european network
of transmission system operators
for gas

TEN-YEAR NETWORK DEVELOPMENT PLAN

2018

PROJECT-SPECIFIC COST-BENEFIT ANALYSIS

1. General Considerations

ENTSOG is the European Network of Transmission System Operators for gas.

ENTSOG's TYNDP18 edition has the important role of identifying the remaining infrastructure gaps through the assessment of the overall gas infrastructure. TYNDP 2018 System Assessment Report defines the basis against which the project-specific cost-benefit analysis (PS-CBA) of PCI candidates is run (link).

In accordance with European Regulation (EU) 347/2013, ENTSOG had run within the TYNDP 2018 a project-specific cost-benefit assessment (PS-CBA) for all projects having declared their intention to apply to PCI during the TYNDP 2018 project data collection. The results are published in this document in the form of Project Fiches.

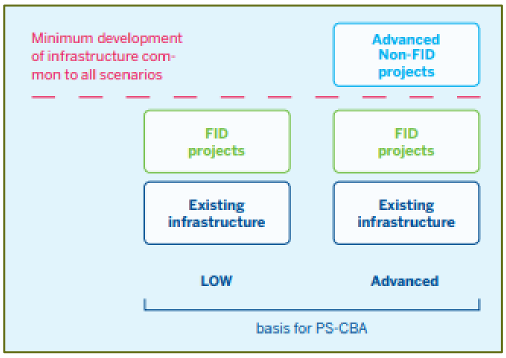
Both TYNDP 2018 and PS-CBA were carried out by ENTSOG in accordance with the adapted version of the 2nd Cost-Benefit Analysis Methodology (CBA Methodology), published by ENTSOG on 23 October 2018 and approved by the European Commission, with Regulation (EC) 715/2009 and Regulation (EU) 347/2013. PS-CBA was performed considering legal requirements as set out in Regulation (EC) 347/2013. PS-CBA should not be perceived as a complete assessment of PCI candidate projects.

The Project Fiches included in this document represent a summary of the relevant project(s) information and PS-CBA results in a harmonised, synthetic and comparable manner. This allows to provide all the relevant information while ensuring a level-playing field and a transparent assessment towards all stakeholders.

2. Project-Specific Assessment (PS-CBA)

Following ENTSOG 2nd CBA Methodology, and depending on the maturity of each project, the PS-CBA assessment evaluates the impact of projects under different infrastructure levels:

> Main assessment against the reference grid: Low infrastructure level (existing infrastructure + projects having FID status)
> Additional assessment against Advanced infrastructure level: existing infrastructure + infrastructure projects having FID status + Advanced Projects



Those represent the counterfactual situation in terms of level of development of the gas infrastructure against which the project is assessed. The infrastructure levels are consistent across the different projects assessed.

The impact of a project is therefore measured comparing the situations "*with the project*" and "*without the project*" (Incremental Approach) in each considered infrastructure levels and pear each demand scenarios[1].

Generally, benefits generated by projects tend to be higher in the Low infrastructure level, where the infrastructure grid is less developed (only existing infrastructure and FID projects), whereas in the Advanced infrastructure level, the infrastructure gaps might be already (partially) fulfilled by possible competing projects. Higher benefits in the Advanced infrastructure level can be triggered by the presence in this grid of projects complementary to the one(s) assessed (e.g. enhancers).

Often, a number of functionally-related projects need to be implemented for their benefit(s) to materialise. For such reason, the PS-CBAs have been performed by ENTSOG at group level.

3. ENTSOG 2nd CBA Methodology, Multi-Criteria analysis and how to read the Project Fiche

The Project Fiche offers a summary of the main information related to the projects forming a specific assessed group. Detailed information are available in TYNDP 2018 Annex A – Project Table (here) and TYNDP 2018 Annex A – Project Sheets (here).

The TYNDP 2018 Project Fiches include contribution by both ENTSOG (in green boxes) and project promoters (in the blue boxes). All published results have been calculated according to ENTSOG methodology unless differently stated. Where relevant promoters were asked to provide justification directly inside the Project Fiches.

Section B "Project Cost Information", indicates the cost for the overall group and for each project forming this group. During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. Section B displays the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. For the purposes of these Project Fiches, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG or provided by the promoter. The cost values represented in Section B are not discounted/actualised.

[1] For more details on TYNDP 2018 demand scenarios consult the TYNDP 2018 Scenario Report available here.

In **section C** the main benefits stemming from the realisation of the project group against the four policy criteria are reported and described. Section C is composed of 3 different sub-section:
- *C.1 Summary of Project Benefits*, where ENTSOG and promoters have described the benefits reported in sub-sections C.2 and C.3;
- *C.2 Quantitative Benefits*, that includes all quantitative indicators results (more detailed below in 3.1);
- *C.3 Monetised Benefits*, that includes all monetised indicators (more detailed below in 3.2);
- *C.4 Sensitivity on Monetised Benefits*, that includes the sensitivities run by ENTSOG on the monetised benefits.

This analysis takes into consideration the results of the TYNDP 2018 System Assessment Report for the identification of the infrastructure gaps.

3.1. Quantitative Benefits

ENTSOG 2nd CBA Methodology is a multi-criteria analysis with monetised elements and non-monetised or quantitative elements.

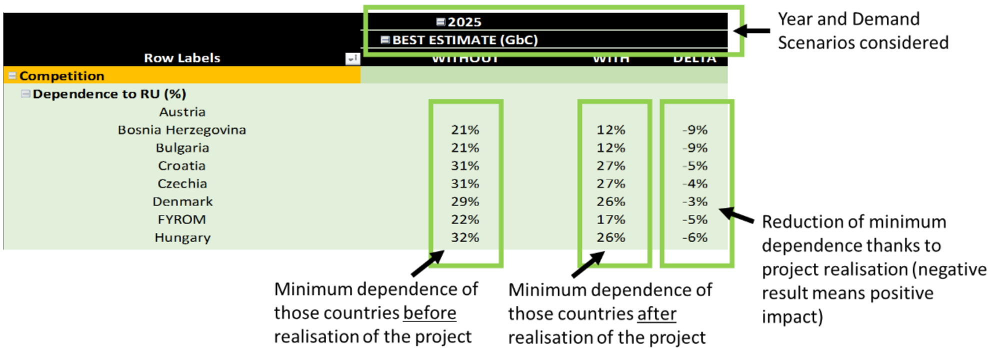
Benefits have been calculated for the years: 2020, 2025, 2030 and 2040.

This last group of benefits is quantified in **section C.2** ("Quantitative Benefits"). The tables presented in this section show values from the CBA Methodology Quantitative Indicators[2] with and without the project, as well as the project impact (or delta) for each indicator. Benefits are displayed according to the relevant policy criteria. Some indicators are expressed in percentage of demand of a given country and therefore the impact of a project must be understood accordingly (e.g. depending of the market size of the impacted country a 10% impact could be significantly different).

Important: there might be cases where tables in section C.2 include more results than the one explained in section C.1.
Section C.1 focuses in fact on the main and most relevant benefits of the project realisation while ignoring results that could be caused by "modelling noises". In any case, results should be always carefully interpreted.

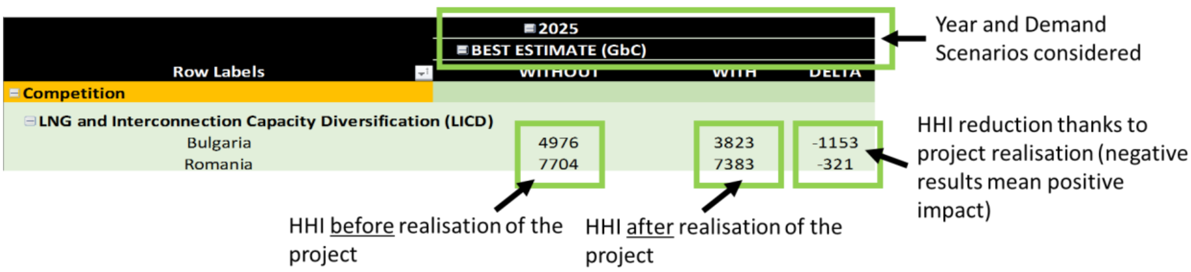
Below a short explanation on how to read the indicators included in section D. Indicator results are shown only for countries impacted by the assessed project group.

> Supply source dependence: it measures the unreducible share of a certain supply source that country X needs to cover its demand. The value cannot be higher than 100% (i.e. the country is completely dependent on a single supply source).



Supply Source Dependence is calculated using a cooperative approach, under this assumption countries will cooperate sharing the same level of dependence unless an infrastructure related limitation prevents them to align their dependence.

> LNG and Interconnection Capacity Diversification: it measures the diversification of paths that a gas can flow through and how balanced the different entries are. This is necessary to ensure competition and arbitrage between countries. The indicator is an HHI indicator that goes from 0 to 10.000. The lower the indicator the more diversified and balanced are a country entry points[3].



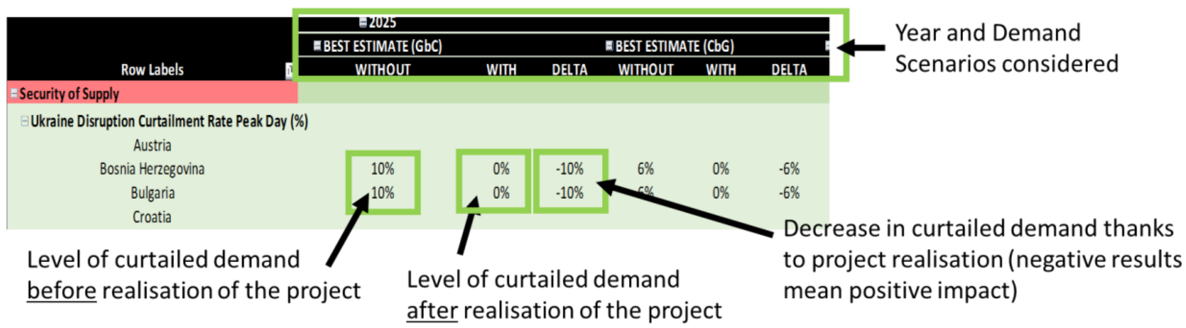
> Supply Source Access: it measures the number of supply sources an area can access from a market perspective. The ability of an area to access a given source is measured through a supply source diversification metric. This supply source diversification ability is calculated as the ability of each area to benefit from a decrease in the price of the considered supply source for at least 20% (such ability does not always mean that the area has a physical access to the source). Tariffs are included in the calculation of the SSA indicator in order to take into account the so called

[2] More information regarding indicators can be found in: Section 3.2.2 'Indicators' of the Adapted 2nd ENTSOG CBA Methodology (link) and Sections 3.1 'Indicators used in TYNDP' and 3.2 'Indicators used only in PS-CBA' of Annex D – Methodology, for TYNDP18 (link).

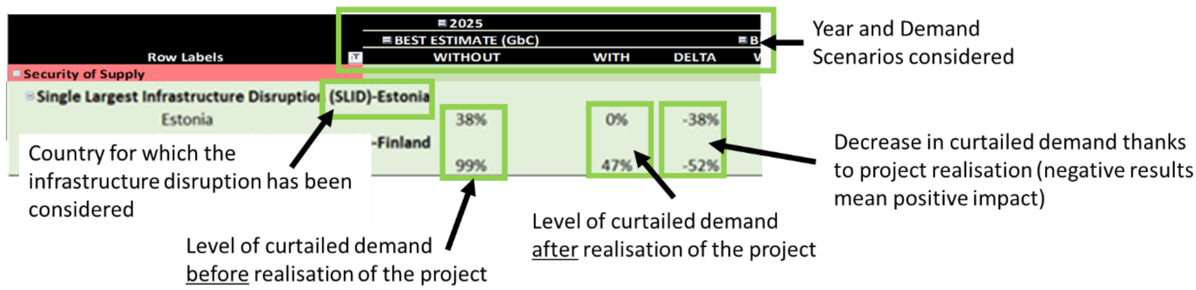
[3] Where a market would have two borders the LICD cannot be lower than 5000. For a market having three borders the LICD cannot be lower than 3333.

pancaking effect that could limit the source from spreading from a country to another. The indicator is also impacted by the threshold defined and the size of the market.

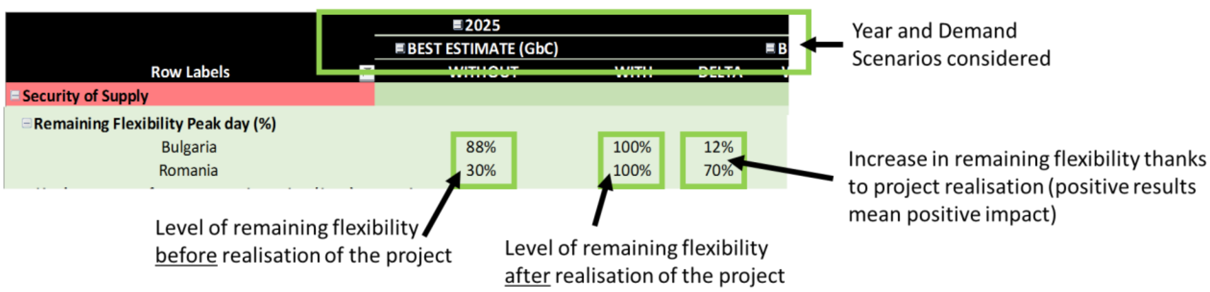
> Curtailment Rate: it measures the demand that cannot be satisfied in a given area due to: (1) climatic stress conditions meaning extreme temperatures with lower probability of occurrence than normal conditions (e.g. occurring with a statistical probability of at least once in 20 years, 1/20); (2) supply stress conditions, in case of supply stress due to specific route disruptions (Ukraine transit, Belarus transit, Baltic States and Finland imports, Algeria route). Only values above 0% (i.e. where there is curtailment) up to 100% (i.e. all the country demand faces curtailment) are displayed.



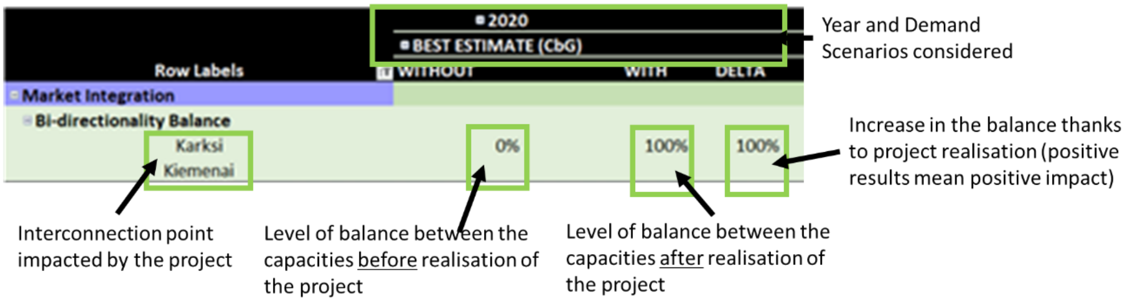
> Single Largest Infrastructure Disruption: it measures the demand that cannot be satisfied in a given area due to disruption of the country main infrastructure. The same country might be impacted by different single largest infrastructure disruptions. Only values above 0% (i.e. where there is curtailment) up to 100% (i.e. all the country demand faces curtailment) are displayed.



> Remaining Flexibility: it measures the resilience of the country gas system when coping with the various stressful events. A country with 88% of remaining flexibility it means he can cover at least 188% of its demand in the assessed situation. Only values above 0% (i.e. the country can cover 1XX% of its peal demand) up to 100% (i.e. the country can cover 200% of its peak demand) are displayed.



> Bi-directional: it measures the balance between the capacities in each direction of an entry point. It is calculated as ratio between additional capacity in a specific entry point in other direction over the existing capacity at an entry point in the prevailing direction. The indicator is capped at 100%. A value of 100% means that at a specific entry point there is full balance between capacities in the two directions.

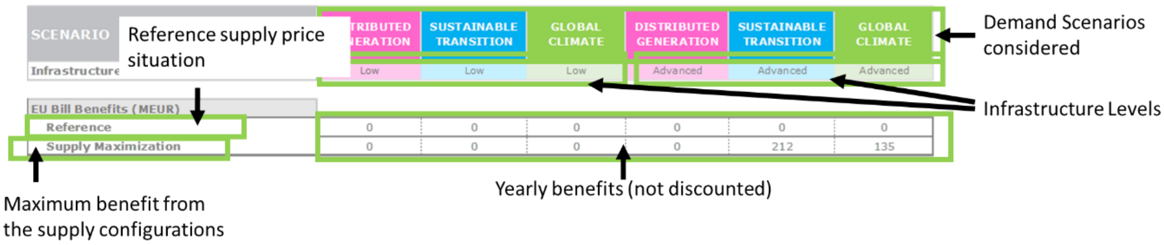


3.2. Monetised Benefits

Monetised elements are shown in **section C.3**.

The following benefits are monetised in the PS-CBA assessment:

> Supply costs savings (EU Bill): this indicator captures the benefits stemming from projects reducing overall European cost of gas under different demand scenarios along the assessment period. Compared to TYNDP 2017, where all supply sources were based on the same reference price, the new TYNDP 2018 price approach allows for a better reflection of differences among the supply prices already in the reference supply configuration (called "Reference"). It is calculated at European level and takes into account also tariffs[4] at European borders.
A project group can bring benefits in terms of reduction in the cost of gas supply when connecting to a (new) cheaper source, when providing an alternative and cheaper route (i.e. lower tariffs), or both. In order to better identify when the positive effect from the project is related to the connection to a (new) cheaper supply source or to the utilisation of an alternative route, ENTSOG has also carried out sensitivities on the tariffs value to be used with the projects (see 3.3 of this document). The inclusion of infrastructure tariffs in the modelling assumptions may result in tariffs being a strong driver for flows. It is important to underline that this may also result in modelled flows following a more binary behaviour than real flows, as in reality different factors impact on network users' nominations. In order to avoid that "cheaper" tariffs would foster the overutilization of projects against existing infrastructures, ENTSOG has considered, in its assessment, long-term capacity bookings for existing infrastructures.
In order to analyse the sensitivity of countries to changes in gas prices and the uncertainty related to the supply price evolution, additionally to the reference supply cost situation, supply cost savings are calculated under five other supply price configurations, where one specific source is considered being more expensive or cheaper by 5 EUR/MWh than the others[5].
In the table, the Refence and the maximum benefit from the five supply price configurations (called "Supply Maximisation") are displayed.



Additionally, it is important to underline that ENTSOG does not consider supply long-term contracts in its assessment. The use of supply long-term contracts have different and opposite implications:
- the impact of projects will depend on the assumptions retained on the evolution of contracts in force, for example in terms of expiration or renegotiation period;
- assessed gas flows and resulting future infrastructure gaps will be sensitive to the assumption made on the quantities considered to be reconstructed.
Instead, ENTSOG considers Minimum and Maximum supply potentials[6] as consulted with stakeholders during the TYNDP 2018 development process. Benefits from projects are therefore related also to the actual availability of this supply. The Minimum supply potential can be considered as a proxy of supply long-term contract at European level.

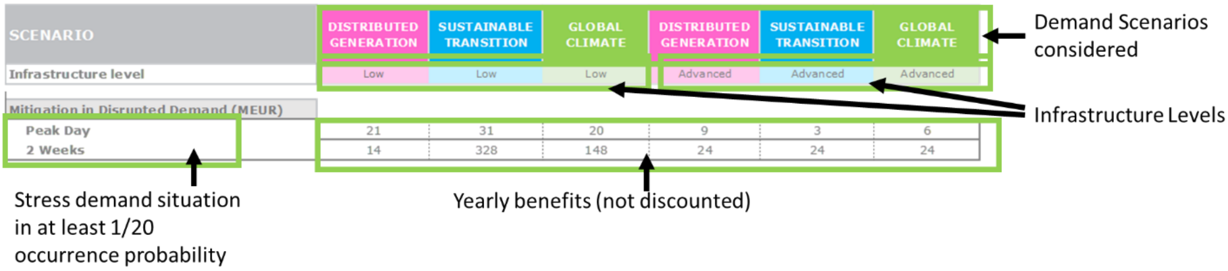
> Reduction in the risk of demand curtailment: it measures the benefits derived by the implementation of the project reducing or fully mitigating demand curtailment along the assessment period and under defined demand scenarios. The indicator calculated under several stressful conditions[7], has been monetised using a uniform CoDG (Cost of Disruption of Gas) of 600 EUR/MWh and taking into account a probability of occurrence of 1-20 years (i.e. 5%) in order to take into account the lower probability of occurrence of peak and stressful situations.

[4] More information on tariff values and long-term capacity booking information used for the reference assessment are available in Annex D – Tariff Values, for TYNDP 2018.

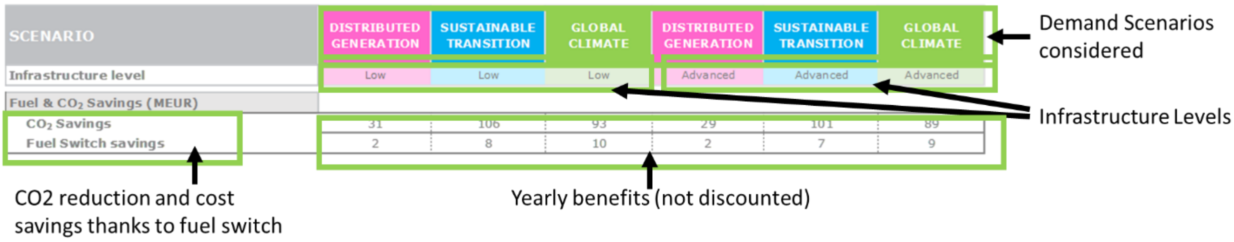
[5] More information regarding supply price configurations and supply curves can be found in 2.3 'Supply Price Curve' of Annex D – Methodology, for TYNDP18.

[6] More information regarding supply potentials can be found in 2.4 'Gas Supply Potentials From Import Sources' of Annex D – Methodology, for TYNDP18 and in the TYNDP 2018 Scenario Report and its Supply Annex.

[7] More information available in Section 3.1.4 'Demand Curtailment and Curtailment Rate' of Annex D – Methodology, for TYNDP18.



> Fuel substitution benefits: it measures benefits related to fuel switching and reduction in CO_2 emissions[8]. Benefits from substitution effect have been provided by the concerned promoters.

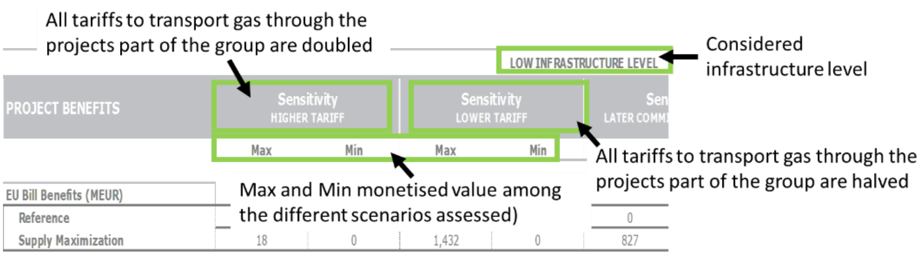


When calculating the economic performance indicators (e.g. Economic Net Present Value), ENTSOG, in its 2nd CBA Methodology, recommends using an economic life of 25 years. The same reference economic life should be retained for all projects assessed to ensure comparability in the analysis of the results.

3.3. Sensitivities on Monetised Benefits

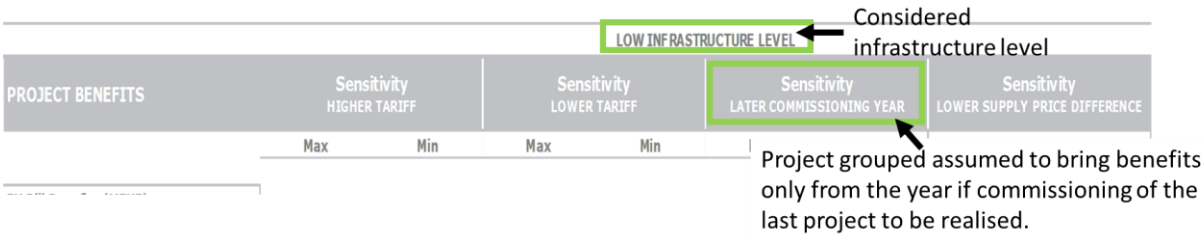
In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivity on some relevant assumptions such as tariffs, commissioning year and lower supply price differential. The sensitivity on the monetised benefits is shown in **section C.4** “Sensitivities analysis on monetised benefits” of the project fiche.

> For tariffs, both upper (double of the reference tariffs) and lower (half of the reference tariffs) sensitivities have been carried out. For simplicity, in the tariff sensitivity tables only the minimum and maximum values among the different assessed demand scenarios are shown. The inclusion of tariffs has impact only on the “Supply costs savings” indicator (EU Bill Benefits). Comparing the results in terms of EU bill in the no-sensitivity assessment (section C.3) with the results under the tariff sensitivity (section C.4) in case of high tariffs allows to better identify which benefits are related to supply cost savings thanks to the connection to a (new) cheaper supply source or more related to the utilisation of an alternative and cheaper route. In case of presence of benefits related to tariffs savings, the EU Bill values in section C.4 will be lower than the EU Bill values in section C.3.

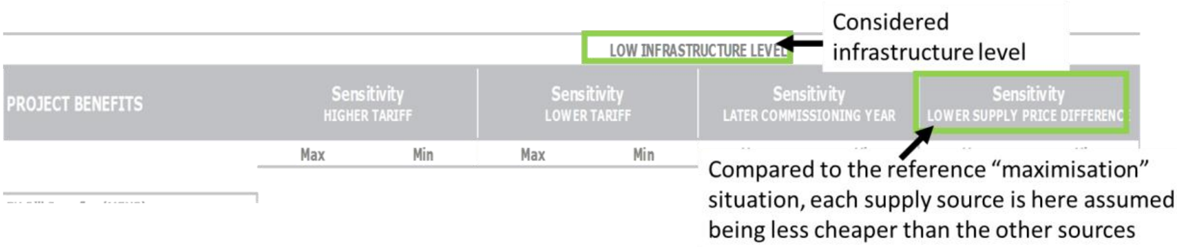


> For commissioning year, while the reference approach considers as commissioning year of the whole assessed group the year of realisation of the first project (part of the group) to be commissioned, in the sensitivity it has been considered as commissioning year of the whole assessed group the year of realisation of the last project (part of the group) to be commissioned. A project group might in fact already start bringing some benefits before the completion of all the phases of the group, with the realisation of the first capacity increment. This sensitivity has an impact on all monetised indicators. Example1: two projects forming a group, one with commissioning year 2018 and one 2025. Example2: Group formed by a single project but with different phases and different years (again 2018 and 2025). For both groups the sensitivity will assess the group as commissioned in 2018 and in 2025. Only in case a group is formed by a single project that has no different phases, the sensitivity will show the same results.

[8] More information available in Section 3.2.3 ‘Substitution effect’ of Annex D – Methodology, for TYNDP18.



> For the supply price differential, only a lower sensitivity has been applied and considering a price spread of 2.5 EUR/MWh when minimising the supply cost of a specific source against the rest of the supply sources. While in the "reference" supply maximisation a source is assumed to be 5 EUR/MWh cheaper than the other sources, in this sensitivity the source is expected to be 2.5 EUR/MWh cheaper. More information about the different supply source configurations are available in TYNDP 2018 Annex D – Methodology. As for the tariff sensitivity, this sensitivity has an impact only on the "Supply costs savings" indicator (EU Bill Benefits) since it has an influence on the supply sources merit order and consequently on their utilisation.



Sensitivities are calculated for all scenarios and only maximum and minimum results among all assessed scenarios are displayed. All sensitivities results are displayed for both Low and Advanced infrastructure level.

3.4. Other Impacts and Benefits

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. **Section D** "Environmental Impact" further elaborates on the mitigation measures taken by the project promoter. It is responsibility of the project promoter to submit such measures in form of qualitative or quantitative information.

In **section E** "Other Benefits", promoters indicated any benefit which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology. It is responsibility of the project promoter to submit such information.

Section F "Useful Link", include any link as provided by the promoters.

3.5. Gasification projects

A specific assessment has been carried out by ENTSOG with regards to the so called "gasification projects". Those are projects that aim at bringing gas to countries or areas not reached by natural gas yet. The traditional indicators cannot be computed for those projects since they would show only negative results.
For example, in the case of supply source dependence a gasification project will increase the dependence of that country/region to gas since before the dependence was 0% due to the fact that before the project realisation the country/region did not have access at all to gas. Therefore, benefits from the realisation of "gasification projects" can be measured only in terms of:
- natural gas replacing more polluting or expensive fuels (from promoters);
- access to a new gas supply source (from ENTSOG).
Those are the "gasification projects": WEST_08 (Malta); WST_12 (Sardinia); SGC_02 (Cyprus); SGC_03 (incl. also Cyprus gasification).

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_01a

Reasons for grouping [ENTSOG]

The project group represents the first interconnection pipeline between Estonia and Finland (Balticonnector) and includes the two sides of the investments as well as an off-shore section crossing the Baltic Sea.

Objective of the project(s) in the group [Promoter]

The Balticconnector pipeline project will play a major role in the energy strategies of Finland, Estonia and the EU. The project aims at improving regional security of supply by diversifying gas sources. It will create a framework for market opening, growth and enable the use of alternative sources, such as liquid natural gas (LNG) and biogas. Finally, it enables the interconnection of the Finnish and Baltic gas markets and their integration with the EU's common

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0895	Balticconnector Estonian part	Elering AS	EE	FID	8.1.1	2019	2019	On time
TRA-F-0928	Balticconnector Finnish part	Baltic Connector Oy	FI	FID	8.1.1	2019	2019	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0895	500	77	10
TRA-F-0895	700	55	10
TRA-F-0928	500	77	10
TRA-F-0928	700	21	10

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0895	Elering AS	Balticonnector / Paldiski (EE)	2019	80	80
TRA-F-0928	Baltic Connector Oy	Balticconnector / Siuntio	2019	80	80

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-928	TRA-F-895
CAPEX [mln. EUR]	259.50	128.50	131.00
Range CAPEX		5%	5%
OPEX [mln. EUR/y]	3.00	1.50	1.50

Description of costs and range [Promoter]

The total cost of the project is EUR 260 million. The project would not be viable without considerable support from the EU. In 2016, the European Commission (CEF) granted funding of EUR 187.5 million to the project.

The project has been divided into the following subprojects:

- Onshore pipeline Siuntio-Inkoo (Finland)
- Compression and metering station, Inkoo (Finland)
- Offshore pipeline Inkoo (Finland) - Paldiski (Estonia)
- Compression and metering station, Paldiski (Estonia)
- Onshore pipeline, Paldiski-Kiili (Estonia)
- Pressure regulating station, Kiili (Estonia)

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project Benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Finland. Without the project group Finland has only one physical entry point from Russia, whereas with the project Finland will have an additional entry point which connects Finland and Estonia. The interconnection allows further cooperation between Finland and their neighbouring countries and therefore alignment of their dependence to Russian gas.

The projects group **improves the diversification of entry capacities** both in Estonia and Finland, as the commissioning of this project group will entail a new within-EU entry point for both countries. Diversification of entry capacities is measured by LNG and Interconnection capacity indicator which is an HHI indicator and ranges from 0 to 10.000 (which represents only one EU-entry point). Estonia reduces LICD from 10,000 to 5,000, whereas for Finland the improvement in diversification of entry capacities is not captured by LICD indicator as import entry points from Non-EU countries are not considered by LICD indicator, after the realization of the project group Finland will have one within EU entry point and LICD indicator of 10,000.

Depending on the considered demand scenario, the project group **increases the number of supply sources** Finland has access to. With the interconnection, Finland has significant access to new supply sources (LNG or Norwegian gas depending on the scenario).

> **Security of Supply:**

The project group **increases the Remaining Flexibility** in Finland and Estonia. Finland improves the Remaining Flexibility from 2020 in all demand scenarios for peak day. Whereas Estonia improves the Remaining Flexibility only in EUCO30, where gas demand is considerably higher than for the other scenarios.

Regarding the supply import routes disruptions, in **case of Baltics-Finland disruption the project mitigates the risk of demand curtailment** in Finland for both peak-day and 2-weeks demand cases. The project allows further integration and cooperation between Finland and their neighbouring countries, and consequently distribution of curtailment rate between these countries.

The project **fully mitigates the risk of demand curtailment** in Estonia and **significantly reduces the risk of demand curtailment** in Finland, in case of **disruption of their respective single largest infrastructure.**

> **Market integration:**

From 2030 and depending on the demand scenario, the **project reduces cost of gas supply** by 2 MEUR/y on average and is not dependent on the supply configurations. This reduction in the cost of gas supply can be explained by savings in transportation costs especially in the Baltics thanks to the utilisation of this new alternative route.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The project will enhance the energy security and strengthen the gas system of Baltic countries and Finland and is expected to also have a positive effect on the gas market through the creation of larger market area, increased competition and price convergence. It is expected to decrease natural gas price and together with higher CO_2 prices would motivate new power investments that will be built in the region to utilise natural gas. Currently older power plants in Estonia operate on oil shale, which is more CO_2 intensive process compared to using natural gas. In Finland industry would benefit from decreased gas prices.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Finland	98%	42%	-56%	94%	60%	-34%	94%	57%	-37%	90%	61%	-29%	87%	45%	-42%	94%	67%	-27%	74%	40%	-34%	83%	58%	-25%	73%	37%	-36%
LNG and Interconnection Capacity Diversification (LICD)																											
Estonia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000
Supply Source Access (SSA)																											
Croatia																2	3	1									
Finland	1	2	1				1	2	1				1	2	1												
Serbia																4	5	1									

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Finland	99%	50%	-49%	96%	48%	-47%	96%	48%	-48%	94%	53%	-41%	93%	43%	-50%	96%	66%	-30%	91%	60%	-31%	91%	58%	-33%	90%	52%	-37%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Finland	99%	62%	-37%	97%	60%	-37%	97%	59%	-38%	96%	64%	-32%	95%	55%	-39%	96%	72%	-25%	93%	66%	-26%	93%	65%	-27%	91%	59%	-32%
Remaining Flexibility 2-Week Cold Spell (%)																											
Estonia																92%	100%	8%									
Finland										93%	100%	7%				37%	64%	26%	33%	69%	36%	51%	88%	37%	66%	100%	34%
Remaining Flexibility Peak day (%)																											
Estonia																60%	100%	40%									
Finland	68%	100%	32%	70%	100%	30%	78%	100%	22%	45%	77%	32%	77%	100%	23%	15%	32%	17%	8%	37%	29%	26%	53%	27%	38%	75%	37%
Single Largest Infrastructure Disruption (SLID)-Estonia																											
Estonia	38%	0%	-38%	36%	0%	-36%	36%	0%	-36%	34%	0%	-34%	18%	0%	-18%	53%	0%	-53%				34%	0%	-34%	4%	0%	-4%
Single Largest Infrastructure Disruption (SLID)-Finland																											
Finland	99%	47%	-52%	97%	45%	-52%	97%	43%	-53%	96%	51%	-45%	95%	39%	-55%	96%	62%	-35%	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%

ADVANCED Infrastructure Level

Row Labels	2020			2025					
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition									
Dependence to RU (%)									
Finland	98%	42%	-56%	94%	19%	-75%	94%	9%	-85%
LNG and Interconnection Capacity Diversification (LICD)									
Estonia	10,000	5,000	-5,000	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)									
Finland	1	2	1				1	3	2
Security of Supply									
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)									
Finland	99%	50%	-49%	96%	24%	-72%	96%	23%	-73%
Baltics Finland Disruption Curtailment Rate Peak Day (%)									
Finland	99%	62%	-37%	97%	43%	-54%	97%	41%	-56%
Remaining Flexibility 2-Week Cold Spell (%)									
Finland									
Remaining Flexibility Peak day (%)									
Finland	68%	100%	32%	70%	100%	30%	78%	100%	22%
Single Largest Infrastructure Disruption (SLID)-Estonia									
Estonia	38%	0%	-38%						
Single Largest Infrastructure Disruption (SLID)-Finland									
Finland	99%	47%	-52%	97%	43%	-54%	97%	41%	-56%

Row Labels	2030								
	SUSTAINABLE			DISTRIBUTED			EUCO30		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition									
Dependence to RU (%)									
Finland	90%	21%	-69%	87%	1%	-86%	94%	30%	-64%
LNG and Interconnection Capacity Diversification (LICD)									
Estonia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)									
Finland	1	3	2	1	3	2	1	3	2
Security of Supply									
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)									
Finland	94%	34%	-60%	93%	18%	-75%	96%	53%	-43%
Baltics Finland Disruption Curtailment Rate Peak Day (%)									
Finland	96%	51%	-45%	95%	39%	-55%	96%	61%	-36%
Remaining Flexibility 2-Week Cold Spell (%)									
Finland	93%	100%	7%				37%	80%	43%
Remaining Flexibility Peak day (%)									
Finland	45%	90%	45%	77%	100%	23%	15%	51%	36%
Single Largest Infrastructure Disruption (SLID)-Estonia									
Estonia									
Single Largest Infrastructure Disruption (SLID)-Finland									
Finland	96%	51%	-45%	95%	39%	-55%	96%	61%	-36%

Row Labels	2040								
	CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition									
Dependence to RU (%)									
Finland	74%	0%	-74%	83%	21%	-62%	73%	0%	-73%
LNG and Interconnection Capacity Diversification (LICD)									
Estonia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)									
Finland	2	3	1	1	2	1	2	3	1
Security of Supply									
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)									
Finland	91%	51%	-40%	91%	45%	-46%	90%	40%	-50%
Baltics Finland Disruption Curtailment Rate Peak Day (%)									
Finland	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%
Remaining Flexibility 2-Week Cold Spell (%)									
Finland	33%	72%	40%	51%	97%	46%	66%	100%	34%
Remaining Flexibility Peak day (%)									
Finland	8%	40%	32%	26%	64%	38%	38%	80%	42%
Single Largest Infrastructure Disruption (SLID)-Estonia									
Estonia									
Single Largest Infrastructure Disruption (SLID)-Finland									
Finland	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	3.4	1.8	0.0	0.0	0.0
Supply Maximization	0.0	3.4	1.8	0.0	3.3	1.7
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	3.3	3.1	3.3	4.4	4.4	4.4
2 Weeks	1.1	14.3	15.5	30.4	30.4	30.4
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	2.7	3.9	6.8	2.6	3.8	6.8
Fuel Switch savings	0.5	1.0	0.6	0.5	0.7	0.4

C.4 Sensitivities analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	5.1	0.7	3.4	0.0	3.4	0.0
Supply Maximization	0.0	0.0	5.1	0.7	3.4	0.0	1.7	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.3	3.1	3.3	3.1	1.1	0.8	3.3	3.1
2 Weeks	15.5	1.1	15.5	1.1	16.0	14.3	15.5	1.1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	6.8	2.7	6.8	2.7	6.8	2.7	6.8	2.7
Fuel Switch savings	1.0	0.5	1.0	0.5	1.0	0.5	1.0	0.5

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	12.6	0.0	3.3	0.0	1.6	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.4	4.4	4.4	4.4	2.1	2.1	4.4	4.4
2 Weeks	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	6.8	2.6	6.8	2.6	6.8	2.6	6.8	2.6
Fuel Switch savings	0.7	0.4	0.7	0.4	0.7	0.4	0.7	0.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Environmental impact assessments for the projects have not indicated any substantial and irreversible impacts on the environment. In order to ensure that environmental assessments are correct, environmental monitoring is carried out before, during and after the construction of the infrastructure.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.

As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

F. Useful Links

The project website (Baltic Connector Oy): http://balticconnector.fi/en/

The project website (Elering AS): https://elering.ee/en/balticconnector

Estonian Gas Transmission Network Development Plan 2018 – 2027: https://elering.ee/sites/default/files/attachments/Eesti%20gaasi%C3%BClekandev%C3%B5rgu%20arengukava%202018-2027_t%C3%A4iendatud_16_05_2018.pdf

PCI 8.1.1. Fiche: http://ec.europa.eu/energy/maps/pci_fiches/pci_8_1_1_en_2017.pdf

PCI 8.1.1. Implementation Plan : http://ec.europa.eu/energy/maps/pci_fiches/pci_annex2_8_1_1_en_2017.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_01b

Reasons for grouping [ENTSOG]

The project group represents the first interconnection pipeline between Estonia and Finland (Balticonnector) and includes the two sides of the investments as well as an off-shore section crossing the Baltic Sea. The group includes also the enabler project TRA-F-915.

Objective of the project(s) in the group [Promoter]

The project group aims at increasing security of supply of the Finnish and Baltic region by connecting the gas systems of Finland and Baltic countries. Enhancement of Estonia-Latvia interconnection project will enable Finland to access Incukalns gas storage in Latvia. The implementation of the project group will also create a positive environment for the development of regional gas market.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0895	Balticconnector Estonian part	Elering AS	EE	FID	8.1.1	2019	2019	On time
TRA-F-0915	Enhancement of Estonia-Latvia interconnection	Elering AS	EE	FID	8.2.2	2019	2019	On time
TRA-F-0928	Balticconnector Finnish part	Baltic Connector Oy	FI	FID	8.1.1	2019	2019	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0895	700	55	10
TRA-F-0895	500	77	10
TRA-F-0915	-	-	10
TRA-F-0928	700	21	10
TRA-F-0928	500	77	10

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0895	Elering AS	Balticonnector / Paldiski (EE)	2019	80	80
TRA-F-0915	Elering AS	Karksi	2019	46.4	105
TRA-F-0928	Baltic Connector Oy	Balticconnector / Siuntio	2019	80	80

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-928	TRA-F-895	TRA-F-915
CAPEX [mln. EUR]	296.50	128.50	131.00	37.00
Range CAPEX		5%	5%	5%
OPEX [mln. EUR/y]	4.00	1.50	1.50	1.00

Description of costs and range [Promoter]

The total cost of the projects is approximately EUR 300 million. The project would not be viable without considerable support from the EU. In 2016, the European Commission (CEF) granted funding of EUR 187.5 million to the Balticconnector project and EUR 18.6 million to the Enhancement of Estonia-Latvia interconnection project.

The project has been divided into the following subproject:

> Onshore pipeline Siuntio-Inkoo (Finland)
> Compression and metering station, Inkoo (Finland)
> Offshore pipeline Inkoo (Finland) - Paldiski (Estonia)
> Compression and metering station, Paldiski (Estonia)
> Onshore pipeline Paldiski-Kiili (Estonia)
> Pressure regulating station, Kiili (Estonia)
> New bi-directional gas metering station, Karksi (Estonia)
> Gas compressor station, Puiatu (Estonia)
> Line valve station, Lilli (Estonia)

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Finland. Without the project group Finland has only one physical entry point from Russia, whereas, with the project, Finland will have an additional entry point which connects Finland and Estonia. The interconnection allows further cooperation between Finland and their neighbouring countries and therefore alignment of their dependence to Russian gas.

The projects group **improves the diversification of entry capacities** in Estonia, Latvia and Finland, as the commissioning of this project group will entail a new within-EU entry points for the three countries. Diversification of entry capacities is measured by LNG and Interconnection capacity indicator which is an HHI indicator and ranges from 0 (perfect market) to 10.000 (which represents only one EU-entry point). Both Estonia and Latvia reduce LICD from 10,000 (which represents only one EU-entry) to 5,000, whereas for Finland the improvement in diversification of entry capacities is not captured by LICD indicator as import entry points from Non-EU countries are not considered by LICD indicator, after the realization of the project group Finland will have one within EU entry point and LICD indicator of 10,000.

Depending on the considered demand scenarios the projects group **increases the number of supply sources** Finland has access to. With the project, Finland has significant access to new supply sources (LNG or Norwegian gas depending on the scenario).

> **Security of Supply:**

The project group **increases the Remaining Flexibility** in Finland and Estonia. Finland improves the Remaining Flexibility from 2020 in all scenarios in peak day. Whereas Estonia improves the Remaining Flexibility only in EUCO30, where gas demand in considerably higher than for the other scenarios.

Regarding the supply import routes disruptions, in **case of Baltics Finland disruption the project mitigates the risk of demand curtailment** in Finland for both peak-day and 2-weeks disruptions. The project allows further integration and cooperation between Finland and their neighbouring countries, and consequently distribution of curtailment rate between these countries.

The project **fully mitigates the risk of demand curtailment** in Estonia and **significantly** in Finland, in case of **disruption of their respective single largest infrastructure.**

> **Market integration:**

From 2030 and depending on the demand scenario, the **project group reduces cost of gas supply** by 2 MEUR/y on average and is not dependent on supply configurations. This reduction in the cost of gas supply can be explained by savings in transportation costs especially in the Baltics thanks to the utilisation of this new alternative route.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The project will enhance the energy security and strengthen the gas system of Baltic countries and Finland and is expected to also have a positive effect on the gas market through the creation of larger market area, increased competition and price convergence. It is expected to decrease natural gas price and together with higher CO_2 prices would motivate new power investments that will be built in the region to utilise natural gas. Currently older power plants in Estonia operate on oil shale, which is more CO_2 intensive process compared to using natural gas. In Finland industry would benefit from decreased gas prices.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025			2030												2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Finland	98%	42%	-56%	94%	60%	-34%	94%	57%	-37%	90%	61%	-29%	87%	45%	-42%	94%	67%	-27%	74%	40%	-34%	83%	58%	-25%	73%	37%	-36%
LNG and Interconnection Capacity Diversification (LICD)																											
Estonia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000
Supply Source Access (SSA)																											
Croatia																2	3	1									
Finland	1	2	1				1	2	1				1	2	1												
Serbia																4	5	1									
Security of Supply																											
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Finland	99%	50%	-49%	96%	48%	-47%	96%	48%	-48%	94%	53%	-41%	93%	43%	-50%	96%	66%	-30%	91%	60%	-31%	91%	58%	-33%	90%	52%	-37%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Finland	99%	62%	-37%	97%	60%	-37%	97%	59%	-38%	96%	64%	-32%	95%	55%	-39%	96%	72%	-25%	93%	66%	-26%	93%	65%	-27%	91%	59%	-32%
Remaining Flexibility 2-Week Cold Spell (%)																											
Estonia																65%	100%	35%									
Finland										93%	100%	7%				37%	64%	26%	33%	69%	36%	51%	88%	37%	66%	100%	34%
Poland																			87%	88%	1%						
Remaining Flexibility Peak day (%)																											
Estonia	84%	100%	16%	89%	100%	11%	90%	100%	10%	95%	100%	5%				38%	100%	62%				94%	100%	6%			
Finland	68%	100%	32%	70%	100%	30%	78%	100%	22%	45%	77%	32%	77%	100%	23%	15%	32%	17%	8%	37%	29%	26%	53%	27%	38%	75%	37%
Poland																			72%	72%	1%						
Single Largest Infrastructure Disruption (SLID)-Estonia																											
Estonia	38%	0%	-38%	36%	0%	-36%	36%	0%	-36%	34%	0%	-34%	18%	0%	-18%	53%	0%	-53%				34%	0%	-34%	4%	0%	-4%
Single Largest Infrastructure Disruption (SLID)-Finland																											
Finland	99%	47%	-52%	97%	45%	-52%	97%	43%	-53%	96%	51%	-45%	95%	39%	-55%	96%	62%	-35%	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%
Market Integration																											
Bi-directionality Balance																											
Karksi	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

ADVANCED Infrastructure Level

Row Labels	2020			2025			2030												2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Finland	98%	42%	-56%	94%	19%	-75%	94%	9%	-85%	90%	21%	-69%	87%	1%	-86%	94%	30%	-64%	74%	0%	-74%	83%	21%	-62%	73%	0%	-73%
Latvia				34%	19%	-15%	23%	8%	-15%	38%	21%	-18%	12%	1%	-11%	30%	13%	-17%	10%	0%	-10%	36%	22%	-14%	6%	0%	-6%
Lithuania				33%	19%	-14%	23%	9%	-14%	38%	21%	-17%	11%	2%	-10%	30%	13%	-17%	9%	0%	-9%	35%	22%	-13%	5%	0%	-5%
LNG and Interconnection Capacity Diversification (LICD)																											
Estonia	10,000	5,000	-5,000	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000
Supply Source Access (SSA)																											
Finland	1	2	1	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	2	3	1	1	2	1	2	3	1
Security of Supply																											
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Finland	99%	50%	-49%	96%	24%	-72%	96%	23%	-73%	94%	34%	-60%	93%	18%	-75%	96%	53%	-43%	91%	51%	-40%	91%	45%	-46%	90%	40%	-50%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Finland	99%	62%	-37%	97%	43%	-54%	97%	41%	-56%	96%	51%	-45%	95%	39%	-55%	96%	61%	-36%	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%
Remaining Flexibility 2-Week Cold Spell (%)																											
Finland										93%	100%	7%				37%	80%	43%	33%	72%	40%	51%	97%	46%	66%	100%	34%
Remaining Flexibility Peak day (%)																											
Estonia	84%	100%	16%																								
Finland	68%	100%	32%	70%	100%	30%	78%	100%	22%	45%	90%	45%	77%	100%	23%	15%	51%	36%	8%	40%	32%	26%	64%	38%	38%	80%	42%
Single Largest Infrastructure Disruption (SLID)-Estonia																											
Estonia	38%	0%	-38%																								
Single Largest Infrastructure Disruption (SLID)-Finland																											
Finland	99%	47%	-52%	97%	43%	-54%	97%	41%	-56%	96%	51%	-45%	95%	39%	-55%	96%	61%	-36%	93%	60%	-32%	93%	55%	-38%	91%	50%	-42%
Market Integration																											
Bi-directionality Balance																											
Karksi	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	3.4	1.8	0.0	0.0	0.0
	Supply Maximization	0.0	3.4	1.8	0.0	8.6	5.6
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	3.3	3.1	3.2	4.4	4.4	4.4
	2 Weeks	1.1	14.3	15.4	30.4	30.4	30.4
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	3.4	6.2	8.8	3.3	6.0	8.6
	Fuel Switch savings	0.6	1.1	0.8	0.6	0.8	0.6

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	1.7	0.8	5.5	4.6	3.4	0.0	3.4	0.0
Supply Maximization	2.3	0.4	6.1	4.1	3.4	0.0	1.7	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.3	3.1	3.3	3.1	1.1	0.8	3.3	3.1
2 Weeks	15.4	1.1	15.4	1.1	16.0	14.3	15.4	1.1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.8	3.4	8.8	3.4	8.8	3.4	8.8	3.4
Fuel Switch savings	1.1	0.6	1.1	0.6	1.1	0.6	1.1	0.6

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	28.1	0.0	8.6	0.0	4.3	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.4	4.4	4.4	4.4	2.1	2.1	4.4	4.4
2 Weeks	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.6	3.3	8.6	3.3	8.6	3.3	8.6	3.3
Fuel Switch savings	0.8	0.6	0.8	0.6	0.8	0.5	0.8	0.6

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Environmental impact assessments for the projects have not indicated any substantial and irreversible impacts on the environment. In order to ensure that environmental assessments are correct, environmental monitoring is carried out before, during and after the construction of the infrastructure.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

F. Useful Links

The project website (Baltic Connector Oy): http://balticconnector.fi/en/
The project website (Elering AS): https://elering.ee/en/balticconnector

Estonian Gas Transmission Network Development Plan 2018 – 2027:
https://elering.ee/sites/default/files/attachments/Eesti%20gaasi%C3%BClekandev%C3%B5rgu%20arengukava%202018-2027_t%C3%A4iendatud_16_05_2018.pdf

PCI 8.1.1. Fiche: http://ec.europa.eu/energy/maps/pci_fiches/pci_8_1_1_en_2017.pdf

PCI 8.1.1. Implementation Plan: http://ec.europa.eu/energy/maps/pci_fiches/pci_annex2_8_1_1_en_2017.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_02

Reasons for grouping [ENTSOG]

The project group aims at enhancing the transmission capacity of the gas systems between Latvia and Lithuania. The group includes the two sides of the investments as well as the enabler project TRA-F-915.

Objective of the project(s) in the group [Promoter]

The objective of the group of projects is to remove bottlenecks and increase security of supply in the Baltic gas system and provide positive environment for the development of regional gas market. This could be achieved by enhancing the current interconnection capacities at Latvia-Lithuania and Estonia-Latvia interconnection and enabling bi-directional flow at Estonia-Latvia interconnection.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0915	Enhancement of Estonia-Latvia interconnection	Elering AS	EE	FID	8.2.2	2019	2019	On time
TRA-N-0342	Enhancement of Latvia-Lithuania interconnection (Lithuania's part)	Amber Grid	LT	Less-Advanced	8.2.1	2020	2020	Rescheduled
TRA-N-0382	Enhancement of Latvia-Lithuania interconnection (Latvian part)	Conexus Baltic Grid	LV	Less-Advanced	8.2.1	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0915	-	-	10
TRA-N-0342	-	-	-
TRA-N-0382	700	93	11

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0915	Elering AS	Karksi	2019	46.4	105
TRA-N-0342	AB Amber Grid	Kiemenai	2020	60	57.4
TRA-N-0382	Conexus Baltic Grid	Kiemenai	2023	57.41	60

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-382	TRA-N-342	TRA-F-915
CAPEX [mln. EUR]	62.40	20.70	4.70	37.00
Range CAPEX		10%	10%	5%
OPEX [mln. EUR/y]	1.30	0.20	0.10	1.00

Description of costs and range [Promoter]

The total cost composes of the following project components:

Enhancement of Estonia-Latvia interconnection:

- New bi-directional gas metering station in Karksi, Estonia
- Gas compressor station in Puiatu, Estonia
- Line valve station in Lilli, Estonia

Enhancement of Latvia-Lithuania interconnection (Lithuania's part):

- Increase of capacity of GMS Kiemenai
- Adjustment of Panevezys piping

Enhancement of Latvia-Lithuania interconnection (Latvian part):

- Increase of the maximal operation pressure up to 50 bar in Latvia's transmission system

CAPEX and OPEX and their respective ranges for the Enhancement of Estonia-Latvia interconnection project were estimated during the engineering phase of the project in 2014-2016 by using Project Promoter's expertise and engineering consultant's expertise. The cost numbers can be considered as best estimation done at the time of engineering.
CAPEX and OPEX for the Enhancement of Latvia-Lithuania interconnection were estimated in the Feasibility Study and Cost/Benefits Analysis conducted in 2018.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Latvia.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Finland in peak day and 2-week cold spell and Estonia in peak day (only in EUCO30, where gas demand in considerably higher than for the other scenarios). Benefits stemming from the realisation of this group are spread among different countries (Poland and Denmark).

Regarding the supply import routes disruptions:

- In **case of Baltics-Finland disruption the project mitigates the risk of demand curtailment** in Finland and Estonia for both peak-day and 2-weeks disruptions. Additionally, for the **same route disruption, the project fully mitigates the risk of demand curtailment** in Lithuania.
- In case **of Belarus disruption**, the **project mitigates the risk of demand curtailment** in Lithuania and Poland.

Regarding disruption of the main infrastructure:

- In case of **SLID-Lithuania**, the project **fully mitigates the risk of demand curtailmen**t in Lithuania.
- In case of **SLID-Finland**, the project **reduces the risk of demand curtailment** in Finland and Estonia.

> **Market integration:**

The **bidirectionality is improved** with the creation of capacity between Latvia and Lithuania.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects will strengthen the gas system of Baltic region and is expected to also have a positive effect on the gas market through the creation of larger market area, increased competition and price convergence. Decreased natural gas price and higher CO2 prices would motivate plants in the region to operate on natural gas. For example, currently older power plants in Estonia operate on oil shale, which is more CO2 intensive process compared to using natural gas.

The realisation of the group’s projects will result in gaining benefits for the fuel switch alternative under different scenarios. On the group’s level the highest benefits vary by years depending on the scenario applied. The group will receive the highest benefits starting from 2040, if Sustainable Transition scenario is applied, and lower value of benefits from 2025 if Distributed Generation scenario and from 2030 if EUCO scenario are considered.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
LNG and Interconnection Capacity Diversification (LICD)																											
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Estonia	58%	50%	-9%	57%	48%	-9%	56%	47%	-9%	60%	52%	-8%	52%	42%	-10%	72%	66%	-6%	64%	58%	-6%	64%	58%	-6%	58%	52%	-6%
Finland	60%	50%	-10%	58%	48%	-10%	58%	48%	-10%	61%	53%	-9%	53%	43%	-10%	72%	66%	-6%	66%	60%	-6%	65%	58%	-7%	60%	52%	-8%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Estonia	68%	62%	-6%	66%	59%	-7%	66%	58%	-8%	70%	62%	-8%	62%	54%	-8%	76%	70%	-6%	70%	66%	-4%	70%	64%	-6%	64%	58%	-6%
Finland	70%	62%	-8%	68%	60%	-8%	66%	59%	-8%	70%	64%	-6%	63%	55%	-8%	77%	72%	-5%	71%	66%	-5%	71%	65%	-6%	66%	59%	-6%
Lithuania													5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Lithuania																6%	1%	-5%				8%	3%	-5%			
Poland																5%	1%	-4%				7%	3%	-4%			
Belarus Disruption Curtailment Rate Peak Day (%)																											
Lithuania													5%	0%	-5%	14%	10%	-4%	4%	0%	-4%	16%	12%	-4%	4%	0%	-4%
Poland																13%	9%	-4%				16%	12%	-3%			
Remaining Flexibility 2-Week Cold Spell (%)																											
Denmark																									89%	91%	1%
Finland																56%	64%	8%	62%	69%	7%	80%	88%	8%			
Poland																			87%	88%	1%						
Remaining Flexibility Peak day (%)																											
Estonia																89%	100%	11%									
Finland	95%	100%	5%	98%	100%	2%				69%	77%	8%				26%	32%	6%	31%	37%	6%	46%	53%	7%	68%	75%	8%
Poland																			72%	72%	1%						
Single Largest Infrastructure Disruption (SLID)-Finland																											
Estonia	54%	46%	-8%	52%	44%	-8%	50%	42%	-8%	56%	49%	-7%	46%	37%	-9%	66%	60%	-6%	60%	22%	-38%	58%	49%	-9%	52%	24%	-28%
Finland	55%	47%	-7%	52%	45%	-7%	51%	43%	-8%	57%	51%	-6%	47%	39%	-8%	66%	62%	-5%				60%	55%	-5%	52%	50%	-3%
Single Largest Infrastructure Disruption (SLID)-Lithuania																											
Lithuania													5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%

	2020			2025									2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																														
Bi-directionality Balance																														
Karksi	0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%
Kiemenai				96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%

ADVANCED Infrastructure Level

	2020			2025			2030												2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Latvia				34%	19%	-15%	23%	9%	-14%	38%	21%	-18%	12%	2%	-10%	30%	13%	-17%	10%	0%	-10%	36%	22%	-14%	6%	0%	-6%
Lithuania				33%	19%	-14%	23%	9%	-14%	38%	21%	-17%	11%	2%	-10%	30%	13%	-17%	9%	0%	-9%	35%	22%	-13%	5%	0%	-5%
LNG and Interconnection Capacity Diversification (LICD)																											
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000

Security of Supply																																							
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																																							
Estonia	58%	50%	-9%																																				
Finland	60%	50%	-10%																																				
Baltics Finland Disruption Curtailment Rate Peak Day (%)																																							
Estonia	68%	62%	-6%																																				
Finland	70%	62%	-8%																																				
Lithuania																		5%	0%	-5%	11%	0%	-11%	4%	0%	-4%											4%	0%	-4%
Belarus Disruption Curtailment Rate Peak Day (%)																																							
Lithuania																		5%	0%	-5%	11%	0%	-11%	4%	0%	-4%											4%	0%	-4%
Remaining Flexibility Peak day (%)																																							
Finland	95%	100%	5%																																				
Single Largest Infrastructure Disruption (SLID)-Finland																																							
Estonia	54%	46%	-8%																																				
Finland	55%	47%	-7%																																				
Single Largest Infrastructure Disruption (SLID)-Lithuania																																							
Lithuania																		5%	0%	-5%	11%	0%	-11%	4%	0%	-4%											4%	0%	-4%

	2020			2025			2030																		2040														
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30						CLIMATE			SUSTAINABLE			DISTRIBUTED								
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA				WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA						
Market Integration																																							
Bi-directionality Balance																																							
Karksi	0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%						
Kiemenai				96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%				96%	100%	4%	96%	100%	4%	96%	100%	4%						

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR)						
Reference	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	8.5	5.4
Mitigation in Disrupted Demand (MEUR)						
Peak Day	0.9	1.2	0.8	0.4	0.1	0.2
2 Weeks	0.6	13.1	5.9	1.0	1.0	1.0
Fuel & CO_2 Savings (MEUR)						
CO_2 Savings	1.2	4.2	3.7	1.2	4.0	3.5
Fuel Switch savings	0.1	0.3	0.4	0.1	0.3	0.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.1	2.6	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	4.1	2.6	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.2	0.8	1.2	0.8	1.1	0.5	1.2	0.8
2 Weeks	13.1	0.6	13.1	0.6	15.1	5.9	13.1	0.6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.2	1.2	4.2	1.2	4.4	1.3	4.2	1.2
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	3.2	1.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	16.6	0.0	9.2	0.0	4.2	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.4	0.1	0.4	0.1	0.2	0.0	0.4	0.1
2 Weeks	1.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.0	1.2	4.0	1.2	4.2	1.3	4.0	1.2
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Environmental impact for the Enhancement of Estonia-Latvia interconnection project has been deemed minor. Environmental monitoring will be carried out before, during and after the construction in order to ensure compatibility with environmental requirements.

The project related construction and operation activities for Latvia-Lithuania interconnection has been analyzed for eligibility for Environmental Impact Assessment (EIA) or initial screening procedures. The analysis has been based on national regulatory acts in Latvia and Lithuania, which implement the EIA Directive. Given the fact that the Feasibility study provided the technical solution for the implementation of the project, i.e. the reconstruction, readjustment or upgrade of existing pipelines for the transport of gas and related infrastructure, e.g. CS and GMS (and not construction / installation of new infrastructure of such type), the project or intended activity should not a subject of the EIA or initial screening.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

F. Useful Links

Estonian Gas Transmission Network Development Plan 2018 – 2027: https://elering.ee/en/gas-system

Enhancement of Estonia-Latvia interconnection project website: https://elering.ee/en/balticconnector

Enhancement of Latvia-Lithuania interconnection (Latvian part): http://www.conexus.lv/ipgk-modernizacijas-projekti-eng/latvijas-lietuvas-starpsavienojuma-jaudas-palielinasana-latvijas-dala

Enhancement of Latvia-Lithuania interconnection (Lithuanian part): www.ambergrid.lt/en/transmission-system/development-of-the-transmission-system/enhancement-Latvia-Lithuania-interconnection

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_03a

Reasons for grouping [ENTSOG]

The project group includes a stand-alone project aiming at providing flexible short-term storage products and allowing compression extraction from existing Incukalns UGS in Latvia beside the current scope of using the storage as the seasonal storage.

Objective of the project(s) in the group [Promoter]

The objective of the project is to enhance operations of the storage to allow the storage to maintain its functionality after pressure upgrade in the Baltic transmission system, to improve regional security of supply, to provide flexible volumes of gas and to increase liquidity of gas flows, thus contributing to the integration of energy markets of the common Baltic market zone.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
UGS-N-0374	Enhancement of Incukalns UGS	Conexus Baltic Grid	LV	Advanced	8.2.4	2020	2024	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0374	20	50	0

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
UGS-N-0374	Conexus Baltic Grid	Incukalns (LV)	2020	30	-
UGS-N-0374	Conexus Baltic Grid	Incukalns (LV)	2024	20	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-374
CAPEX [mln. EUR]	88.20	88.20
Range CAPEX		10%
OPEX [mln. EUR/y]	7.10	7.10

Description of costs and range [Promoter]

The provided costs are real expected costs. The project consists of three Activities: 1) surface equipment infrastructure, 2) wells infrastructure and 3) compression units. According to the latest assessment, total CAPEX of the project is 88 MEUR. The assessment is based on the costs occurred for the similar activities and projects experienced by the project promoter or other companies in the region, therefore the range of 10% is justified.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project Benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

CO_2 Savings & Fuel Switch benefits explained [Promoter]

CO_2 savings are based on the fact that within Activity of enhancement of the compression units, the project provides for replacement of the ignition system and control panels for the Cooper Bessemer five reciprocating gas compression units Z330 with the ignition system and control panels of the compressor units W330 produced by Hoerbirger, which will result in reduction of CO_2 emissions by up to 7000 tons per year. This design has been developed to comply with the Directive for Medium combustion plant 2015/2193.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels		
	2030		
	DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA
Security of Supply			
Remaining Flexibility Peak day (%)			
Poland	80%	81%	1%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	0.5	0.5	0.0	0.0	0.0
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.3	1.0	0.9	0.3	1.0	0.9
	Fuel Switch savings	0.0	0.0	0.1	0.0	0.0	0.1

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.4	3.4	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	4.4	3.4	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.5	0.0	0.5	0.0	0.0	0.0	0.5	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR)								
CO_2 Savings	1.0	0.3	1.0	0.3	1.0	0.2	1.0	0.3
Fuel Switch savings	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.0	3.7	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	4.5	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR)								
CO_2 Savings	1.0	0.3	1.0	0.3	1.0	0.2	1.0	0.3
Fuel Switch savings	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0374	UGS	Air pollution	Gauja National Park

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
CO_2 and NOx emissions	Installation of new ignition systems and control panels for 5 compression units	CAPEX 8.7 MEUR	

Environmental Impact explained [Promoter]

By replacement of ignition systems and control panels for five compression units it is assessed that CO_2 emissions will be reduced by 7000 t per year and NOx by 35 -90% depending on the regime.

Additional information (Environmental impact) [Promoter]

Enhancement of the five existing compression units will result in decrease of fuel gas consumption by 5% when running at the full load and by approximately 15% when running at 70-80% of full load and increasing of productivity and flexibility by approximately 10%.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project is aimed at the increase of the daily withdrawal capacity from the storage especially in the end of the withdrawal season and increase of flexibility of gas supply. It is essential for securing of the reliable operation of the storage after increase of the max operation pressure in the Latvian transmission system to 50 bar.
According to the project promoter estimates, two benefits (externalities) are monetized: saved costs of working capital and saved costs of gas disruptions to the economy. For costs of gas disruption, short term gas disruption is assessed taking into consideration share of natural gas on GDP with equal weights assigned to the scenarios Distributed Generation, Global Climate Action and Sustainable Transition. Considering the increased volume of gas supply after project implementation, the discounted value of saved capital per year amount to 89.8 Million EUR (benefiting countries: LV, EE, LT). Total monetized discounted benefit of saved costs of gas disruption is 79.6 MEUR (benefiting countries: mainly LV, slightly EE).
The other benefits are:

- Improvement of the regional security of supply by ensuring flexibility in supply and availability of gas.
  To ensure the needs of the common gas supply system of the region and to avoid such security problems as peak loads, emergency situations and supply disruption IUGS shall ensure stable and firm supply
- Supporting diversification of gas supply sources in the Baltic States through facilitating efficient use of the storage
  Storage effectively functions as additional gas source in region. Seasonal use of storage allows optimising gas deliveries from LNG markets
- Promoting wholesale market development, facilitating price improvements
  Increasing liquidity though immediately available gas in storage increases competition between suppliers and results in stabilization of gas price
- Facilitating the development of a regional energy market in the East Baltic region
  Stabile and firm extraction capacity of IUGS will enable further integration of Baltic energy market to continental Europe and the Nordic zone and assure the increased demand in the region.

F. Useful Links

Conexus Project link:
http://www.conexus.lv/ipgk-modernizacijas-projekti-eng/pci-projekts-824-kapitalieguldijumu-pieprasijums-incukalns-ugs-attistibai

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_03b

Reasons for grouping [ENTSOG]

The project group aims at enhancing the transmission capacity of the gas systems between Latvia and Lithuania. The group includes the two sides of the investments as well as the enabler project TRA-F-915 and the enhancer project UGS-N-374.

Objective of the project(s) in the group [Promoter]

The objectives of the projects are to remove bottlenecks in the Baltic gas system and provide positive environment for the development of regional gas market. This is achieved by enhancing the current interconnection capacities at Latvia-Lithuania and Estonia-Latvia interconnection, enabling bi-directional flow at Estonia-Latvia interconnection and enhancing the Incukalns gas storage.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0915	Enhancement of Estonia-Latvia interconnection	Elering AS	EE	FID	8.2.2	2019	2019	On time
TRA-N-0342	Enhancement of Latvia-Lithuania interconnection (Lithuania's part)	Amber Grid	LT	Less-Advanced	8.2.1	2020	2020	Rescheduled
UGS-N-0374	Enhancement of Incukalns UGS	Conexus Baltic Grid	LV	Advanced	8.2.4	2020	2024	Rescheduled
TRA-N-0382	Enhancement of Latvia-Lithuania interconnection (Latvian part)	Conexus Baltic Grid	LV	Less-Advanced	8.2.1	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0915	-	-	10
TRA-N-0342	-	-	-
TRA-N-0382	700	93	11

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0374	20	50	0

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0915	Elering AS	Karksi	2019	46.4	105
TRA-N-0342	AB Amber Grid	Kiemenai	2020	60	57.4
TRA-N-0382	Conexus Baltic Grid	Kiemenai	2023	57.41	60
UGS-N-0374	Conexus Baltic Grid	Incukalns (LV)	2020	30	-
UGS-N-0374	Conexus Baltic Grid	Incukalns (LV)	2024	20	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-382	TRA-N-342	TRA-F-915	UGS-N-374
CAPEX [mln. EUR]	150.60	20.70	4.70	37.00	88.20
Range CAPEX		10%	10%	5%	10%
OPEX [mln. EUR/y]	8.40	0.20	0.10	1.00	7.10

Description of costs and range [Promoter]

The total cost composes of the following project components:

Enhancement of Estonia-Latvia interconnection

> New bi-directional gas metering station in Karksi, Estonia
> Gas compressor station in Puiatu, Estonia
> Line valve station in Lilli, Estonia

Enhancement of Latvia-Lithuania interconnection (Lithuania's part)

> Increase of capacity of GMS Kiemenai
> Adjustment of Panevezys piping

Enhancement of Latvia-Lithuania interconnection (Latvian part)

> Increase of maximal operation pressure in transmission system of Latvia up to 50 bar

Enhancement of Incukalns UGS

> Surface equipment infrastructure
> Wells infrastructure
> Compression units

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Latvia.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Finland in peak day and 2-week cold spell and Estonia in peak day (only in EUCO30, where gas demand in considerably higher than for the other scenarios). Benefits stemming from the realisation of this group are spread among different countries (Poland and Denmark).
Regarding the supply import routes disruptions:

- In **case of Baltics-Finland disruption the project mitigates the risk of demand curtailment** in Finland and Estonia for both peak-day and 2-weeks disruptions. Additionally, for the **same route disruption, the project fully mitigates the risk of demand curtailment** in Lithuania.
- In case **of Belarus disruption**, the **project mitigates the risk of demand curtailment** in Lithuania and Poland.

Regarding disruption of the main infrastructure:

- In case of **SLID-Lithuania**, the project **fully mitigates the risk of demand curtailmen**t in Lithuania.
- In case of **SLID-Finland**, the project **reduces the risk of demand curtailment** in Finland and Estonia.

> **Market integration:**

The **bidirectionality is improved** with the creation of capacity between Latvia and Lithuania.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects will strengthen the gas system of Baltic region and is expected to also have a positive effect on the gas market through the creation of larger market area, increased competition and price convergence. Decreased natural gas price and higher CO_2 prices would motivate plants in the region to operate on natural gas. For example, currently older power plants in Estonia operate on oil shale, which is more CO_2 intensive process compared to using natural gas.
The realisation of the group's projects will result in gaining benefits for the fuel switch alternative under different scenarios. On the group's level the highest benefits vary by years depending on the scenario applied. The group will receive the highest benefits starting from 2040, if Sustainable Transition scenario is applied, and lower value of benefits from 2025 if Distributed Generation scenario and from 2030 if EUCO scenario are considered.
For Incukalns UGS enhancement project CO_2 savings benefits are based on the fact that within Activity of enhancement of the compression units, the project provides for replacement of the ignition system and control panels for the Cooper Bessemer five reciprocating gas compression units Z330 with the ignition system and control panels of the compressor units W330 produced by Hoerbirger, which will result in reduction of CO_2 emissions up to 7 000 tons per year. This design has been developed to comply with the Directive for Medium combustion plant 2015/2193.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
LNG and Interconnection Capacity Diversification (LICD)																											
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Estonia	58%	50%	-9%	57%	48%	-9%	56%	47%	-9%	60%	52%	-8%	52%	42%	-10%	72%	66%	-6%	64%	58%	-6%	64%	58%	-6%	58%	52%	-6%
Finland	60%	50%	-10%	58%	48%	-10%	58%	48%	-10%	61%	53%	-9%	53%	43%	-10%	72%	66%	-6%	66%	60%	-6%	65%	58%	-7%	60%	52%	-8%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Estonia	68%	62%	-6%	66%	59%	-7%	66%	58%	-8%	70%	62%	-8%	62%	54%	-8%	76%	70%	-6%	70%	66%	-4%	70%	64%	-6%	64%	58%	-6%
Finland	70%	62%	-8%	68%	60%	-8%	66%	59%	-8%	70%	64%	-6%	63%	55%	-8%	77%	72%	-5%	71%	66%	-5%	71%	65%	-6%	66%	59%	-6%
Lithuania													5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Lithuania																6%	1%	-5%				8%	3%	-5%			
Poland																5%	1%	-4%				7%	3%	-4%			
Belarus Disruption Curtailment Rate Peak Day (%)																											
Lithuania													5%	0%	-5%	14%	10%	-4%	4%	0%	-4%	16%	12%	-4%	4%	0%	-4%
Poland																13%	9%	-4%				16%	12%	-3%			
Remaining Flexibility 2-Week Cold Spell (%)																											
Denmark																									89%	91%	1%
Finland																56%	64%	8%	62%	69%	7%	80%	88%	8%			
Poland																			87%	88%	1%						
Remaining Flexibility Peak day (%)																											
Estonia																89%	100%	11%									
Finland	95%	100%	5%	98%	100%	2%				69%	77%	8%				26%	32%	6%	31%	37%	6%	46%	53%	7%	68%	75%	8%
Poland																			72%	72%	1%						
Single Largest Infrastructure Disruption (SLID)-Finland																											
Estonia	54%	46%	-8%	52%	44%	-8%	50%	42%	-8%	56%	49%	-7%	46%	37%	-9%	66%	60%	-6%	60%	22%	-38%	58%	49%	-9%	52%	24%	-28%
Finland	55%	47%	-7%	52%	45%	-7%	51%	43%	-8%	57%	51%	-6%	47%	39%	-8%	66%	62%	-5%				60%	55%	-5%	52%	50%	-3%
Single Largest Infrastructure Disruption (SLID)-Lithuania																											
Lithuania													5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%

	2020			2025									2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																														
Bi-directionality Balance																														
Karksi	0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%
Kiemenai				96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%

ADVANCED Infrastructure Level

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Latvia				34%	19%	-15%	23%	9%	-14%	38%	21%	-18%	12%	2%	-10%	30%	13%	-17%	10%	0%	-10%	36%	22%	-14%	6%	0%	-6%
Lithuania				33%	19%	-14%	23%	9%	-14%	38%	21%	-17%	11%	2%	-10%	30%	13%	-17%	9%	0%	-9%	35%	22%	-13%	5%	0%	-5%
LNG and Interconnection Capacity Diversification (LICD)																											
Latvia	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000	10,000	5,000	-5,000

Row Labels	2020			2025									2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																														
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																														
Estonia	58%	50%	-9%																											
Finland	60%	50%	-10%																											
Baltics Finland Disruption Curtailment Rate Peak Day (%)																														
Estonia	68%	62%	-6%																											
Finland	70%	62%	-8%																											
Lithuania																5%	0%	-5%	11%	0%	-11%	4%	0%	-4%				4%	0%	-4%
Belarus Disruption Curtailment Rate Peak Day (%)																														
Lithuania																5%	0%	-5%	11%	0%	-11%	4%	0%	-4%				4%	0%	-4%
Remaining Flexibility Peak day (%)																														
Finland	95%	100%	5%																											
Single Largest Infrastructure Disruption (SLID)-Finland																														
Estonia	54%	46%	-8%																											
Finland	55%	47%	-7%																											
Single Largest Infrastructure Disruption (SLID)-Lithuania																														
Lithuania																5%	0%	-5%	11%	0%	-11%	4%	0%	-4%				4%	0%	-4%

Row Labels	2020			2025									2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																														
Bi-directionality Balance																														
Karksi	0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%
Kiemenai				96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	8.5	5.4
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.9	1.2	0.8	0.4	0.1	0.2
2 Weeks	0.6	13.1	5.9	1.0	1.0	1.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	1.4	4.9	4.3	1.4	4.9	4.3
Fuel Switch savings	0.1	0.3	0.4	0.1	0.3	0.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	8.3	6.7	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	8.3	6.7	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.2	0.8	1.2	0.8	1.3	0.5	1.2	0.8
2 Weeks	13.1	0.6	13.1	0.6	18.1	5.8	13.1	0.6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.9	1.4	4.9	1.4	4.9	1.1	4.9	1.4
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	6.2	5.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	15.1	0.0	10.3	0.0	4.2	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.4	0.1	0.4	0.1	0.2	0.0	0.4	0.1
2 Weeks	1.0	1.0	1.0	1.0	0.0	0.0	1.0	1.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.9	1.4	4.9	1.4	4.9	1.1	4.9	1.4
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0374	UGS	Air pollution	Gauja National Park

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
CO_2 and NOx emissions	Installation of new ignition systems and control panels for 5 compression units	CAPEX 8.7 MEUR	

Environmental Impact explained [Promoter]

Environmental impact for the Enhancement of Estonia-Latvia interconnection project has been deemed minor. Environmental monitoring will be carried out before, during and after the construction in order to ensure compatibility with environmental requirements.

The project of Enhancement of Latvia-Lithuania interconnection related construction and operation activities have been analyzed for eligibility for Environmental Impact Assessment (EIA) or initial screening procedures. The analysis has been based on national regulatory acts in Latvia and Lithuania, which implement the EIA Directive. Given the fact that the Feasibility study provided the technical solution for the implementation of the project, i.e. the reconstruction, readjustment or upgrade of existing pipelines for the transport of gas and related infrastructure, e.g. CS and GMS (and not construction / installation of new infrastructure of such type), the project or intended activity should not a subject of the EIA or initial screening. For Incukalns UGS enhancement project, by replacement of ignition systems and control panels for five compression units it is assessed that CO2 emissions will be reduced by 7000 t per year and NOx by 35 -90% depending on the regime.

Additional information (Environmental Impact) [Promoter]

For Incukalns UGS project, enhancement of the five existing compression units will result in decrease of fuel gas consumption by 5% when running at the full load and by approximately 15% when running at 70-80% of full load and increasing of productivity and flexibility by approximately 10%.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The enhancement of Incukalns UGS project is aimed at the increase of the daily withdrawal capacity from the storage especially in the end of the withdrawal season and increase of flexibility of gas supply. It is essential for securing of the reliable operation of the storage after increase of the max operation pressure in the Latvian transmission system to 50 bar.
According to the project promoter estimates, two benefits (externalities) are monetized: saved costs of working capital and saved costs of gas disruptions to the economy. For costs of gas disruption, short term gas disruption is assessed taking into consideration share of natural gas on GDP with equal weights assigned to the scenarios Distributed Generation, Global Climate Action and Sustainable Transition. Taking into account the increased volume of gas supply after project implementation, the discounted value of saved capital per year amount to 89.8 Million EUR (benefiting countries: LV, EE, LT). Total monetized discounted benefit of saved costs of gas disruption is 79.6 MEUR (benefiting countries: mainly LV, slightly EE).

F. Useful Links

Estonian Gas Transmission Network Development Plan 2018 – 2027: https://elering.ee/en/gas-system
Enhancement of Estonia-Latvia interconnection project website: https://elering.ee/en/balticconnector
Enhancement of Incukalns UGS: http://www.conexus.lv/ipgk-modernizacijas-projekti-eng/pci-projekts-824-kapitalieguldijumu-pieprasijums-incukalns-ugs-attistibai
Enhancement of Latvia- Lithuania interconnection (Latvian part): http://www.conexus.lv/ipgk-modernizacijas-projekti-eng/latvijas-lietuvas-starpsavienojuma-jaudas-palielinasana-latvijas-dala
Enhancement of Latvia-Lithuania interconnection (Lithuanian part): www.ambergrid.lt/en/transmission-system/development-of-the-transmission-system/enhancement-Latvia-Lithuania-interconnection

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_04

Reasons for grouping [ENTSOG]

The project group aims at connecting the gas transmission systems in Poland, Denmark and the upstream system in the North Sea with a view of transporting Norwegian gas to the countries in the Baltic Sea region and Central-Eastern Europe. The group includes the two sides of the investments (TRA-N-780 and TRA-N-271), an off-shore section crossing the Baltic Sea (TRA-N-1173) as well the enabler project TRA-N-394.

Objective of the project(s) in the group [Promoter]

The project group aim at connecting the transmission systems in PL, DK and the upstream system in the North Sea with a view of transporting Norwegian gas to the countries in the Baltic Sea region and Central-Eastern Europe. The project will also bring the opportunity for DK and SE to diversify their supply potential (LNG deliveries from the terminal in Świnoujście).

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0780	Baltic Pipe project – onshore section in Denmark	Energinet.dk	DK	Advanced	8.3.1	2022	2022	On time
TRA-N-0271	Poland - Denmark interconnection (Baltic Pipe) - offshore section	GAZ-SYSTEM S.A.	PL	Advanced	8.3.2	2022	2022	NA
TRA-N-0394	Norwegian tie-in to Danish upstream system	Energinet.dk	DK	Advanced	NA	2022	2022	On time
TRA-N-1173	Poland - Denmark interconnection (Baltic Pipe) - onshore section in Poland	GAZ-SYSTEM S.A.	PL	Advanced	8.3.2	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0780	900/1000	210	36
TRA-N-0271	1000	40	-
TRA-N-0271	900	280	-
TRA-N-0394	800	105	-
TRA-N-1173	1000	188	41

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0780	Energinet.dk	Nybro	2022	306.8	-
TRA-F-0780	Energinet.dk	Interconnector PL-DK	2022	91.1	306.8
TRA-N-0271	GAZ-SYSTEM S.A.	Interconnector PL-DK	2022	306.8	91.1
TRA-N-0394	Energinet.dk	Nybro	2022	306.8	-
TRA-N-0394	Energinet.dk	Europipe (NO) / Baltic Pipe (DK)	2022	306.8	-
TRA-N-1173	GAZ-SYSTEM S.A.	Aggregated Distribution (PL)	2022	0	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-780	TRA-N-271	TRA-N-1173	TRA-N-394
CAPEX [mln. EUR]	1778.50	629.00	485.08*	374.42*	290.00
Range CAPEX		0%	15%	15%	0%
OPEX [mln. EUR/y]	44.83	22.9	8.73*	6.74*	5.96

The promoters did not indicate intention to apply for the 4th PCI selection process for project TRA-N-1173. In line with the defined guidelines, only costs for projects whose promoters declared their intention to apply to the 4th PCI process during the TYNDP 2018 project data collection are published.

Description of costs and range [Promoter]

The costs were calculated based on market prices and costs of similar investment projects. The costs are best estimate in this project phase.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Improving the connection of the gas transmission systems in Poland, Denmark and the upstream system in the North Sea with a view of transporting Norwegian gas and LNG to the countries in the Baltic Sea region and Central-Eastern Europe, the group realisation also allows to **significantly reduce the dependence from Russian gas** in Germany, Sweden, Poland and Denmark.
Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** in Denmark and Poland.
Depending on the considered demand scenarios the projects group **increases the number of supply sources** Finland has access to. With the project Finland has significant access to Norwegian gas.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Denmark and Poland in case of peak-day and 2-week cold spell situation.
Regarding the supply import routes disruptions, in **case of Baltics-Finland** and **Belarus disruptions** the project **mitigates the risk of demand curtailment** in Lithuania and Poland. Furthermore, for **Ukrainian disruption the project fully mitigates the risk of demand curtailme**nt in Poland.
The project **fully mitigates the risk of demand curtailment** in Demark and Sweden, Lithuania and Poland in the scenarios with high demand in case of disruption of the single largest infrastructure in Denmark, Lithuania and Poland respectively.
Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in some European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 4 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be partially explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (up to 6 Mln EUR/y depending on the scenarios).
Additional benefits compared to the reference situation can be observed in the case of Russian supply minimisation (71 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows some countries further to rely on alternative sources (Norwegian gas and LNG) in case of more expensive Russian gas prices.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe (exceeding in some cases 50% of the energy mix). Similar conditions hold true for instance in the power generation and heating sectors.
This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as the Baltic Pipe project are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries in Central Eastern Europe.
The Baltic Pipe project may well have an impact on fuel switch by contributing to substitution of high emission sources of energy in heavy industry and coal power plants. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low emission fuels. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil).
Due to the underlying assumptions of ENTSOG's TYNDP18 scenarios, higher fuel switch benefits are expected under the Sustainable Transition and Distributed Generation scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria													33%	22%	-11%									
Croatia	31%	29%	-2%				35%	31%	-4%	27%	24%	-3%	33%	23%	-10%				48%	34%	-14%			
Czechia	31%	28%	-3%	28%	24%	-4%	35%	30%	-5%	26%	23%	-3%	33%	22%	-11%				47%	33%	-14%			
Denmark	29%	21%	-8%	21%	11%	-10%	34%	25%	-9%	13%	6%	-7%	33%	22%	-11%	18%	0%	-18%				5%	1%	-4%
Germany	25%	21%	-4%	16%	11%	-5%	28%	25%	-4%	9%	6%	-3%	24%	19%	-5%	9%	0%	-9%						
Hungary	32%	29%	-3%	29%	24%	-5%	35%	31%	-4%	27%	24%	-3%	34%	23%	-11%				48%	33%	-15%			
Poland	31%	22%	-9%	28%	11%	-17%	34%	25%	-9%	26%	6%	-20%	33%	22%	-11%	18%	0%	-18%	48%	32%	-16%	30%	1%	-29%
Slovakia	31%	29%	-2%	28%	24%	-4%	35%	31%	-4%	26%	23%	-3%	33%	22%	-11%				48%	33%	-15%			
Slovenia													33%	22%	-11%									
Sweden	30%	22%	-8%	22%	11%	-11%	34%	25%	-9%	13%	6%	-7%	33%	22%	-11%	18%	0%	-18%				5%	1%	-4%
LNG and Interconnection Capacity Diversification (LICD)																								
Denmark	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5001	-4999	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Poland	2500	2066	-435	2500	2066	-435	2500	2066	-435	2500	2066	-435	2500	2066	-435	2500	2066	-435	2500	2066	-435	2500	2066	-435
Supply Source Access (SSA)																								
Bulgaria																			2	3	1			
Finland	1	2	1				1	2	1				1	2	1	1	2	1	1	2	1	1	2	1
Romania				2	3	1																		

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania																			2%	0%	-2%			
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania													6%	0%	-6%				8%	0%	-8%			
Poland													5%	0%	-5%				7%	0%	-7%			
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania													14%	11%	-3%				16%	4%	-12%			
Poland													13%	0%	-13%				16%	4%	-12%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark	89%	100%	11%	89%	100%	11%	77%	100%	23%	97%	100%	3%	20%	100%	80%	74%	100%	26%	90%	100%	10%	89%	100%	11%
Poland							90%	100%	10%	98%	100%	2%	22%	45%	22%	88%	100%	12%	18%	39%	21%	68%	98%	29%
Remaining Flexibility Peak day (%)																								
Denmark	52%	100%	48%	52%	100%	48%	43%	100%	57%	61%	100%	39%	2%	100%	98%	41%	100%	59%	56%	100%	44%	56%	100%	44%
Germany							35%	37%	2%															
Poland	85%	100%	15%	88%	100%	12%	69%	100%	30%	80%	100%	20%	13%	34%	20%	72%	100%	28%	8%	26%	18%	51%	78%	26%
Sweden													10%	37%	27%									
Single Largest Infrastructure Disruption (SLID)-Denmark																								
Denmark	5%	0%	-5%	5%	0%	-5%	13%	0%	-13%				30%	0%	-30%	14%	0%	-14%	12%	0%	-12%	2%	0%	-2%
Sweden	6%	0%	-6%	6%	0%	-6%	14%	0%	-14%				31%	0%	-31%	15%	0%	-15%	12%	0%	-12%	2%	0%	-2%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													5%	0%	-5%				10%	0%	-10%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Germany							2%	0%	-2%															
Sweden							2%	0%	-2%															

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria				11%	8%	-3%				4%	1%	-3%												
Bosnia Herzegovina				11%	8%	-3%				4%	1%	-3%												
Croatia				11%	8%	-3%				4%	1%	-3%	15%	12%	-3%									
Czechia										4%	1%	-3%	20%	13%	-7%	4%	0%	-4%	30%	21%	-9%	5%	0%	-5%
Denmark				11%	8%	-3%				4%	1%	-3%	20%	13%	-7%	4%	0%	-4%	30%	21%	-9%	4%	0%	-4%
Estonia				11%	8%	-3%				4%	1%	-3%	21%	13%	-8%	4%	0%	-4%	29%	21%	-8%	2%	0%	-3%
Finland										4%	1%	-3%				4%	0%	-4%	30%	21%	-10%			
Germany				11%	8%	-3%				4%	1%	-3%	17%	12%	-5%				25%	21%	-4%			
Hungary				11%	8%	-3%				4%	1%	-3%	15%	12%	-3%									
Italy										3%	1%	-2%	14%	12%	-3%									
Latvia				11%	8%	-3%				4%	1%	-3%	21%	13%	-8%	4%	0%	-4%	30%	22%	-8%	4%	0%	-4%
Lithuania													21%	13%	-8%	5%	0%	-5%	31%	22%	-9%	5%	0%	-5%
Luxembourg							13%	11%	-2%															
Netherlands							23%	21%	-2%				15%	12%	-3%									
Poland										4%	2%	-2%	20%	13%	-7%	5%	0%	-5%	31%	22%	-9%	5%	0%	-5%
Serbia				11%	8%	-3%				4%	1%	-3%	15%	12%	-3%									
Slovakia													20%	13%	-7%	5%	0%	-5%	30%	22%	-8%	5%	0%	-5%
Slovenia				11%	8%	-3%				4%	1%	-3%												
Sweden				11%	8%	-3%							20%	13%	-7%	2%	0%	-2%	23%	19%	-4%			
Switzerland				11%	8%	-3%				4%	1%	-3%	15%	12%	-3%									
LNG and Interconnection Capacity Diversification (LICD)																								
Denmark	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5001	-4999	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Poland	2115	1781	-335	2115	1781	-335	2115	1781	-335	2115	1781	-335	2115	1781	-335	2115	1781	-335	2115	1781	-335	2115	1781	-335
Supply Source Access (SSA)																								
Finland																2	3	1				2	3	1

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark							93%	100%	7%				30%	100%	70%	89%	100%	11%						
Italy																						89%	89%	1%
Poland													49%	72%	22%				44%	65%	21%			
Remaining Flexibility Peak day (%)																								
Denmark	64%	100%	36%	64%	100%	36%	56%	100%	44%	73%	100%	27%	11%	100%	89%	54%	100%	46%	72%	100%	28%	69%	100%	31%
Italy																						62%	63%	1%
Poland													38%	58%	20%				31%	50%	19%	83%	100%	17%
Sweden													47%	73%	27%									
Single Largest Infrastructure Disruption (SLID)-Denmark																								
Denmark							4%	0%	-4%				23%	0%	-23%	5%	0%	-5%						
Sweden							5%	0%	-5%				24%	0%	-24%	6%	0%	-6%	2%	0%	-2%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.7	8.9	1.9	1.1	1.3	1.1
Supply Maximization	9.7	34.5	7.6	11.1	21.0	9.0
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.1	3.0	1.2	0.0	0.1	0.2
2 Weeks	0.0	30.6	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	15.6	47.2	11.2	14.5	42.4	10.8
Fuel Switch savings	0.3	0.0	0.3	0.3	0.0	0.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	5.8	0.5	21.3	2.2	8.9	0.7	8.9	0.7
Supply Maximization	10.8	0.0	107.3	0.7	34.5	7.6	17.3	3.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.0	0.1	3.0	0.1	0.1	0.0	3.0	0.1
2 Weeks	30.6	0.0	30.6	0.0	30.6	0.0	30.6	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	47.2	11.2	47.2	11.2	47.2	11.2	47.2	11.2
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	1.3	1.1	1.3	1.1
Supply Maximization	0.0	0.0	0.0	0.0	21.0	9.0	10.5	4.5
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	42.4	10.8	42.4	10.8	42.4	10.8	42.4	10.8
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0271	Transmission infrastructure	Approx. 320 km, DN 900/1000	The process of obtaining administrative decisions (including environmental) is ongoing. The list of environmentally sensitive areas crossed by the project will be indicated in the decisions on environmental conditions.
TRA-N-1173	Transmission infrastructure	188 km, DN 1000	The process of obtaining administrative decisions (including environmental) is ongoing. The list of environmentally sensitive areas crossed by the project will be indicated in the decisions on environmental conditions.
TRA-F-0780	Transmission infrastructure	210 km, DN 900/1000	The process for environmental impact assessment is ongoing. Second public hearing is planned in Q1 2019. The list of environmentally sensitive areas crossed by the project will be indicated in the approval of the EIA process.
TRA-N-0394	Transmission infrastructure	105 km, DN 800	The process for environmental impact assessment is ongoing. Second public hearing is planned in Q1 2019. The list of environmentally sensitive areas crossed by the project will be indicated in the approval of the EIA process.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline.	To ensure appropriate protection of environmentally sensitive areas during the construction GAZ-SYSTEM S.A. implements appropriate mitigation measures that may include (onshore part of the project): > environmental supervision during pipeline’s construction. > crossing selected rivers’ valleys with trenchless technologies. > technical facilities’ and storages’ location i.e. out of natural habitats, protected areas, wetlands, surface waters, etc. > cutting down shrubs and trees beyond breeding season. > habitats’ reclamation by sowing of collected seeds after the construction. > protecting the construction site with a temporary sheet piles in places, where increased amphibians’ migration may occur. > transplantation of protected plants out of construction site. Mitigation measures will also be included in the offshore part of the project: > sonar surveys on shoaling or schooling fish, > decreasing illumination and restricting the spectrum of light on ships for reducing impacts on biological resources while still maintaining safe operations. > by using tunnelling, preservation of cliffs as a natural habitat, and potential breeding sites for sand martins remain undisturbed.	n/a	n/a

	Concrete mitigation measures for both onshore and offshore part of the project will be determined in the decisions on environmental conditions. The project promoters will comply with environmental requirements during the construction phase. To ensure appropriate protection of environmentally sensitive areas during the construction Energinet implements appropriate mitigation measures that may include (onshore part of the project): > environmental supervision during pipeline's construction. > reduction of the construction zone for the pipeline to minimize negative impact on protected nature and species. > crossing selected rivers' valleys with trenchless technologies. > technical facilities' and storages' location i.e. out of natural habitats, protected areas, wetlands, surface waters etc. > cutting down shrubs and trees beyond breeding season, > habitats' reclamation by sowing of collected seeds after the construction, > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur, > transplantation of protected plants out of construction site. Mitigation measures that may be included in the offshore part of the project: > re-establish important habitat structures where needed, > survey and document affected seafloor areas, > plan construction activities to show a maximum of consideration to local fauna. Concrete mitigation measures for both onshore and offshore part of the project will be determined in the decisions on environmental conditions. The project promoters will comply with environmental requirements during the construction phase.		

Environmental Impact explained [Promoter]

There are no pending issues for compliance with EU and national legislation; the preparation of related documents is carried out in accordance with the applicable environmental legal acts in Poland and Denmark, i.e. adopted in accordance with EU legislation.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM is currently developing the Baltic Pipe and a number of other PCI projects, namely expansion of the LNG Terminal in Świnoujście, Poland – Lithuania Interconnection (GIPL), Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland, Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland. These projects are parts of infrastructure priority corridors defined by the EC, i.e. North-South Gas Interconnections in Central Eastern and South Eastern Europe ("NSI East Gas"), Baltic Energy Market Interconnection Plan in Gas ('BEMIP Gas').
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the implementation of all of them will create the synergy effect by interlinking both priority gas corridors. Implementation of a direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets.
The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.
The Baltic Pipe Project will allow gas transmission tariffs to be maintained at a low level. In Denmark, this will be an important factor in controlling and significantly lowering the future gas transmission cost in Denmark.

F. Useful Links

Official project webpage: https://www.baltic-pipe.eu/
Energinet project webpage: https://en.energinet.dk/Infrastructure-Projects/Projektliste/BalticPipe
GAZ-SYSTEM project webpage: http://en.gaz-system.pl/nasze-inwestycje/integracja-z-europejski-systemem/baltic-pipe/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_05a

Reasons for grouping [ENTSOG]

The project group represents the interconnection pipeline between Lithuania and Poland and includes the two sides of the investments. It aims at establishing a bi-directional interconnection between the gas transmission systems in the two countries.

Objective of the project(s) in the group [Promoter]

The main purpose of the projects is to integrate gas markets of the Baltic States and Finland into a common EU gas market, thus, to increase the security and reliability of gas supply and competition, enable flexible and efficient use of LNG terminals and transmission infrastructure in Poland and Lithuania.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0212	Gas Interconnection Poland-Lithuania (GIPL) - PL section	GAZ-SYSTEM S.A.	PL	FID	8.5	2021	2021	Delayed
TRA-F-0341	Gas Interconnection Poland-Lithuania (GIPL) (Lithuania's section)	Amber Grid	LT	FID	8.5	2021	2021	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0212	700	357	30
TRA-F-0341	700	165	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0212	GAZ-SYSTEM S.A.	Interconnector PL-LT	2021	58.3	73.9
TRA-F-0341	AB Amber Grid	Interconnector PL-LT	2021	73.9	58.3

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-341	TRA-F-212
CAPEX [mln. EUR]	595.08	136.00	458.93*
Range CAPEX		10%	5%
OPEX [mln. EUR/y]	10.09	1.83	8.26*

Description of costs and range [Promoter]

The GIPL pipeline will run from Jauniūnai Gas Compressor Station (GCS) in Širvintos district on the Lithuanian side to Hołowczyce GCS on the Polish side. The investments on the territories of Lithuania and Poland will consist of:

- Construction of a new pipeline (Lithuania and Poland)
- New GCS in Poland.

The investment may range up to 10% due to changes in the supply markets for pipes and services.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Estonia, Finland, Latvia and Lithuania. The interconnection allows cooperation between Poland and some of its neighbouring countries (Baltic states and Finland) and therefore further alignment of their dependence to Russian gas.
The projects group **contributes to the diversification of entry points** (LICD indicator) in Lithuania and Poland.
For all demand scenarios the project group **increases the number of supply sources** Estonia, Latvia and Lithuania have access to. Thanks to the projects group, Baltic states have significant access to Norwegian gas, and depending on the demand scenario they can also have significant access to LNG as a supply source. Also, depending on demand scenario the project group **increases the number of supply sources** Finland has access. With the project and for low demand scenarios, Finland has access to Norwegian gas until 2030.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Poland and Lithuania in case of peak-day demand. For Poland Remaining Flexibility is also increasing in case of 2-week cold spell situation.
Regarding the supply import routes disruptions, in **case of Baltics-Finland and Belarus disruptions** the project **mitigates the risk of demand curtailment** in Lithuania.
Additionally, for Sustainable Transition demand scenario and under **Ukrainian disruption the project group slightly mitigates the risk of demand** curtailment in Hungary, Slovakia, Poland and Switzerland, such a disruption will have an impact on overall Europe.
The project significantly mitigates the risk of demand curtailment in Lithuania and Poland **in case of disruption of their respective single largest infrastructure**. Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in some European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 11 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be partially explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (up to 6 Mln EUR/y depending on the scenarios) that can be attributed to the connection to the new source(s).
Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (36 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows Baltic states to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe and the Baltic region. In some countries, including Poland and Estonia, these sources far exceed 50% of the energy mix. Similar conditions hold true for instance in the power generation and heating sectors.
This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as the GIPL project are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil, wood) in the vicinity of the project area. As a result, this will foster the energy transition in an efficient, affordable and sustainable manner.
Due to the underlying assumptions of Sustainable Transition Scenario, higher fuel switch benefits are expected in this particular scenario.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	97%	60%	-37%	97%	56%	-41%	96%	61%	-35%	91%	45%	-46%	96%	66%	-30%	83%	40%	-43%	91%	58%	-33%	82%	36%	-46%
Finland	96%	60%	-36%	96%	57%	-39%	95%	61%	-34%	91%	45%	-46%	96%	67%	-29%	82%	40%	-42%	90%	58%	-32%	82%	37%	-45%
Latvia	97%	60%	-37%	97%	56%	-41%	96%	61%	-35%	91%	45%	-46%	96%	66%	-30%	83%	40%	-43%	91%	58%	-33%	82%	36%	-46%
Lithuania	98%	60%	-38%	98%	56%	-42%	96%	61%	-35%	91%	44%	-47%	96%	66%	-30%	83%	39%	-44%	91%	57%	-34%	82%	36%	-46%
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	10010	5005	-5004	10010	5003	-5008	10010	5013	-4996	10011	5003	-5008	10010	5017	-4993	10012	5003	-5009	10010	5016	-4994	10012	5003	-5009
Poland	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339
Supply Source Access (SSA)																								
Austria																			2	3	1			
Bulgaria							2	3	1															
Czechia																			2	3	1			
Estonia	1	2	1	1	3	2	1	2	1	1	3	2	1	2	1	1	3	2	1	2	1	1	3	2
Finland				1	2	1				1	2	1												
Germany																			2	3	1			
Latvia	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2
Lithuania	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2
Poland																			2	3	1			
Slovakia																			2	3	1			

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	11%	-47%	53%	4%	-50%	51%	2%	-49%	54%	4%	-50%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	6%	-41%	45%	0%	-45%	43%	8%	-35%	45%	0%	-45%
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	14%	-44%	53%	4%	-50%	51%	16%	-35%	54%	4%	-50%
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland	96%	100%	4%	98%	100%	2%	83%	90%	7%	93%	98%	5%	18%	22%	4%	81%	88%	7%	14%	18%	4%	63%	68%	6%
Romania													17%	18%	1%	18%	19%	1%				22%	23%	1%
Remaining Flexibility Peak day (%)																								
Bulgaria										76%	77%	1%				77%	79%	2%						
Germany																			38%	39%	1%			
Italy																			34%	35%	1%			
Lithuania										94%	100%	6%	82%	100%	18%	95%	100%	5%				95%	100%	5%
Poland	79%	85%	6%	81%	88%	6%	63%	69%	6%	75%	80%	6%	10%	13%	4%	67%	72%	6%	4%	8%	4%	46%	51%	5%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	11%	-47%	53%	4%	-50%	51%	2%	-49%	54%	4%	-50%
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													9%	5%	-4%				13%	10%	-4%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Poland																			2%	0%	-2%			
Slovakia																			2%	0%	-2%			
Switzerland																			2%	0%	-2%			
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Romania													34%	34%	-1%	35%	34%	-1%				33%	32%	-1%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria																			7%	6%	-1%			
Bulgaria										8%	7%	-1%												
Czechia							5%	4%	-1%															
Hungary																			8%	6%	-2%			
Poland							4%	2%	-2%															
Slovakia																			8%	6%	-2%			
Switzerland																			8%	6%	-2%			

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	34%	19%	-15%	29%	8%	-21%	37%	21%	-16%	14%	1%	-12%	47%	13%	-34%	10%	0%	-10%	34%	21%	-13%	6%	0%	-6%
Finland	33%	19%	-14%	30%	9%	-21%	36%	21%	-15%	12%	1%	-11%	47%	30%	-17%	9%	0%	-9%	34%	21%	-14%	5%	0%	-5%
Latvia	38%	19%	-19%	31%	8%	-23%	41%	21%	-20%	17%	1%	-16%	48%	13%	-35%	15%	0%	-15%	39%	22%	-17%	10%	0%	-10%
Lithuania	39%	19%	-20%	31%	9%	-22%	42%	21%	-21%	18%	2%	-16%	48%	13%	-35%	15%	0%	-15%	39%	22%	-17%	11%	0%	-11%
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	10010	5005	-5004	10010	5003	-5008	10010	5013	-4996	10011	5003	-5008	10010	5017	-4993	10012	5003	-5009	10010	5016	-4994	10012	5003	-5009
Poland	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144
Supply Source Access (SSA)																								
Estonia	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Finland	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1				2	3	1
Latvia	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Lithuania	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	11%	-47%	53%	4%	-50%	51%	0%	-51%	54%	4%	-50%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	11%	-47%	53%	4%	-50%	51%	0%	-51%	54%	4%	-50%
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland													68%	72%	4%				61%	65%	4%			
Remaining Flexibility Peak day (%)																								
Lithuania										94%	100%	6%	82%	100%	18%	95%	100%	5%				95%	100%	5%
Poland													55%	58%	4%				46%	50%	4%			
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	5%	-50%	58%	11%	-47%	53%	4%	-50%	51%	0%	-51%	54%	4%	-50%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	11.6	17.4	3.8	0.1	3.8	4.3
Supply Maximization	42.4	33.4	33.0	15.2	22.3	15.3
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	4.4	4.2	4.3	4.4	4.2	4.4
2 Weeks	2.2	22.2	22.9	23.6	22.2	23.1
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	2.3	9.7	1.7	1.9	8.1	1.6
Fuel Switch savings	0.0	0.3	0.2	0.0	0.3	0.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	5.9	0.0	19.1	8.7	17.4	3.8	17.4	3.8
Supply Maximization	32.7	0.0	59.9	2.2	42.4	33.0	21.2	16.5
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.4	4.2	4.4	4.2	2.2	2.1	4.4	4.2
2 Weeks	22.9	2.2	22.9	2.2	23.6	22.2	22.9	2.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	9.7	1.7	9.7	1.7	9.7	1.7	9.7	1.7
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	4.3	0.1	4.3	0.1
Supply Maximization	0.0	0.0	0.0	0.0	22.3	15.2	11.2	7.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.4	4.2	4.4	4.2	2.2	2.1	4.4	4.2
2 Weeks	23.6	22.2	23.6	22.2	23.6	22.2	23.6	22.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.1	1.6	8.1	1.6	8.1	1.6	8.1	1.6
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-341	Transmission Infrastructure	165 km, DN 700	Vegetation Wildlife
TRA-F-212	Transmission Infrastructure	357 km, DN 700	The project crosses: > Natura 2000 sites (Ostoja Nadbużańska, Czerwony Bór, Ostoja Narwiańska, Dolina Pisy, Dolina Dolnego Bugu, Dolina Dolnej Narwi), > Nature Parks (Równina Kurpiowska, Dolina Dolnej Narwi, Jezior Rajgrodzkich, Dolina Rospudy, Pojezierze Północnej Suwalszczyzny, Pojezierze Sejneńskie, Dolina Bugu), > Landscape Park (Podlaski Przełom Bugu), > groundwater bodies, surface water bodies.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
LT: Forest mint, European pond turtles, European fire-bellied toads, greater spotted eagles, black storks, fishes Destruction of habitats and nests PL: Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline.	LT: Time limitation of construction works, restoration of nests, collection of environmentally sensitive plants and species PL; To ensure appropriate protection of environmentally sensitive areas during the construction GAZ-SYSTEM S.A. will implement following mitigation measures: > environmental supervision during pipeline's construction; > crossing selected rivers' valleys with trenchless technologies (e.g. HDD); > crossing selected habitats with trenchless technologies; > technical facilities' and storages' location i.a. out of natural habitats, protected areas, wetlands, min. 100m from surface waters; > narrowed width of construction site in particularly valuable areas; > minimizing the time of maintaining an open trench, minimizing dewatering the trenches or using sheet piling; > transplantation of habitats and its re-transplantation on the surface or sowing of collected seeds after the construction; > cutting down shrubs and trees beyond breeding season; > works in a selected areas carried out during 5am-22pm; > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur.	n/a	n/a

Environmental Impact explained [Promoter]

There are no pending issues for compliance with EU and national legislation; the preparation of related documents have been carried out in accordance with the applicable Environmental Laws of Lithuania and Poland, i.e. adopted in accordance with EU legislation. The Environmental Impact Assessment (EIA) for the project's part in the territory of Lithuania and Poland have been conducted. Following EIA, the monitoring plan has been prepared and the experts to implement the monitoring will be outsourced during the construction period.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM is currently developing Poland-Lithuania Interconnection (GIPL) and a number of other PCI projects from (BEMIP (extension of LNG terminal in Świnoujście, Baltic Pipe) and NSI EAST (Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland, Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland) Gas Priority Corridors.
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the future implementation of these PCI projects will create the synergy effect by interlinking both BEMIP and NSI East gas priority corridors. Implementation of a direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets.
The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

Amber Grid project link:
www.ambergrid.lt/en/projects/gas-interconnection-poland-lithuania-gipl
GAZ-SYSTEM project link:
http://en.gaz-system.pl/nasze-inwestycje/integracja-z-europejski-systemem/polska-litwa/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_05b

Reasons for grouping [ENTSOG]

The project group represents the interconnection pipeline between Lithuania and Poland (with the two sides of the investments) together with the projects enhancing the transmission capacity of the gas systems between Latvia and Lithuania.

Objective of the project(s) in the group [Promoter]

The main purpose of the project group is to integrate gas markets of the Baltic States and Finland into a common EU gas market, thus increasing the security and reliability of gas supply and competition, enabling more flexible and efficient use of LNG terminals, and transmission and storage infrastructure.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0342	Enhancement of Latvia-Lithuania interconnection (Lithuania's part)	Amber Grid	LT	Less-Advanced	8.2.1	2020	2020	Rescheduled
TRA-F-0212	Gas Interconnection Poland-Lithuania (GIPL) - PL section	GAZ-SYSTEM S.A.	PL	FID	8.5	2021	2021	Delayed
TRA-F-0341	Gas Interconnection Poland-Lithuania (GIPL) (Lithuania's section)	Amber Grid	LT	FID	8.5	2021	2021	Delayed
TRA-N-0382	Enhancement of Latvia-Lithuania interconnection (Latvian part)	Conexus Baltic Grid	LV	Less-Advanced	8.2.1	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0212	700	357	30
TRA-F-0341	700	165	-
TRA-N-0342	-	-	-
TRA-N-0382	700	93	11

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0212	GAZ-SYSTEM S.A.	Interconnector PL-LT	2021	58.3	73.9
TRA-F-0341	AB Amber Grid	Interconnector PL-LT	2021	73.9	58.3
TRA-N-0342	AB Amber Grid	Kiemenai	2020	62.87	54.5
TRA-N-0382	Conexus Baltic Grid	Kiemenai	2023	54.5	62.87

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-341	TRA-F-212	TRA-N-382	TRA-N-342
CAPEX [mln. EUR]	620.33	136.00	458.93*	20.70	4.70
Range CAPEX		10%	5%	10%	10%
OPEX [mln. EUR/y]	10.39	1.83	8.26*	0.20	0.10

Description of costs and range [Promoter]

The GIPL pipeline will run from Jauniūnai Gas Compressor Station (GCS) in Širvintos district on the Lithuanian side to the Hołowczyce GCS on the Polish side. The investments on the territory of Lithuania and Poland will include:

- Construction of a new pipeline (Lithuania and Poland)
- New GCS in Poland.

For project TRA-N-382 the most economically feasible technical alternative was chosen i.e. instead of building a new pipeline in the territory of Latvia was decided to increase the maximal gas pressure in the Latvia's gas transmission system up to 50 bar. This alternative is in the line with the market expectations.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Estonia, Finland, Latvia and Lithuania. The interconnection allows cooperation between Poland and some of its neighbouring countries (Baltic states and Finland) and therefore further alignment of their dependence to Russian gas.

The projects group **contributes to the diversification of entry points** (LICD indicator) in Lithuania and Poland.

For all demand scenarios the project group **increases the number of supply sources** Estonia, Latvia and Lithuania have access to. Thanks to the projects group, Baltic states have significant access to Norwegian gas, and depending on the demand scenario they can also have significant access to LNG as a supply source.

Depending on demand scenario the project group **increases the number of supply sources** Finland has access. With the project and for low demand scenarios, Finland has access to Norwegian gas until 2030.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Poland and Lithuania in case of peak-day demand. For Poland Remaining Flexibility is also increasing in case of 2-week cold spell situation.

Regarding the supply import routes disruptions, in **case of Baltics-Finland and Belarus disruptions** the project **mitigates the risk of demand curtailment** in Lithuania.

Additionally, under **Ukrainian disruption the project group slightly mitigates the risk of demand** curtailment in Hungary, Slovakia, Poland and Switzerland.

Furthermore, for **Ukrainian disruption the project fully mitigates the risk of demand curtailme**nt in Poland.

The project significantly mitigates the risk of demand curtailment in Lithuania and Poland **in case of disruption of their respective single largest infrastructure**. Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in some European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 10 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be partially explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (up to 6 Mln EUR/y depending on the scenarios) that can be attributed to the connection to the new source(s).

Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (36 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows Baltic states to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices.

Bidirectionality is improved with the creation of capacity between Latvia and Lithuania.

Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe and the Baltic region. In some countries, including Poland and Estonia, these sources far exceed 50% of the energy mix. Similar conditions hold true for instance in the power generation and heating sectors.

This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as the GIPL project and LT-LV interconnection are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil, wood) in the vicinity of the project area. As a result, this will foster the energy transition in an efficient, affordable and sustainable manner.

Due to the underlying assumptions of Sustainable Transition Scenario, higher fuel switch benefits are expected in this scenario.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	97%	60%	-37%	97%	56%	-41%	96%	61%	-35%	91%	45%	-46%	96%	66%	-30%	83%	40%	-43%	91%	58%	-33%	82%	36%	-46%
Finland	96%	60%	-36%	96%	57%	-39%	95%	61%	-34%	91%	45%	-46%	96%	67%	-29%	82%	40%	-42%	90%	58%	-32%	82%	37%	-45%
Latvia	97%	60%	-37%	97%	56%	-41%	96%	61%	-35%	91%	45%	-46%	96%	66%	-30%	83%	40%	-43%	91%	58%	-33%	82%	36%	-46%
Lithuania	98%	60%	-38%	98%	56%	-42%	96%	61%	-35%	91%	44%	-47%	96%	66%	-30%	83%	39%	-44%	91%	57%	-34%	82%	36%	-46%
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	10010	5002	-5008	10010	5003	-5008	10010	5002	-5008	10011	5003	-5008	10010	5002	-5008	10012	5003	-5009	10010	5002	-5008	10012	5003	-5009
Poland	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339	2839	2500	-339
Supply Source Access (SSA)																								
Austria																			2	3	1			
Bulgaria							2	3	1															
Czechia																			2	3	1			
Estonia	1	2	1	1	3	2	1	2	1	1	3	2	1	2	1	1	3	2	1	2	1	1	3	2
Finland				1	2	1				1	2	1												
Germany																			2	3	1			
Latvia	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2
Lithuania	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2	1	3	2
Poland																			2	3	1			
Slovakia																			2	3	1			

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	0%	-58%	53%	0%	-53%	51%	0%	-51%	54%	0%	-54%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	1%	-46%	45%	0%	-45%	43%	3%	-40%	45%	0%	-45%
Poland																			4%	3%	-1%			
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	10%	-48%	53%	0%	-53%	51%	12%	-39%	54%	0%	-54%
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland	96%	100%	4%	98%	100%	2%	83%	90%	7%	93%	98%	5%	18%	22%	4%	81%	88%	7%	14%	18%	4%	63%	68%	6%
Romania													17%	18%	1%	18%	19%	1%				22%	23%	1%
Remaining Flexibility Peak day (%)																								
Bulgaria										76%	77%	1%				77%	79%	2%						
Germany																			38%	39%	1%			
Italy																			34%	35%	1%			
Lithuania										94%	100%	6%	82%	100%	18%	95%	100%	5%				95%	100%	5%
Poland	79%	85%	6%	81%	88%	6%	63%	69%	6%	75%	80%	6%	10%	13%	4%	67%	72%	6%	4%	8%	4%	46%	51%	5%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	0%	-58%	53%	0%	-53%	51%	0%	-51%	54%	0%	-54%
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													9%	5%	-4%				13%	10%	-4%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Poland																			2%	0%	-2%			
Slovakia																			2%	0%	-2%			
Switzerland																			2%	0%	-2%			
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Romania													34%	34%	-1%	35%	34%	-1%				33%	32%	-1%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria																			7%	6%	-1%			
Bulgaria										8%	7%	-1%												
Czechia							5%	4%	-1%															
Hungary																			8%	6%	-2%			
Poland							4%	2%	-2%										8%	6%	-2%			
Slovakia																			8%	6%	-2%			
Switzerland																			8%	6%	-2%			

Row Labels	2025			2030						2040								
	BEST ESTIMATE (CbG)			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																		
Bi-directionality Balance																		
Kiemenai	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%

ADVANCED Infrastructure Level

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	34%	19%	-15%	29%	8%	-21%	37%	21%	-16%	14%	1%	-12%	47%	13%	-34%	10%	0%	-10%	34%	21%	-13%	6%	0%	-6%
Finland	33%	19%	-14%	30%	9%	-21%	36%	21%	-15%	12%	1%	-11%	47%	30%	-17%	9%	0%	-9%	34%	21%	-14%	5%	0%	-5%
Latvia	38%	19%	-19%	31%	9%	-22%	41%	21%	-20%	17%	2%	-15%	48%	13%	-35%	15%	0%	-15%	39%	22%	-17%	10%	0%	-10%
Lithuania	39%	19%	-20%	31%	9%	-22%	42%	21%	-21%	18%	2%	-16%	48%	13%	-35%	15%	0%	-15%	39%	22%	-17%	11%	0%	-11%
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	10010	5002	-5008	10010	5003	-5008	10010	5002	-5008	10011	5003	-5008	10010	5002	-5008	10012	5003	-5009	10010	5002	-5008	10012	5003	-5009
Poland	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144	1925	1781	-144
Supply Source Access (SSA)																								
Estonia	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Finland	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1				2	3	1
Latvia	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Lithuania	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	0%	-58%	53%	0%	-53%	51%	0%	-51%	54%	0%	-54%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania	45%	0%	-45%	41%	0%	-41%	46%	0%	-46%	46%	0%	-46%	47%	0%	-47%	45%	0%	-45%	43%	0%	-43%	45%	0%	-45%
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	0%	-58%	53%	0%	-53%	51%	0%	-51%	54%	0%	-54%
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland													68%	72%	4%				61%	65%	4%			
Remaining Flexibility Peak day (%)																								
Lithuania										94%	100%	6%	82%	100%	18%	95%	100%	5%				95%	100%	5%
Poland													55%	58%	4%				46%	50%	4%			
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania	52%	0%	-52%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%	58%	0%	-58%	53%	0%	-53%	51%	0%	-51%	54%	0%	-54%

Row Labels	2025			2030						2040								
	BEST ESTIMATE (CbG)			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																		
Bi-directionality Balance																		
Kiemenai	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%	96%	100%	4%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	11.0	16.4	3.7	0.1	3.8	4.3
	Supply Maximization	40.4	31.5	31.2	14.3	21.3	14.4
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	4.5	4.1	4.3	4.5	4.1	4.3
	2 Weeks	2.2	22.7	21.9	22.6	21.4	22.1
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	2.8	11.1	3.6	2.4	9.5	3.4
	Fuel Switch savings	0.1	0.4	0.4	0.1	0.4	0.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	3.8	0.0	19.8	9.9	17.4	3.8	16.4	3.7
Supply Maximization	31.5	0.0	58.8	3.6	42.4	33.0	20.2	15.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.5	4.1	4.5	4.1	2.3	2.1	4.5	4.1
2 Weeks	22.7	2.2	22.7	2.2	23.7	22.9	22.7	2.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	11.1	2.8	11.1	2.8	12.0	3.0	11.1	2.8
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	4.3	0.1	4.3	0.1
Supply Maximization	0.0	0.0	0.0	0.0	22.3	15.2	10.6	7.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.5	4.1	4.5	4.1	2.3	2.1	4.5	4.1
2 Weeks	22.6	21.4	22.6	21.4	23.6	22.2	22.6	21.4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	9.5	2.4	9.5	2.4	10.2	2.6	9.5	2.4
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-341	Transmission Infrastructure	165 kn, DN 700	Vegetation Wildlife
TRA-F-212	Transmission Infrastructure	357 km, DN 700	The project crosses; > Natura 2000 sites (Ostoja Nadbużańska, Czerwony Bór, Ostoja Narwiańska, Dolina Pisy, Dolina Dolnego Bugu, Dolina Dolnej Narwi), > Nature Parks (Równina Kurpiowska, Dolina Dolnej Narwi, Jezior Rajgrodzkich, Dolina Rospudy, Pojezierze Północnej Suwalszczyzny, Pojezierze Sejneńskie, Dolina Bugu), > Landscape Park (Podlaski Przełom Bugu), > groundwater bodies, > surface water bodies.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
LT: Forest mint European pond turtles, European fire-bellied toads, greater spotted eagles, black storks, fishes; destruction of habitats and nests. PL: Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline.	LT: Time limitation of construction works, restoration of nests, collection of environmentally sensitive plants and species.PL: To ensure appropriate protection of environmentally sensitive areas during the construction GAZ-SYSTEM S.A. will implement following mitigation measures: > environmental supervision during pipeline's construction; > crossing selected rivers' valleys with trenchless technologies (e.g. HDD); > crossing selected habitats with trenchless technologies; > technical facilities' and storages' location i.a. out of natural habitats, protected areas, wetlands, min. 100m from surface waters; > narrowed width of construction site in particularly valuable areas; > minimizing the time of maintaining an open trench, minimizing dewatering the trenches or using sheet piling; > transplantation of habitats and its re-transplantation on the surface or sowing of collected seeds after the construction; > cutting down shrubs and trees beyond breeding season; > works in a selected area carried out during 5am-22pm; > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur.	n/a	n/a

Environmental Impact explained [Promoter]

For the GIPL project there are no pending issues for compliance with EU and national legislation; the preparation of related documents have been carried out in accordance with the applicable Environmental Laws of Lithuania and Poland, i.e. adopted in accordance with EU legislation. The Environmental Impact Assessment (EIA) for the project's part in the territory of Lithuania and Poland have been conducted. Following EIA, the monitoring plan has been prepared and the experts to implement the monitoring will be outsourced during the construction period.
The project of Enhancement of Latvia-Lithuania interconnection related construction and operation activities have been analyzed for eligibility for Environmental Impact Assessment (EIA) or initial screening procedures. The analysis has been based on national regulatory acts in Latvia and Lithuania, which implement the EIA Directive. Given the fact that the Feasibility study provided the technical solution for the implementation of the project, i.e. the reconstruction, readjustment or upgrade of existing pipelines for the transport of gas and related infrastructure, e.g. CS and GMS (and not construction / installation of new infrastructure of such type), the project or intended activity should not a subject of the EIA or initial screening.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM is currently developing Poland-Lithuania Interconnection (GIPL) and a number of other PCI projects from (BEMIP (extension of LNG terminal in Świnoujście, Baltic Pipe) and NSI EAST (Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland, Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland) Gas Priority Corridors.
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the future implementation of these PCI projects will create the synergy effect by interlinking both BEMIP and NSI East gas priority corridors. Implementation of a direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets.
The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

Amber Grid project:
www.ambergrid.lt/en/projects/gas-interconnection-poland-lithuania-gipl
www.ambergrid.lt/en/transmission-system/development-of-the-transmission-system/enhancement-Latvia-Lithuania-interconnection
Conexus project:
http://www.conexus.lv/ipgk-modernizacijas-projekti-eng/latvijas-lietuvas-starpsavienojuma-jaudas-palielinasana-latvijas-dala
GAZ-SYSTEM project:
http://en.gaz-system.pl/nasze-inwestycje/integracja-z-europejski-systemem/polska-litwa/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_06

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project to be developed in Sweden. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The objective of the project is to construct an LNG terminal in the Port of Gothenburg to supply the marine market, the Industrial of grid segment and as a second entry point to the Swedish transmission system for natural gas. We expect with the full containment tank with grid connection to be ready in operations 2022.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-0032	Project GO4LNG LNG terminal Gothenburg	Swedegas AB	SE	Advanced	8.6	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0032	0.5	25000	75000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0032	Swedegas AB	Gothenburg LNG	2022	26	-
LNG-N-0032	Swedegas AB	Gothenburd LNG	2022	-	26

Based on information provided by the promoter during TYNDP 2018 Project Data Collection an Annual Exit Capacity data of 0.9 bcm/y (26 GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report2) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-32
CAPEX [mln. EUR]	105.00	105.00
Range CAPEX		20%
OPEX [mln. EUR/y]	4.50	4.50

Description of costs and range [Promoter]

> **Cost estimation CAPEX:**

The cost estimate class D (according to our internal procedure) is defined as the Pre-engineering Phase estimate and gives a cost estimate with an accuracy of ±20%. The accuracy of the technical output is approximately ±10%. The basis of the confidence is also based on market prices received in 2015 and reviewed 2017.

> **Cost estimation OPEX:**

The cost for OPEX is estimated to +/- 30% and based on internal best practice and experience equal to 2-3% of the cost estimate.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Denmark and Sweden.
Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Sweden.
The project group increases access to LNG in Sweden in all demand scenarios; however, these increases not always modify the number of sources Sweden has access to, since for low demand scenarios Sweden already access some LNG without the project. Only in 2040 and for high demand scenarios the **project group increases the number of supply sources** in Sweden and Denmark.

> **Security of Supply:**

The project group **increases the Remaining Flexibility** in Denmark and Sweden in case of peak-day and 2-week cold spell situation. The project significantly mitigates the risk of demand curtailment in Denmark and Sweden **in case of disruption of their respective single largest infrastructure**.

> **Market integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 1 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show no benefits. Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation (4 Mln EUR/y on average in the low infrastructure level).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

With the project implementation the CO_2 emissions will be reduced to less use of oil products. For the marine segment the regular fuel oil or marine gas oil will be replaced by LNG and/or LBG as well reducing the CO2emissions. For the industry segment the LPG and oil-based consumption can be replaced by LNG and/or LBG by the grid and truck supplies. The LNG could switch out potential fuel in the heavy truck segment as well. Here the main competitor today is conventional diesel.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Denmark	29%	26%	-3%										33%	30%	-3%									
Greece							0%	5%	5%															
Sweden	30%	26%	-4%	22%	19%	-3%	34%	25%	-9%	13%	1%	-12%	33%	31%	-2%	18%	9%	-9%	33%	24%	-9%	5%	0%	-5%
LNG and Interconnection Capacity Diversification (LICD)																								
Sweden	10000	5460	-4540	10000	5370	-4630	10000	5276	-4724	10000	5167	-4833	10000	5693	-4307	10000	5341	-4659	10000	5294	-4706	10000	5114	-4886
Supply Source Access (SSA)																								
Denmark																			2	3	1			
Sweden																			2	3	1			

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Belarus Disruption Curtailment Rate Peak Day (%)																								
Belgium																			2%	1%	-1%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark	89%	100%	11%	89%	100%	11%	77%	93%	16%	97%	100%	3%	20%	30%	10%	74%	90%	16%	90%	100%	10%	89%	100%	11%
Sweden	19%	53%	34%	19%	53%	34%	15%	49%	33%	86%	100%	14%	28%	62%	34%	24%	55%	31%	38%	78%	39%			
Remaining Flexibility Peak day (%)																								
Denmark	52%	64%	12%	52%	64%	12%	43%	56%	13%	61%	73%	12%	2%	11%	8%	41%	54%	13%	56%	72%	15%	56%	69%	12%
Germany																			39%	40%	1%			
Italy																			35%	36%	1%			
Poland										80%	81%	1%												
Sweden	6%	36%	30%	6%	36%	30%	6%	37%	30%	69%	100%	31%	10%	47%	36%	14%	43%	28%	25%	61%	36%	89%	100%	11%
Single Largest Infrastructure Disruption (SLID)-Denmark																								
Denmark	5%	0%	-5%	5%	0%	-5%	13%	4%	-9%				30%	23%	-7%	14%	5%	-9%	12%	1%	-11%	2%	0%	-2%
Sweden	6%	0%	-6%	6%	0%	-6%	14%	5%	-9%				31%	24%	-7%	15%	6%	-9%	12%	2%	-10%	2%	0%	-2%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Sweden							2%	0%	-2%															
Single Largest Infrastructure Disruption (SLID)-Sweden]																								
Sweden	97%	66%	-30%	97%	66%	-30%	96%	66%	-30%	67%	27%	-40%	86%	49%	-36%	82%	53%	-28%	95%	59%	-36%	56%	13%	-43%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina																			8%	6%	-2%			
Bulgaria																			8%	6%	-2%			
Italy							6%	5%	-1%															
Luxembourg																			8%	6%	-2%			
Serbia																			8%	6%	-2%			
Slovenia																			8%	6%	-2%			

ADVANCED Infrastructure Level

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Sweden							21%	19%	-2%										22%	19%	-3%			
LNG and Interconnection Capacity Diversification (LICD)																								
Sweden	10000	5460	-4540	10000	5370	-4630	10000	5276	-4724	10000	5167	-4833	10000	5693	-4307	10000	5341	-4659	10000	5294	-4706	10000	5114	-4886

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Sweden	19%	53%	34%	19%	53%	34%	15%	49%	33%	86%	100%	14%	28%	62%	34%	24%	55%	31%	38%	78%	39%			
Remaining Flexibility Peak day (%)																								
Sweden	6%	36%	30%	6%	36%	30%	6%	37%	30%	69%	100%	31%	37%	73%	36%	14%	43%	28%	25%	61%	36%	89%	100%	11%
Single Largest Infrastructure Disruption (SLID)-Sweden]																								
Sweden	97%	66%	-30%	97%	66%	-30%	96%	66%	-30%	67%	27%	-40%	86%	49%	-36%	82%	53%	-28%	95%	59%	-36%	56%	13%	-43%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.6	1.4	1.7	0.2	0.0	0.6
	Supply Maximization	1.7	5.5	3.8	0.4	0.4	0.6
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.7	1.4	1.0	0.7	0.7	0.7
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.4	1.7	4.8	0.4	1.7	4.8
	Fuel Switch savings	0.2	1.9	1.1	0.2	1.9	1.1

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	7.8	2.9	1.7	0.6	1.7	0.6
Supply Maximization	0.0	0.0	12.9	1.6	5.5	1.7	2.8	0.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.4	0.7	1.4	0.7	0.6	0.0	1.4	0.7
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.8	0.4	4.8	0.4	4.8	0.4	4.8	0.4
Fuel Switch savings	1.9	0.2	1.9	0.2	1.9	0.2	1.9	0.2

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	5.2	1.9	0.6	0.0	0.6	0.0
Supply Maximization	0.0	0.0	7.6	0.0	0.6	0.4	0.3	0.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.7	0.7	0.7	0.7	0.0	0.0	0.7	0.7
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.8	0.4	4.8	0.4	4.8	0.4	4.8	0.4
Fuel Switch savings	1.9	0.2	1.9	0.2	1.9	0.2	1.9	0.2

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-0032	LNG terminal	Plot plan in Energy harbour + 1.3 km of underground pipeline	Industrial harbour area.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
LNG leakage	Double wall piping, Impoundment basing	3 MEUR	50 KEUR
Firefighting water untreated out in the water	Impoundment basing trough cannels and dikes	1 MEUR	40 KEUR
Oil leakage from trailers	Oil separator connected to trailer filling stations	0.2 MEUR	20 KEUR

Environmental Impact explained [Promoter]

The highest risk is related to the product itself and due to the properties of a flammable liquid. To increase to amount of flammable gods increase the complexity and the risk in the harbour area. Therefore, extensive domino effects and risk escalation analysis has been performed. The total risk is as expected and acceptable for this type of operations in this area.

Due to leakage and firefighting some specific risk mitigation actions has been identified to protect water and day water system and risk reducing measures identified as listed above. Filling of truck are also identified and the risk for oil spillage is considered.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> Additional Sustainability benefits: infrastructure is being developed for liquefied natural gas will, however in the future will also work for liquefied biogas.

> Gothenburg, an infrastructural hub for shipping, industry and transport in the Nordic region. Ideal location for reaching the whole Baltic region.

> Port of Gothenburg supports the project.

F. Useful Links

Swedegas Project link: www.lnggothenburg.com

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_07

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project which aims at expanding the capacity of the existing LNG terminal in Świnoujście, Poland.

Objective of the project(s) in the group [Promoter]

The objective of the project is to increase regasification capacity from 5 bcm/y to 7.5 bcm/year (nominal capacity) and to provide small scale services covering bunkering, reloading to smaller vessels, trans-shipment and rail loading.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-F-0272	Upgrade of LNG terminal in Świnoujście	GAZ-SYSTEM S.A.	PL	FID	8.7	2023	2023	NA

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-F-0272	2.5	160000	120000-216000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-F-0272	GAZ-SYSTEM S.A.	Swinoujscie	2023	76.57	-
LNG-F-0272	Polskie LNG S.A.	Swinoujscie	2023	-	76.57

Based on information provided by the promoter during TYNDP 2018 Project Data Collection the Exit Capacity data of 2.5 (bcm/y) / 76.57 (GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-F-272
CAPEX [mln. EUR]	371.37	371.37*
Range CAPEX		30%
OPEX [mln. EUR/y]	13.00	13.00*

Description of costs and range [Promoter]

The costs were calculated based on market prices and costs of similar investment projects. The costs are best estimate in this project phase.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **reduces dependence from Russian gas** in Poland, Slovakia, Hungary and Czechia. FiD projects allow these countries to further share LNG supplies arriving to Poland and therefore reduce Russian gas dependency in these areas). In terms of Russian dependency, benefits from the project group in Baltic countries are limited by the interconnection capacity between Poland and Lithuania, and therefore no further reduction of Russian gas dependence is observed in the Baltic region.
Depending on the considered demand scenarios the projects group **increases the number of supply sources** Poland and Baltic States have access to. With the project these countries have significant access to LNG as a significant supply source even with demand levels.

> **Security of Supply:**

The project group **increases the Remaining Flexibility** in Poland in all demand scenarios for peak-day and 2-week cold spell. Additionally, it also **improves remaining Flexibility** in Lithuania under high demand scenarios and peak-day.
Regarding the supply import routes disruptions, in **case of Baltics-Finland** and **Belarus disruptions** the project **mitigates the risk of demand curtailment** in Lithuania and Poland under high demand scenarios. Furthermore, for **Ukrainian disruption the project mitigates the risk of demand curtailment** in Poland under high demand scenarios.
The project significantly mitigates the risk of demand curtailment in Lithuania and Poland **in case of disruption of their respective single largest infrastructure**. Additionally, the project group allows for full mitigation of risk of demand curtailment in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition.

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply** for Blue Transition demand scenario. For this demand scenario and reference supply price configuration project estimated benefits are 16 Mln EUR/y. These benefits can be partially explained by the savings in transportation costs thanks to the utilisation of this new alternative route (mainly in Poland). In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (2 Mln EUR/y) that can be attributed to higher LNG supply in the area impacted by this project group.
Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (23 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows some countries to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices. However, for these supply configurations flows to the Baltic countries are always limited by the interconnection capacity between Poland and Lithuania.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe (exceeding in some cases 50% of the energy mix). Similar conditions hold true for instance in the power generation and heating sectors.
This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as extension of LNG terminal in Świnoujście are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries in Central-Eastern Europe.
LNG terminal in Świnoujście may well have an impact on fuel switch by contributing to substitution of high emission sources of energy in heavy industry and coal power plants. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low emission fuels. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil).
The project is also expected to positively influence sustainability with the reduction of pollutant emissions into the air. This concerns emissions coming from high sulphur marine fuels emitting sulphur dioxide and solid particles that are harmful to human health, the environment and responsible for acidic rains. The project meets the objectives of the so-called sulphur directive.
Due to the underlyings assumptions of Sustainable Transition and Distributed Generation scenarios, higher fuel switch benefits are expected for both demand scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia	37%	31%	-6%				39%	35%	-4%	32%	27%	-5%	38%	33%	-5%	30%	27%	-3%				36%	31%	-5%
Czechia	37%	31%	-6%	34%	28%	-6%	39%	35%	-4%	32%	26%	-6%	38%	33%	-5%	29%	27%	-3%	52%	47%	-5%	36%	31%	-5%
Hungary	37%	32%	-5%	35%	29%	-6%	39%	35%	-4%	32%	27%	-5%	38%	34%	-4%	30%	27%	-3%				36%	31%	-5%
Poland	36%	31%	-5%	34%	28%	-6%	38%	34%	-4%	32%	26%	-6%	38%	33%	-5%	29%	18%	-11%	52%	48%	-5%	35%	30%	-5%
Slovakia	37%	31%	-6%	35%	28%	-7%	39%	35%	-4%	32%	26%	-6%	38%	33%	-5%				52%	48%	-4%	36%	31%	-5%
Supply Source Access (SSA)																								
Estonia										2	3	1				2	3	1				2	3	1
Latvia													2	3	1				2	3	1			
Lithuania													2	3	1				2	3	1			
Poland													2	3	1				2	3	1			
Serbia													4	5	1									
Slovenia							2	3	1															
Sweden							2	3	1															

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Poland																						1%	0%	-1%			
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Lithuania																						8%	2%	-6%			
Poland																4%	0%	-4%				8%	0%	-8%			
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Lithuania																14%	6%	-8%				16%	8%	-8%			
Poland																12%	5%	-7%				14%	7%	-7%			
Belarus Disruption Curtailment Rate Peak Day (%)																											
Belgium										2%	0%	-2%															
Lithuania										2%	0%	-2%				22%	14%	-8%				24%	16%	-8%			
Poland																21%	13%	-8%				23%	16%	-8%			
Curtailment Rate Peak Day (%)																											
Poland																						1%	0%	-1%			
Remaining Flexibility 2-Week Cold Spell (%)																											
Poland	67%	70%	3%	89%	100%	11%	91%	100%	9%	77%	90%	13%	86%	98%	12%	14%	22%	8%	75%	88%	13%	10%	18%	8%	57%	68%	11%
Remaining Flexibility Peak day (%)																											
Czechia																						97%	100%	3%			
Germany																						37%	39%	3%			
Italy																						33%	35%	3%			
Lithuania																88%	100%	12%				68%	100%	32%			
Poland	52%	58%	5%	70%	85%	15%	73%	88%	15%	56%	69%	13%	67%	80%	14%	4%	13%	9%	59%	72%	13%	0%	8%	8%	40%	51%	12%
Single Largest Infrastructure Disruption (SLID)-Lithuania																											
Lithuania																						8%	2%	-6%			
Poland																4%	0%	-4%				7%	0%	-7%			
Single Largest Infrastructure Disruption (SLID)-Poland																											
Poland																14%	5%	-9%				17%	10%	-8%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																											
Austria																						2%	0%	-2%			
Slovakia																						2%	0%	-2%			
Switzerland																						2%	0%	-2%			
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Austria																						8%	6%	-2%			
Czechia										6%	4%	-2%															
Germany										6%	5%	-1%										7%	6%	-1%			
Greece										6%	4%	-2%															
Hungary																						8%	6%	-2%			
Poland										6%	2%	-4%				5%	0%	-5%				9%	6%	-3%			
Slovakia																						8%	6%	-2%			
Switzerland																						8%	6%	-2%			

ADVANCED Infrastructure Level

Row Labels	2020			2030			2040					
	BEST ESTIMATE (CbG)			EUCO30			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Poland	67%	70%	3%	63%	72%	8%	57%	65%	8%			
Remaining Flexibility Peak day (%)												
Poland	52%	58%	5%	50%	58%	9%	42%	50%	8%	98%	100%	2%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	0.0	16.0	0.0	0.0	1.1	0.0
	Supply Maximization	17.3	32.3	19.4	16.8	10.1	11.4
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	5.9	1.7	0.0	0.0	0.0
	2 Weeks	0.0	32.2	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	3.2	13.8	1.1	2.5	11.1	0.9
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	1.5	0.4	28.9	7.8	16.0	0.0	16.0	0.0
Supply Maximization	2.5	0.3	64.1	0.0	32.3	17.3	16.1	8.7
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	5.9	0.0	5.9	0.0	3.4	0.0	5.9	0.0
2 Weeks	32.2	0.0	32.2	0.0	32.2	0.0	32.2	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	13.8	1.1	13.8	1.1	13.8	1.1	13.8	1.1
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.4	0.3	23.0	18.8	1.1	0.0	1.1	0.0
Supply Maximization	1.6	0.2	39.8	0.0	16.8	10.1	8.4	5.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	5.9	0.0	5.9	0.0	3.4	0.0	5.9	0.0
2 Weeks	32.2	0.0	32.2	0.0	32.2	0.0	32.2	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	11.1	0.9	11.1	0.9	11.1	0.9	11.1	0.9
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-F-0272	LNG infrastructure	Approx. 65 ha	Natura 2000 area PLH 320019 Wolin and Uznam

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
The LNG terminal in Świnoujście will be expanded in the current location (projects: additional SCV, third tank, LNG-to-rail) and additionally in the coastal area adjacent to the existing eastern breakwater (jetty). The results of environmental monitoring conducted since 2010 illustrate that the integrity and functions of the Natura 2000 area PLH 320019 Wolin and Uznam will not be affected. The project will have no adverse impact on protected fauna and flora species in the area in question. However, it will have a negligible impact on natural habitats for the protection of which the above-mentioned Natura 2000 site was established, i.e. wash margin 1210 (0.02 ha), initial stages of coastal white sand dunes formation 2110 (0.06 ha), white sand dunes 2120 (0.06 ha), coastal grey sand dunes 2130 * (0.25 ha), dune woods and coastal forests 2180 (0,01 ha). This impact will occur mainly at the stage of construction works, and any damage to the dune and beach habitats will be reclaimed (1210, 2110, 2120).	In order to limit the project's negative impact on the environment, the project promoter will implement the following measures: > project assumptions and solutions taking into account the adaptation of the facility to climate change by adapting rainwater drainage to receive greater volume of rainwater, building the structures ensuring their improved wind stability, using materials resistant to extreme temperature changes; > environmental supervision exercised throughout the entire project implementation stage; > monitoring of environmental quality including air pollution, dust pollution, ground water levels, noise level, waste management, water and sewage management; > proper waste, water and wastewater management, including collection and disposal of waste and sewage; > reduced interference in the natural environment through proper organization of work and adequate construction site management, system of transport and storage of materials, traffic organization during construction and operation phase; > metaplanation of the most valuable species of protected plants prior to commencement of work; > performing tree logging and shrubs clearance outside the bird breeding season; > improvement of the condition of natural habitats 2120 and 2130* by eliminating invasive species as part of compensatory measures planned for implementation.	232,853.27 EUR	23,285.32 EUR

Environmental Impact explained [Promoter]

According to environmental impact assessment conducted for the project, the environmental standards will not be exceeded in terms of emissions to the environment, noise levels, impacts on surface and ground water and climate. The planned project will generate direct greenhouse gases emissions in the construction work phase due to combustion of fuel (mainly diesel) by construction machines and indirectly due to the transport of materials to the construction site. These emissions will cease upon completion of construction phase; thus they will have no long-term impact on the condition of air and will not cause climate change in the project area. At the operational stage, only natural gas combustion emissions will be generated in the process of regasification of LNG in the SCV installation, heating of buildings within the facility area and heating of LNG gas used as fuel for SCV.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM (via its subsidiary Polskie LNG) is currently expanding the LNG Terminal in Świnoujście. GAZ-SYSTEM is also developing
a number of other PCI projects from BEMIP and NSI East Gas Priority Corridors. from BEMIP (Baltic Pipe, Poland-Lithuania interconnection) and NSI East (Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland, Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland) Gas Priority Corridors.
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the future implementation of these projects will create the synergy effect by interlinking both priority gas corridors. Implementation of a direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets.
The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

Polskie LNG project link: http://en.polskielng.pl//

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_08

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project to be developed in Estonia. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The aim of this project is to build and operate the East Baltic Sea regional LNG import and regasification terminal. Terminals focus will be to provide grid and off-grid clients with competitively priced natural gas in order to help reduce energy costs and environmental impacts and offer competition to Russian gas imports in the region.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-0079	Paldiski LNG Terminal	Balti Gaas plc	EE	Less-Advanced	NA	2025	2025	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0079	1.2	160000	160000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0079	Balti Gaas plc	Paldiski LNG	2025	-	140
LNG-N-0079	Elering AS	Paldiski LNG	2025	140	-

Based on information provided by the promoter during TYNDP 2018 Project Data Collection, the Annual Exit Capacity data of 1.2 bcm/y (Daily Exit Capacity of 39 GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-79
CAPEX [mln. EUR]	370.00	370.00
Range CAPEX		10%
OPEX [mln. EUR/y]	7.00	7.00

Description of costs and range [Promoter]

The CAPEX estimation is based on the offers received from Wärtsilä and Tractebel Engineering S.A during the FEED and EPC contract negotiations. As the project is rescheduled, relevant inflation rate has been applied to the offers and a 10% sensitivity range has been used for sensitivity analysis. The OPEX is also based on the FEED documentation. The major investor Alexela has also extensive experience in building and operating oil product terminals, latest of them being a small-scale LNG terminal in Hamina port, where the experience is used for analysing the CAPEX and OPEX ranges of a regional sized terminal (160 000 m3).

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Estonia.
Enabling a new entry in Estonia, the group realisation also allows to **significantly reduce the dependence to Russian gas** for Estonia, Finland, Latvia and Lithuania.
The project group **increases the number of supply sources** Estonia and Finland have access to. It allows Finland to access LNG as a new supply source, whereas for Estonia gives access to this same source under high demand scenarios.

> **Security of Supply:**

The projects group **increases the remaining flexibility** of Finland for all demand scenarios for peak-day. It also improves as well remaining flexibility for this country for high-demand scenarios for 2-weeks cold spell.
Regarding the supply import routes disruptions, in **case of Baltics-Finland**, the projects group ensures a **decrease in the risk of demand curtailment** in Estonia and Finland.
Additionally, under disruption of the single largest infrastructure in Finland, the project group **fully mitigates the risk of demand curtailment** in this country.

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 1 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables do not show any benefits.
Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (10 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows Baltic states to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The largest benefits of fuel switching will be from off-grid clients – heating plants, land and sea transportation, that currently are using more polluting and expensive fuels such as heating oil, LPG and shale oil. In the CBCA decision by Estonian and Finnish NRAs given to Paldiski LNG terminal, state that the calculations made by project promoter reasonably capture the possible benefits of off-grid clients. The calculations made by the project promoter consisted of monetized CO2 reduction and fuel savings of the three different types of off-grid consumers. The results of CO2 reduction amounted to nearly 90 000 tonnes per year where as price of 17,3 €/ton was used, indicating a yearly saving of 1,55 million €. As the current price of CO2 is around 25 €/ton and ENTSOG assumptions for the long term (2040) range from 45 -126 €/ton depending on the considered demand scenario, the current value of such reduction would be 2,25 million € and increasing to 4 – 11 million € per year. As for the fuel switching benefits, it is highly dependent on the price movements of the relevant fuels as well as from the taxation politics of the relevant country. The total yearly savings under different sensitivity cases ranged from 1 -12 million € for heating plants, 0-10 million € for land transport and from 3-55 million € for marine transport per year. Average savings per year was estimated at around 46 million € per year for all sectors of off-grid clients. As mentioned already both of those benefits are highly dependent on the price of different fuels and CO2, environmental and taxation legislation and therefore hard to predict correctly.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2030									2040								
	SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																		
Dependence to RU (%)																		
Estonia	61%	43%	-18%	45%	26%	-19%	66%	51%	-15%	40%	18%	-22%	58%	47%	-11%	36%	29%	-7%
Finland	61%	43%	-18%	45%	26%	-19%	67%	51%	-16%	40%	18%	-22%	58%	47%	-11%	37%	29%	-8%
Latvia	61%	43%	-18%	45%	26%	-19%	66%	51%	-15%	40%	18%	-22%	58%	47%	-11%	36%	29%	-7%
Lithuania	61%	43%	-18%	44%	26%	-18%	66%	51%	-15%	39%	18%	-21%	57%	47%	-10%	36%	29%	-7%
LNG and Interconnection Capacity Diversification (LICD)																		
Estonia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)																		
Estonia	2	3	1				2	3	1				2	3	1			
Finland	1	2	1	2	3	1	1	2	1	1	2	1				1	2	1

	2030									2040								
	SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																		
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																		
Estonia	52%	0%	-52%	42%	0%	-42%	66%	0%	-66%	58%	0%	-58%	58%	0%	-58%	52%	0%	-52%
Finland	53%	34%	-19%	43%	18%	-24%	66%	53%	-13%	60%	51%	-8%	58%	45%	-13%	52%	40%	-12%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																		
Estonia	62%	0%	-62%	54%	0%	-54%	70%	0%	-70%	66%	0%	-66%	64%	0%	-64%	58%	0%	-58%
Finland	64%	51%	-13%	55%	39%	-16%	72%	61%	-11%	66%	60%	-6%	65%	55%	-11%	59%	50%	-9%
Remaining Flexibility 2-Week Cold Spell (%)																		
Finland							64%	80%	16%	69%	72%	3%	88%	97%	9%			
Remaining Flexibility Peak day (%)																		
Finland	77%	90%	13%				32%	51%	18%	37%	40%	3%	53%	64%	11%	75%	80%	4%
Poland				80%	81%	1%												
Single Largest Infrastructure Disruption (SLID)-Finland																		
Estonia	49%	0%	-49%	37%	0%	-37%	60%	0%	-60%	22%	0%	-22%	49%	0%	-49%	24%	0%	-24%

ADVANCED Infrastructure Level

Row Labels	2030			2040		
	SUSTAINABLE			SUSTAINABLE		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition						
Dependence to RU (%)						
Estonia	21%	13%	-9%	21%	9%	-12%
Finland	21%	10%	-11%	21%	7%	-14%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	2.1	0.4	1.4	0.0	0.0	0.0
	Supply Maximization	7.2	15.7	7.3	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.4	2.1	1.8	0.0	0.0	0.0
	2 Weeks	1.1	18.2	16.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.1	0.2	0.2	0.1	0.2	0.1
	Fuel Switch savings	0.2	0.9	0.3	0.2	0.6	0.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.6	2.7	2.1	0.4	2.1	0.4
Supply Maximization	5.0	0.0	26.2	0.0	15.7	7.2	7.8	3.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.1	1.4	2.1	1.4	1.5	1.1	2.1	1.4
2 Weeks	18.2	1.1	18.2	1.1	18.2	15.6	18.2	1.1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1
Fuel Switch savings	0.9	0.2	0.9	0.2	0.9	0.2	0.9	0.2

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.8	2.4	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	9.6	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1
Fuel Switch savings	0.6	0.2	0.6	0.2	0.6	0.1	0.6	0.2

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-079	LNG terminal		Natura 2000 area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Described in EIA	Described in EIA	-	-

Environmental Impact explained [Promoter]

There has been extensive research regarding the potential implementation of the project and both on-shore and off-shore Environmental Impact Assessment (EIA) have been composed. Both studies are available on the homepage of the project. Also, both have had public consultations and showings and have been approved according to the legislation of Estonia. As a short overview, the planned activity will not have any long-term or significant impact on the Pakri bird area and landscape reserve, which could significantly affect the integrity of the Natura site and the achievement of protection aims. As the planning site is strongly affected by previous human activity (military base from Soviet army times) the construction could even have a positive impact in certain areas.

Additional Information (Environmental Impact) [Promoter]

As explained above, extensive research regarding the building of Paldiksi LNG terminal have been made and the EIA documents are available on the homepage of the project. Shortly the project will have no long-term negative effect on the area and in certain areas will even have a positive effect by removing the former human activity consequences. Mitigation measures will not have significant cost impact on the project.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Most of the benefits not considered in the methodology are described by the promoter already in the fuel switching paragraph, where off-grid benefits are considered. In addition to fuel switching cost, a regional sized LNG terminal could attract additional investments to the region by offering energy efficient solutions to different industries, for example data centre as a consumer of cold, peak-shaving electricity plant and different heat consumers (the terminal itself also). Such cooperation models have been calculated also by Wärtsila during the FEED process of the terminal. The social benefits of such investments can be measured in millions but are out of the scope of current terminal building. During the analysis of the market and potential clients, it became clear that an LNG terminal only intended for grid consumers will not be economically reasonable in the region which is why off-grid market must be included, otherwise infrastructure fees could have a reverse impact on consumption and the competitiveness of the gas. Also, it became clear that there is a need for only one regional sized terminal. The regional hub could offer similar benefits to smaller LNG terminals as to natural gas grid market, by offering security of supply, price competition and flexibility in operations.

F. Useful Links

Baltigas Project link: https://baltigaas.eu/

Alexla project link: https://www.alexela.ee/home/

Estonian National Development Plan 2018-2027:

https://elering.ee/sites/default/files/attachments/Eesti%20gaasi%C3%BClekandev%C3%B5rgu%20arengukava%202018-2027.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_09

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project to be developed in Lithuania. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The aim of the project is to ensure continued long-term direct access to global LNG markets, creating economic welfare and security of supply benefits to all Member States in the region. Klaipeda LNG terminal is a regulated infrastructure providing non-discriminatory third party access to suppliers from all Baltic States to import LNG for their use.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-824	LNG Terminal in Klaipeda	Klaipedos Nafta	LT	Less-Advanced	NA	2024	2024	On time

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-824	3.7	170000	160000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-824	AB Klaipėdos nafta	Klaipeda (LNG)	2024	-	122.4

Based on information provided by the promoter during TYNDP 2018 Project Data Collection the Annual Exit Capacity data of 3.7 bcm/y (Daily Exit Capacity of 122 GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-824
CAPEX [mln. EUR]	160.00	160.00
Range CAPEX		10%
OPEX [mln. EUR/y]	13.00	13.00

Description of costs and range [Promoter]

Cost for ensuring the long-term solution are contractually set by a purchase option defined in current time charter contract. The capex range arises from underlying foreign exchange rate fluctuations.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Lithuania.
It also allows to **decrease dependence to Russian gas** for Estonia, Finland, Latvia and Lithuania.
The projects group **increases the number of supply sources** Estonia and Finland have access to. It allows Finland to access LNG as a new supply source in all demand scenarios, whereas for Estonia gives access to this same source under high demand scenarios.

> **Security of Supply:**

In **case of Baltics-Finland disruption**, the project group ensures a **decrease in the risk of demand curtailment** in Lithuania and Poland.
The project fully mitigates the risk of demand curtailment in Lithuania **in case of disruption of its single largest infrastructure**.
Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in many European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 9 Mln EUR/y (on average) in the low infrastructure level. Such benefits can be partially explained by the savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (up to 7 Mln EUR/y depending on the scenarios) that can be attributed to higher LNG supply flows arriving to the Baltic region as well as savings in transportation costs.
Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (71 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows Baltic states and Finland to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

Klaipeda LNG terminal provides break bulk service to split large scale internationally traded LNG cargoes for use in small scale LNG supply chain. In this way, the terminal enables LNG to be used as a fuel for marine vessels, heavy road transport and on shore off-grid solutions in the whole Baltic sea region, replacing heavy fuel oil as primary energy source in majority of cases. As of Feb-2019, 20 small scale reload operations have already been performed at the Klaipeda LNG terminal for clients to be delivered internationally.

As well as small scale break-bulk operations, the Klaipeda LNG terminal is the only alternative gas import route to pipeline gas supply from Russia. As such, it enables regionally produced dispatchable electricity to be based on cleaner burning natural gas and de-risks further long-term power generation investments to switch away from coal and shale oil capacities.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria													33%	30%	-3%									
Croatia	31%	29%	-2%				35%	32%	-3%	27%	24%	-3%							48%	44%	-4%			
Czechia	31%	28%	-3%	28%	24%	-4%	35%	32%	-3%	26%	23%	-3%	33%	30%	-3%				47%	43%	-4%			
Denmark	29%	26%	-3%				34%	31%	-3%				33%	30%	-3%	18%	13%	-5%						
Estonia	60%	44%	-16%	56%	39%	-17%	61%	46%	-15%	45%	21%	-24%	66%	56%	-10%	40%	21%	-19%	58%	44%	-14%	36%	18%	-18%
Finland	60%	44%	-16%	57%	39%	-18%	61%	46%	-15%	45%	22%	-23%	67%	56%	-10%	40%	21%	-19%	58%	44%	-14%	37%	18%	-19%
Germany																9%	6%	-3%						
Hungary	32%	29%	-3%	29%	24%	-5%	35%	32%	-3%	27%	24%	-3%	34%	31%	-2%				48%	43%	-5%			
Latvia	60%	43%	-17%	56%	38%	-18%	61%	46%	-15%	45%	21%	-24%	66%	56%	-10%	40%	21%	-19%	58%	44%	-14%	36%	18%	-18%
Lithuania	60%	27%	-33%	56%	21%	-35%	61%	31%	-30%	44%	15%	-29%	66%	31%	-35%	39%	13%	-26%	57%	43%	-14%	36%	18%	-18%
Poland	31%	27%	-4%	28%	21%	-7%	34%	32%	-3%	26%	16%	-10%				18%	13%	-5%	48%	43%	-5%	30%	18%	-12%
Slovakia	31%	29%	-2%	28%	24%	-4%	35%	32%	-3%	26%	23%	-3%							48%	43%	-5%			
Slovenia													33%	30%	-3%									
Sweden	30%	27%	-3%				34%	31%	-3%				33%	30%	-3%	18%	13%	-5%						
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	5005	3335	-1670	5003	3333	-1669	5013	3340	-1674	5003	3333	-1669	5017	3341	-1675	5003	3333	-1670	5016	3341	-1675	5003	3333	-1670
Supply Source Access (SSA)																								
Bosnia Herzegovina													4	5	1									
Croatia	3	4	1				2	3	1															
Denmark																			200%	300%	100%			
Estonia	2	3	1				2	3	1				2	3	1				2	3	1			
Finland	1	2	1	2	3	1	1	2	1	2	3	1	1	2	1	1	2	1	1	2	1	1	2	1
Hungary							2	3	1										2	3	1			
Slovenia																			2	3	1			
Sweden																			200%	300%	100%			

	2030									2040								
	SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																		
Baltics Finland Disruption Curtailment Rate Peak Day (%)																		
Lithuania				5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																		
Lithuania							6%	0%	-6%				8%	0%	-8%			
Poland							5%	0%	-5%				7%	1%	-6%			
Belarus Disruption Curtailment Rate Peak Day (%)																		
Lithuania				5%	0%	-5%	14%	4%	-10%	4%	0%	-4%	16%	4%	-12%	4%	0%	-4%
Poland							13%	6%	-7%				16%	9%	-7%			
Remaining Flexibility 2-Week Cold Spell (%)																		
Denmark																89%	91%	1%
Remaining Flexibility Peak day (%)																		
Poland				80%	81%	1%												
Single Largest Infrastructure Disruption (SLID)-Lithuania																		
Lithuania				5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	2%	0%	-2%	4%	0%	-4%
Single Largest Infrastructure Disruption (SLID)-Slovakia																		
Austria	2%	0%	-2%															
Belgium	2%	0%	-2%															
Germany	2%	0%	-2%															
Luxembourg	2%	0%	-2%															
Slovenia	2%	0%	-2%										2%	0%	-2%			
Sweden	2%	0%	-2%															
Switzerland	2%	0%	-2%															

ADVANCED Infrastructure Level

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia													13%	10%	-3%				21%	10%	-11%			
Finland																			21%	11%	-10%			
Latvia													13%	10%	-3%				22%	10%	-12%			
Lithuania													13%	10%	-3%				22%	11%	-11%			
LNG and Interconnection Capacity Diversification (LICD)																								
Lithuania	5005	3335	-1670	5003	3333	-1669	5013	3340	-1674	5003	3333	-1669	5017	3341	-1675	5003	3333	-1670	5016	3341	-1675	5003	3333	-1670

Row Labels	2030						2040					
	DISTRIBUTED			EUCO30			CLIMATE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Baltics Finland Disruption Curtailment Rate Peak Day (%)												
Lithuania	5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	4%	0%	-4%
Belarus Disruption Curtailment Rate Peak Day (%)												
Lithuania	5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	4%	0%	-4%
Single Largest Infrastructure Disruption (SLID)-Lithuania												
Lithuania	5%	0%	-5%	11%	0%	-11%	4%	0%	-4%	4%	0%	-4%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	3.8	11.1	11.8	35.1	70.6	44.8
	Supply Maximization	53.3	102.2	57.9	50.8	87.1	56.6
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.4	4.3	1.4	0.4	0.0	0.2
	2 Weeks	0.2	30.6	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.3	1.3	1.1	0.3	1.3	1.1
	Fuel Switch savings	0.0	0.4	0.2	0.0	0.4	0.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	6.9	1.0	15.0	6.2	11.8	3.8	11.8	3.8
Supply Maximization	95.7	0.0	108.9	0.0	102.2	53.3	51.1	26.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.3	0.4	4.3	0.4	2.6	0.1	4.3	0.4
2 Weeks	30.6	0.0	30.6	0.0	30.6	0.0	30.6	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.3	0.3	1.3	0.3	1.3	0.3	1.3	0.3
Fuel Switch savings	0.4	0.0	0.4	0.0	0.4	0.0	0.4	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	64.3	27.3	73.8	36.0	70.6	35.1	70.6	35.1
Supply Maximization	80.6	0.0	93.4	0.0	87.1	50.8	43.5	25.4
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.4	0.0	0.4	0.0	0.2	0.0	0.4	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.3	0.3	1.3	0.3	1.3	0.3	1.3	0.3
Fuel Switch savings	0.4	0.0	0.4	0.0	0.4	0.0	0.4	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Environmental impact assessment procedure has been completed on 22nd of October 2012 once the final consent for construction activities were granted by Regional Environmental Protection Department of Klaipeda by the Ministry of Environment of the Republic of Lithuania. All the environmental risks have been successfully controlled during the construction of the terminal and active operations since December 2014 have not raised any further environmental concerns. The long-term solution for Klaipeda LNG terminal relies on maintaining the same technical and operational concept with no additional investment into infrastructure.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Two principal aspects are identified that make this project a particularly low risk project as compared to a greenfield development of equivalent scope:

1) The Klaipeda LNG terminal is an actively used facility with four years of proven successful operations. The Klaipeda LNG terminal long term solution project in TYNDP 2018 relates to acquisition of an FSRU vessel to extend the terminal operations beyond the initial period of 10 years. As such, the project is seen as a commercial transaction and has virtually no development risks.

2) Additionally, an underlying necessary national legislative environment has already been developed and is in place in order to establish the revenue model for Klaipeda LNG terminal. The state support mechanism has been cleared by European Commission for the entire lifetime of the terminal.

F. Useful Links

The current pilot project Klaipėda LNG terminal operations are described on:
AB Klaipėdos nafta website: https://www.kn.lt/en/our-activities/lng-terminals/klaipeda-lng-terminal/559.
Information on approved regasification and cargo delivery schedules as well as terminal rules and regulations are also published.

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

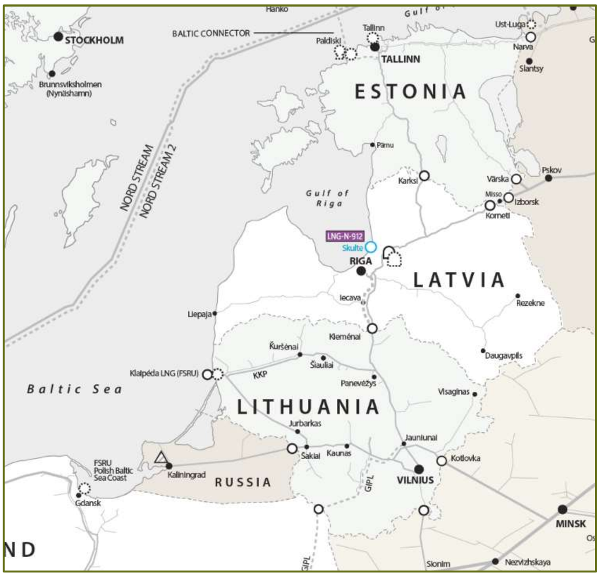
Project Group BEMIP_10

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project to be developed in Latvia. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The project group is composed by one stand-alone LNG project to be developed in Latvia. It does not have LNG storage, but includes direct pipeline connecting the LNG facility to the Incukalns UGS and transmission grid. The project will serve as Incukalns UGS extension – LNG entry point.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-912	Skulte LNG	AS Skulte LNG Terminal	LV	Less-Advanced	NA	2021	2021	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-912	1.5	700000	170000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-912	AS Skulte LNG Terminal	Skulte (LV)	2021	-	150
LNG-N-912	Conexus Baltic Grid	Skulte (LV)	2021	150	-

Based on information provided by the promoter during TYNDP 2018 Project Data Collection the Annual Exit Capacity data of 1.5 bcm/y (Daily Exit Capacity of 48 GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-912
CAPEX [mln. EUR]	120.00	120.00
Range CAPEX		15 %
OPEX [mln. EUR/y]	3.00	3.00

Description of costs and range [Promoter]

The current CAPEX estimate is 120.00 mil. EUR.
FSRU technologies are rapidly developing and so far, used technical solution – platform (size 285x30m) has been replaced by much smaller platform (size 60x30m) and piles used as the mooring system. Similarly, flexible connection to the underground pipeline is optimized. « Connect LNG » system will be used for this purpose.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Latvia.
Enabling a new entry in Latvia with a new supply source (LNG), the group realisation also allows to **significantly reduce the dependence from Russian gas** in Estonia, Finland, Latvia and Lithuania.
Depending on the demand scenario, the project group **increases the number of supply sources** Estonia has access.

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply,** but only under LNG supply Maximisation or Russian supply minimisation (12 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows some countries to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the new LNG terminal provides price stability in the region and provides incentive for fuel switch in the transport industry. Currently oil products are dominant – petrol, diesel and fuel oil. CNG has 97% lower NOx emissions and 20-30% lower CO2 emissions comparing to diesel. LNG Terminal project can provide similar effect on Estonia fuel switch policy replacing oil shale with other energy resources.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	60%	36%	-24%	56%	30%	-26%	61%	39%	-22%	45%	25%	-20%	66%	47%	-19%	40%	18%	-22%	58%	47%	-11%	36%	28%	-8%
Finland	60%	36%	-24%	57%	30%	-27%	61%	39%	-22%	45%	25%	-20%	67%	47%	-20%	40%	18%	-22%	58%	47%	-11%	37%	28%	-9%
Latvia	60%	36%	-24%	56%	30%	-26%	61%	39%	-22%	45%	25%	-20%	66%	47%	-19%	40%	18%	-22%	58%	47%	-11%	36%	28%	-8%
Lithuania	60%	35%	-25%	56%	30%	-26%	61%	38%	-23%	44%	25%	-19%	66%	47%	-19%	39%	18%	-21%	57%	47%	-10%	36%	28%	-8%
Poland																						30%	27%	-3%
LNG and Interconnection Capacity Diversification (LICD)																								
Latvia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)																								
Bosnia Herzegovina													4	5	1									
Croatia	3	4	1				2	3	1															
Estonia	2	3	1										2	3	1									

	2030			2040		
	DISTRIBUTED			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply						
Remaining Flexibility 2-Week Cold Spell (%)						
Denmark				89%	91%	1%
Remaining Flexibility Peak day (%)						
Poland	80%	81%	1%			

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Latvia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.2	12.9	7.9
	Supply Maximization	5.0	23.6	8.7	3.6	19.6	8.5
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	0.5	0.5	0.0	0.0	0.0
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.4	1.3	1.2	0.4	1.3	1.2
	Fuel Switch savings	0.1	0.4	0.2	0.1	0.4	0.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.7	0.1	0.0	0.0	0.0	0.0
Supply Maximization	6.3	0.0	36.0	0.0	23.6	5.0	11.8	2.5
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.5	0.0	0.5	0.0	0.0	0.0	0.5	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.3	0.4	1.3	0.4	1.3	0.4	1.3	0.4
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	23.0	7.6	12.9	0.2	12.9	0.2
Supply Maximization	2.4	0.0	31.5	0.0	19.6	3.6	9.8	1.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.3	0.4	1.3	0.4	1.3	0.4	1.3	0.4
Fuel Switch savings	0.4	0.1	0.4	0.1	0.4	0.1	0.4	0.1

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-0912	FRU, pipeline	> Physical disturbance of habitat and ecology > Increase in air emissions, and potential contamination of seawater and seabed > Disturbance of ecology by noise, vibration, dust or light pollution > Changes to landscape and physical disturbance of sites of cultural importance	Sea water, protected land areas

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Fuel leakage, noise, sea water heating, emission increase	Project is in the middle of EIA process. > Use of proper equipment to reduce fuel leakage risk, limit the emission and limit noise level. > Limited amount of water will be used for vaporizing LNG in order to follow World Bank guidelines (max 3-degree temperature increase 100m from discharge point > FRU will be located 2.5 offshore. 5.2km subsea pipeline will be building to circumvent the residential areas. > Onshore pipeline will circumvent any protected and residential areas > Waste will be collected in special containers	7mil. EUR for building extra 2.7km subsea pipeline and 3km subsea pipeline	

Environmental Impact explained [Promoter]

Please see Table above.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

F. Useful Links

EC link (Skulte LNG Terminal):
https://ec.europa.eu/eipp/desktop/en/projects/project-187.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_11

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone LNG project to be developed in Estonia. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The project group aims at improving Baltic States as well as Finnish security of supply and serving commercial customers. The project will bring a new supply route from the global LNG market to Estonia and the East Baltic region. In addition, it will also enable connection to other European markets through the LNG market. It will thereby bring the Baltic region out of its isolation from the internal market and enable price convergence towards the liquid and well-established North-western European markets.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-0962	Tallinn LNG	Vopak EOS	EE	Advanced	NA	2022	2022	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0962	4	160000	160000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0962	Vopak EOS	Tallinn LNG	2022	-	121
LNG-N-0962	Elering AS	Tallinn LNG	2022	121	-

Based on information provided by the promoter during TYNDP 2018 Project Data Collection the Annual Exit Capacity data of 4 bcm/y (Daily Exit Capacity 121 Gwh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-962
CAPEX [mln. EUR]	250.00	250.00
Range CAPEX		20%
OPEX [mln. EUR/y]	15.00	15.00

Description of costs and range [Promoter]

The capital costs of the terminal amounts to 250 MEUR, as elaborated by Vopak with a +/- 40% degree of accuracy.
The additional cost of connection to the transmission system is estimated to maximum 10 MEUR with a +/- 40% degree of accuracy.
Operating costs for the LNG terminal are estimated at roughly 15 MEUR per annum.
The terminal construction period is assumed to take place during the 2019-2025 period, with CAPEX equally distributed over the six years. The construction is divided in two phases the first phase will take place during the 2019 -2022 period (the year 2022 will be the first full year of operation). The second construction phase will take place during the 2022 -2025 period.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Estonia.
Enabling a new entry in Estonia, the group realisation also allows to **significantly reduce the dependence from Russian gas** in Estonia, Finland, Latvia and Lithuania.
The project group **increases the number of supply sources** Finland has access to. It allows Finland to access LNG as a new supply source in nearly all demand scenarios, whereas for Estonia gives access to this same source under high demand scenarios.

> **Security of Supply:**

Depending on the demand scenario, the project group **increases the remaining flexibility** of Finland for peak-day and 2-weeks cold spell.
Regarding the supply import routes disruptions, in **case of Baltics-Finland disruption**, the project group ensures a **decrease in the risk of demand curtailment** in Estonia and Finland.
Additionally, under disruption of the single largest infrastructure in Finland, the project group **mitigates the risk of demand curtailment** in Finland and Estonia.

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 2 Mln EUR/y (on average) in the low infrastructure level and 6 Mln EUR/y (on average) in the Advanced infrastructure level. Such benefits are driven by new LNG flows arriving to some of the Baltic States (mainly Estonia) through the LNG terminal, substituting a route with higher transportation costs.
Additionally, the project group could bring even higher benefits when considering low prices of LNG supply (LNG max) or high Russian gas prices (RUmin) **with a decrease on the cost of the gas supply** of 13 Mln EUR/y on average under these configurations.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

> **CO2 Savings:**

The access to more competitive gas supplies provides the power sector with a relevant alternative to more polluting fuels such as oil shale. The share of natural gas in the power mix is only currently below 5 % and will only marginally increase until 2030. In comparison, oil and solid fuels is approximately 95 % of current power generation. There is a significant potential in changing the fuel source to gas in terms of lower emissions. Oil shale has an emission of 106 kg/GJ and is one of the highest among the primary fuel sources. For comparison gas has an emission of 57 kg/GJ. The saving alone in CO2 by converting to gas will be at least 540 kg/MWh produced electricity. The combustion of natural gas does not emit soot, dust or fumes. It generates 30% less carbon dioxide (CO2) than fuel oil and 45% less than coal, with a twofold reduction in nitrogen oxide (N0x) emissions and almost no environmentally-damaging sulphur dioxide (SO2) emissions. The monetary effect of CO2 savings is illustrated in the table of section E.

> **Fuel Switching:**

The new terminal brings the Baltic region out of its isolation from the internal market and enable price convergence towards the liquid and well-established North-western European markets in Netherlands and UK, effectively creating a price reference to TTF and/or NBP. The fuel cost and natural gas price will no longer dominated by long term contracts with Gazprom. The lower price of natural gas will help to reduce the use of oil and coal and contribute to a sustainable to decrease of emissions. These was taken in the consideration by the calculation of the monetised benefits.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia	31%	29%	-2%							27%	24%	-3%							48%	44%	-4%			
Czechia	31%	28%	-3%	28%	24%	-4%	35%	32%	-3%	26%	23%	-3%							47%	43%	-4%			
Denmark																18%	13%	-5%						
Estonia	60%	27%	-33%	56%	22%	-34%	61%	31%	-30%	45%	12%	-33%	66%	32%	-34%	40%	10%	-30%	58%	38%	-20%	36%	11%	-25%
Finland	60%	27%	-33%	57%	23%	-34%	61%	31%	-30%	45%	11%	-34%	67%	33%	-34%	40%	9%	-31%	58%	36%	-22%	37%	8%	-29%
Germany																9%	6%	-2%						
Hungary	32%	29%	-3%	29%	24%	-5%				27%	24%	-3%							48%	44%	-4%			
Latvia	60%	28%	-32%	56%	22%	-34%	61%	32%	-29%	45%	16%	-29%	66%	32%	-34%	40%	13%	-27%	58%	43%	-15%	36%	18%	-18%
Lithuania	60%	28%	-32%	56%	23%	-33%	61%	32%	-29%	44%	17%	-27%	66%	32%	-34%	39%	13%	-26%	57%	43%	-14%	36%	18%	-18%
Poland	31%	28%	-3%	28%	23%	-5%	34%	32%	-2%	26%	17%	-9%				18%	13%	-5%	48%	43%	-5%	30%	19%	-11%
Slovakia	31%	29%	-2%	28%	24%	-4%	35%	33%	-2%	26%	23%	-3%							48%	44%	-4%			
Sweden																18%	13%	-5%						
LNG and Interconnection Capacity Diversification (LICD)																								
Estonia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)																								
Bosnia Herzegovina													4	5	1									
Croatia	3	4	1				2	3	1															
Estonia	2	3	1				2	3	1				2	3	1				2	3	1			
Finland	1	2	1	2	3	1	1	2	1	2	3	1	1	2	1	1	2	1	1	2	1	1	2	1
Hungary							2	3	1															
Serbia	3	4	1																					

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Estonia	48%	0%	-48%	47%	0%	-47%	52%	0%	-52%	42%	0%	-42%	66%	0%	-66%	58%	0%	-58%	58%	0%	-58%	52%	0%	-52%
Finland	48%	24%	-24%	48%	23%	-25%	53%	34%	-19%	43%	18%	-24%	66%	53%	-13%	60%	51%	-8%	58%	45%	-13%	52%	40%	-12%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Estonia	59%	0%	-59%	58%	0%	-58%	62%	0%	-62%	54%	0%	-54%	70%	0%	-70%	66%	0%	-66%	64%	0%	-64%	58%	0%	-58%
Finland	60%	43%	-17%	59%	41%	-18%	64%	51%	-13%	55%	39%	-16%	72%	61%	-11%	66%	60%	-6%	65%	55%	-11%	59%	50%	-9%
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Finland													64%	80%	16%	69%	72%	3%	88%	97%	9%			
Remaining Flexibility Peak day (%)																								
Finland							77%	90%	13%				32%	51%	18%	37%	40%	3%	53%	64%	11%	75%	80%	4%
Poland										80%	81%	1%												
Single Largest Infrastructure Disruption (SLID)-Finland																								
Estonia	44%	0%	-44%	42%	0%	-42%	49%	0%	-49%	37%	0%	-37%	60%	0%	-60%	22%	0%	-22%	49%	0%	-49%	24%	0%	-24%
Finland	45%	43%	-2%	43%	41%	-3%																		

ADVANCED Infrastructure Level

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Estonia	60%	19%	-41%	56%	8%	-48%	61%	21%	-40%	45%	1%	-44%	66%	13%	-53%	40%	0%	-40%	58%	21%	-37%	36%	0%	-36%
Finland	60%	19%	-41%	57%	9%	-48%	61%	21%	-40%	45%	1%	-44%	67%	30%	-37%	40%	0%	-40%	58%	21%	-37%	37%	0%	-37%
Latvia	60%	19%	-41%	56%	8%	-48%	61%	21%	-40%	45%	1%	-44%	66%	13%	-53%	40%	0%	-40%	58%	22%	-36%	36%	0%	-36%
Lithuania	60%	19%	-41%	56%	9%	-47%	61%	21%	-40%	44%	2%	-42%	66%	13%	-53%	39%	0%	-39%	57%	22%	-35%	36%	0%	-36%
LNG and Interconnection Capacity Diversification (LICD)																								
Estonia	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667	5,000	3,333	-1,667
Supply Source Access (SSA)																								
Finland				2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	1	2	1	2	3	1

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Estonia	48%	0%	-48%	47%	0%	-47%	52%	0%	-52%	42%	0%	-42%	66%	0%	-66%	58%	0%	-58%	58%	0%	-58%	52%	0%	-52%
Finland	48%	24%	-24%	48%	23%	-25%	53%	34%	-19%	43%	18%	-24%	66%	53%	-13%	60%	51%	-8%	58%	45%	-13%	52%	40%	-12%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Estonia	59%	0%	-59%	58%	0%	-58%	62%	0%	-62%	54%	0%	-54%	70%	0%	-70%	66%	0%	-66%	64%	0%	-64%	58%	0%	-58%
Finland	60%	43%	-17%	59%	41%	-18%	64%	51%	-13%	55%	39%	-16%	72%	61%	-11%	66%	60%	-6%	65%	55%	-11%	59%	50%	-9%
Remaining Flexibility 2-Week Cold Spell (%)																								
Finland													64%	80%	16%	69%	72%	3%	88%	97%	9%			
Remaining Flexibility Peak day (%)																								
Finland							77%	90%	13%				32%	51%	18%	37%	40%	3%	53%	64%	11%	75%	80%	4%
Single Largest Infrastructure Disruption (SLID)-Finland																								
Estonia	44%	0%	-44%	42%	0%	-42%	49%	0%	-49%	37%	0%	-37%	60%	0%	-60%	22%	0%	-22%	49%	0%	-49%	24%	0%	-24%
Finland	45%	43%	-2%	43%	41%	-3%																		

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	2.5	1.1	1.9	5.4	7.6	5.8
Supply Maximization	7.6	16.3	8.2	7.3	22.6	13.1
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	1.7	2.2	1.9	1.7	2.2	1.8
2 Weeks	1.3	19.1	17.4	17.0	19.1	17.4
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	0.1	0.3	0.2	0.1	0.3	0.2
Fuel Switch savings	0.3	0.9	0.4	0.3	0.9	0.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	5.4	3.8	2.5	1.1	2.5	1.1
Supply Maximization	4.4	0.0	31.8	0.0	16.3	7.6	8.2	3.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.2	1.7	2.2	1.7	1.6	1.3	2.2	1.7
2 Weeks	19.1	1.3	19.1	1.3	19.1	17.0	19.1	1.3
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1
Fuel Switch savings	0.9	0.3	0.9	0.3	0.9	0.3	0.9	0.3

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	1.0	0.5	12.9	7.9	7.6	5.4	7.6	5.4
Supply Maximization	6.8	0.0	39.3	0.0	22.6	7.3	11.3	3.7
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.2	1.7	2.2	1.7	1.6	1.3	2.2	1.7
2 Weeks	19.1	17.0	19.1	17.0	19.1	17.0	19.1	17.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.3	0.1	0.3	0.1	0.3	0.1	0.3	0.1
Fuel Switch savings	0.9	0.3	0.9	0.3	0.9	0.3	0.9	0.3

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-0962	LNG Terminal	Muuga Industrial Harbour	None, the LNG terminal is planned on an existing industrial surface.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
None	The LNG terminal is planned on an existing industrial surface. The use of an existing industrial surface mitigates the environmental impact.	None	None

Environmental Impact explained [Promoter]

Muuga Harbour is one of the biggest cargo harbours in the Baltic Sea region and the main industrial/commercial area (Tallinn/Harju area) of Estonia.
The LNG import terminal is going to be constructed nearby the quay No 33 at Muuga Industrial Harbour. The use of an existing industrial surface at Muuga Industrial Harbour mitigates the environmental impact of the construction of the LNG import terminal. Vopak assess all environmental impacts when planning development activities. The construction of the LNG Import Terminal on an existing industrial area has the lowest environmental impacts compare to a green field project. An environmental impact assessment was conducted on behalf of Vopak for the planned LNG Import Terminal. The results were negligible low environmental impacts on the planned surface. The approved building permit took in consideration the environmental impact assessment.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The Tallinn LNG terminal is the only on-land regional terminal project in Finland and Baltic countries that is established in the major port (Muuga Harbor) on existing infrastructure, with excellent road, rail and sea connections. This makes this project most efficient and allows for best market integration and competitiveness (incl. new sources of diversifications, diversification of entry points and competitive/fair price spreads) for the Finno-Baltic gas market, with this also the SoS situation in the region is enhanced. The project promoters of Tallinn LNG terminal are fully independent (Vopak, Port of Tallinn and Vopak E.O.S. does not trade gas or other commodities) long term infrastructure companies, this is the only terminal project in Estonia where the promoters are not affiliated/connected to the trading company.

Baltic region is today solely dependent on supplies from Russia. The addition of Tallinn LNG will therefore improve the diversification substantially in all three categories:

- **Routes**: There are currently only interconnections to Russia (one to Latvia, one to Finland and two to Estonia). The Tallinn LNG project will bring a fifth supply route to region.
- **Counterparts**: Gazprom is currently the sole supplier to the region and the project will enable more counterparts to supply the region.
- **Sources:** Like with the counterparts the current single source of gas is Russia. With the Tallinn LNG project the supply sources can increase for the benefit of competition. The source can be directly to the upstream sources, but also rebunkering from other regasification terminals in e.g. Netherlands, UK and eventually also Poland.

The new LNG import terminal Tallinn will include features such as truck loading, unloading facilities for LNG carriers and (bunker) barge loading facilities. Additional benefits of this infrastructure are:

- providing infrastructure for the distribution of LNG as an alternative fuel for the maritime transport in the Baltic Sea region
- contributing to the fulfilment of Directive 2014/94/EC of the European Union to make LNG available in all EU core ports by end of 2025.
- developing a refuelling point for LNG in the Baltic Sea region to avoid bottlenecks in the LNG bunkering facility for LNG vessels in the Baltic Sea
- solving the chicken-egg deadlock that the adoption of LNG currently faces
- Improvement of environmental sustainability: The key performance indicators include improved energy efficiency, healthy urban environments and lower emissions of CO2 and NOX
- Improved safety and security: The key performance indicator is lowering of risk levels in the transport system (bunkering procedures).
- Economic viability: The key performance indicators include that the terminal operator’s revenues cover all operative costs and that the project implementation requires minimal public funding for the investment.

F. Useful Links

Tallin LNG project link:
https://www.tallinnlng.com/
Port of Tallinn Development Plan:
http://www.portoftallinn.com/muuga-development-plans

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group BEMIP_12

Reasons for grouping [ENTSOG]

The project group is composed by one stand-alone (FSRU) LNG project to be developed in Poland. It includes also connection from the LNG facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The project aims at meeting increasing demand for natural gas in Poland and to guarantee additional import capacities on a regional level. The FSRU is expected to provide an efficient and cost-effective way to enhance diversification and security of gas supplies and to foster competition on regional gas markets.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-947	FSRU Polish Baltic Sea Coast	GAZ-SYSTEM S.A.	PL	Less-Advanced	-	2023	2023	NA

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-947	4.5	160000	120000 – 216000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-947	GAZ-SYSTEM S.A.	FSRU Polish Baltic Sea Coast	2023	138	-
LNG-N-947	Polskie LNG S.A.	FSRU Polish Baltic Sea Coast	2023	-	138

Based on information provided by the promoter during TYNDP 2018 Project Data Collection the Annual Exit Capacity data of 4.5 bcm/y (Daily Exit Capacity 138 (GWh/d) has been considered for modelling the LNG terminal maximum send-out in the yearly assessments.

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-947**
CAPEX [mln. EUR]	196.00	196.00
Range CAPEX		30%
OPEX [mln. EUR/y]	15.00	15.00

Description of costs and range [Promoter]

The costs were calculated based on market prices and costs of similar investment projects. The costs are best estimate in this project phase.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group allows to **reduce dependence from Russian gas** in Poland, Denmark and Sweden. The new access to LNG allows Poland to further diversify its supply mix while potentially reducing flows from Germany that can increase export of gas other than Russian to Denmark and Sweden. Implementation of the project group entails higher supply availability in Poland and as a result, more supply will be available in Germany and their neighbouring countries (Denmark). In terms of Russian dependency, benefits from the project group in Baltic countries are limited by the interconnection capacity between Poland and Lithuania, and therefore no further reduction of Russian gas dependence is observed in the Baltic region.

Depending on the considered demand scenarios the projects group **increases the number of supply sources** in Estonia and Finland (in the latter case thanks to the interconnection available in the low infrastructure level) have access to. These two countries can in fact have more access to LNG benefiting from at least 20% of the area could benefit from a decrease on the LNG price.

> **Security of Supply:**

The project group **increases the Remaining Flexibility** in Poland in all demand scenarios for peak-day and 2-week cold spell.

Regarding the supply import routes disruptions, in **case of Belarus disruptions** the project **mitigates the risk of demand curtailment** in Lithuania and Poland under two weeks cold spell. Furthermore, for **Ukrainian disruption the project mitigates the risk of demand curtailment** under high demand scenarios in 2040.

The project group mitigates the risk of demand curtailment in Poland and Slovakia **in case of disruption of their respective single largest infrastructure.**

> **Market Integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply** for Blue Transition demand scenario. For this demand scenario and in the reference supply price configuration project estimated benefits are 6 Mln EUR/y. These benefits can be explained by the savings in transportation costs (mainly in Poland) thanks to the utilisation of this new alternative route.

Additional benefits compared to the reference situation can be observed in the case of LNG supply Maximisation and Russian supply minimisation (16 Mln EUR/y on average in the low infrastructure level). Such benefits are driven by the fact that the Project Group allows some countries to further benefit from a decrease in LNG price while at the same time to rely on alternative sources in case of more expensive Russian gas prices. However, for these supply configurations flows to the Baltic countries are always limited by the interconnection capacity between Poland and Lithuania.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe (exceeding in some cases 50% of the energy mix). Similar conditions hold true for instance in the power generation and heating sectors.

This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as extension of the FSRU Polish Baltic Sea Coast project are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries in Central-Eastern Europe.

The FSRU project may well have an impact on fuel switch by contributing to substitution of high emission sources of energy in heavy industry and coal power plants. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low emission fuels. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil).

The project is also expected to positively influence sustainability with the reduction of pollutant emissions into the air. This concerns emissions coming from high sulphur marine fuels emitting sulphur dioxide and solid particles that are harmful to human health, the environment and responsible for acidic rains. The project meets the objectives of the so-called sulphur directive.

Due to the underlying assumptions of Sustainable Transition and Distributed Generation scenarios, higher fuel switch benefits are expected for both demand scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria													33%	28%	-5%									
Croatia	31%	29%	-2%				35%	31%	-4%	27%	24%	-3%	33%	29%	-4%				48%	41%	-7%			
Czechia	31%	28%	-3%	28%	24%	-4%	35%	30%	-5%	26%	23%	-3%	33%	28%	-5%				47%	40%	-7%			
Denmark	29%	23%	-6%	21%	16%	-5%	34%	28%	-6%	13%	9%	-4%	33%	28%	-5%	18%	9%	-9%						
Germany	25%	23%	-2%				28%	26%	-3%				24%	21%	-2%	9%	4%	-5%						
Hungary	32%	29%	-3%	29%	24%	-5%	35%	31%	-4%	27%	24%	-3%	34%	29%	-4%				48%	41%	-7%			
Poland	31%	23%	-8%	28%	17%	-11%	34%	29%	-6%	26%	10%	-16%	33%	28%	-5%	18%	9%	-9%	48%	40%	-8%	30%	10%	-21%
Slovakia	31%	29%	-2%	28%	24%	-4%	35%	31%	-4%	26%	23%	-3%	33%	28%	-5%				48%	41%	-7%			
Slovenia													33%	28%	-5%									
Sweden	30%	23%	-7%	22%	17%	-5%	34%	28%	-6%	13%	10%	-3%	33%	28%	-5%	18%	9%	-9%						
Supply Source Access (SSA)																								
Bosnia Herzegovina													4	5	1									
Croatia	3	4	1				2	3	1															
Denmark																			2	3	1			
Estonia	2	3	1				2	3	1				2	3	1				2	3	1			
Finland	1	2	1	2	3	1	1	2	1															
Hungary							2	3	1										2	3	1			
Slovenia																			2	3	1			
Sweden																			2	3	1			

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania																			2%	0%	-2%			
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania													6%	0%	-6%				8%	0%	-8%			
Poland													5%	0%	-5%				7%	0%	-7%			
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania													14%	11%	-3%				16%	2%	-14%			
Poland													13%	0%	-13%				16%	2%	-14%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Poland							90%	100%	10%	98%	100%	2%	22%	40%	18%	88%	100%	12%	18%	35%	17%	68%	92%	24%
Remaining Flexibility Peak day (%)																								
Germany																			39%	42%	3%			
Italy													48%	49%	1%				35%	40%	5%			
Poland	85%	100%	15%	88%	100%	12%	69%	94%	24%	80%	100%	20%	13%	30%	16%	72%	97%	24%	8%	23%	15%	51%	73%	21%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													5%	0%	-5%				10%	0%	-10%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%										2%	0%	-2%			
France																			2%	0%	-2%			
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%										2%	0%	-2%			
Portugal																			2%	0%	-2%			
Slovenia							2%	0%	-2%										2%	0%	-2%			
Spain																			2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
United Kingdom																			2%	0%	-2%			
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria																			6%	4%	-2%			
Bosnia Herzegovina																			8%	4%	-4%			
Bulgaria																			8%	5%	-3%			
Czechia																			6%	4%	-2%			
Germany																			6%	3%	-3%			
Hungary																			6%	4%	-2%			
Luxembourg																			8%	4%	-4%			
Poland							2%	0%	-2%										6%	4%	-2%			
Serbia																			8%	4%	-4%			
Slovakia																			6%	4%	-2%			
Slovenia																			8%	4%	-4%			
Switzerland																			6%	4%	-2%			

ADVANCED Infrastructure Level

Sum of Value	Column Labels					
	2030			2040		
	EUCO30			SUSTAINABLE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply						
Remaining Flexibility 2-Week Cold Spell (%)						
Poland	72%	90%	18%	65%	82%	17%
Remaining Flexibility Peak day (%)						
Poland	58%	75%	16%	50%	65%	15%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	6.5	0.0	3.7	3.7	3.7
	Supply Maximization	10.7	28.9	6.5	12.2	9.1	11.6
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	7.7	1.4	0.0	0.0	0.0
	2 Weeks	0.0	30.6	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	3.2	13.8	1.1	2.5	11.1	0.9
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	33.3	12.1	6.5	0.0	6.5	0.0
Supply Maximization	0.6	0.0	84.2	0.0	28.9	6.5	14.5	3.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	7.7	0.0	7.7	0.0	4.7	0.0	7.7	0.0
2 Weeks	30.6	0.0	30.6	0.0	30.6	0.0	30.6	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	13.8	1.1	13.8	1.1	12.8	1.1	13.8	1.1
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	37.3	27.7	3.7	3.7	3.7	3.7
Supply Maximization	0.0	0.0	62.6	0.0	12.2	9.1	6.1	4.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	11.1	0.9	11.1	0.9	10.3	0.9	11.1	0.9
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-947	LNG infrastructure	FSRU unit – Port of Gdansk (0.5 ha) Connection to the transmission network: offshore section - approx. 7 km, onshore section – approx. 30 km	Appropriate administrative decisions (including environmental) are yet to be obtained. The list of environmentally sensitive areas crossed by the project will be indicated in the decisions on environmental conditions.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Bay of Gdańsk, Port of Gdansk; Extended part of breakwater	Concrete mitigation measures for both onshore and offshore part of the project will be determined in the decisions on environmental conditions. The project promoter will comply with environmental requirements during the construction phase.	N/A	N/A

Environmental Impact explained [Promoter]

There are no pending issues for compliance with EU and national legislation; the preparation of related documents are carried out in accordance with the applicable environmental legal acts in Poland, i.e. adopted in accordance with EU legislation.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM implements the FSRU Polish Baltic Sea Coast project. GAZ-SYSTEM develops also a number of other PCI projects from the BEMIP (Baltic Pipe, Poland-Lithuania interconnection, capacity extension of LNG terminal in Świnoujście) and NSI East (Poland - Slovakia Interconnection with North - South Gas Corridor in Eastern Poland, Poland - Czech Republic Interconnection with North - South Gas Corridor in Western Poland) Gas Priority Corridors.
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the future implementation of these projects will create the synergy effect by interlinking both priority gas corridors. The implementation of a direct gas connection with deposits on Norwegian Continental Shelf, significant LNG supply options (FSRU in PL, Świnoujście In PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, the Czech Republic, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets. The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

GAZ-SYSTEM website: http://www.gaz-system.pl/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_01

Reasons for grouping [ENTSOG]

The project group represents the Poland-Slovakia Interconnection and includes the two sides of the investments (TRA-N-275 and TRA-N-190) as well as the enabler project TRA-N-245 in Poland. The interconnection will create the first bi-directional cross-border pipeline between Poland and Slovakia.

Objective of the project(s) in the group [Promoter]

The objective of the project group is to implement a missing interconnection between the transmission systems of Poland and Slovakia and complete the North-South gas corridor. The group aims at increasing the security of gas supplies in Central-Eastern Europe through the diversification of supply sources and routes.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0190	Poland - Slovakia interconnection	Eustream, a.s.	SK	FID	6.2.1	2021	2021	Delayed
TRA-F-0275	Poland - Slovakia Gas Interconnection (PL section)	GAZ-SYSTEM S.A.	PL	FID	6.2.1	2021	2021	NA
TRA-N-0245	North - South Gas Corridor in Eastern Poland	GAZ-SYSTEM S.A.	PL	Less-Advanced	6.2.2	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0190	1000	106	0
TRA-F-0275	1000	372	30
TRA-N-0245	700	72	-
TRA-N-0245	700	103	-
TRA-N-0245	700	39	-
TRA-N-0245	1,000	316	-
TRA-N-0245	700	60	-
TRA-N-0245	1,000	135	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0190	eustream, a.s.	Interconnector PL - SK	2021	143.96	174.59
TRA-F-0275	GAZ-SYSTEM S.A.	Interconnector PL - SK	2021	174.5	143.9
TRA-N-0245	GAZ-SYSTEM S.A.	Aggregated Distribution (PL)	2022	-	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-275	TRA-F-190	TRA-N-245
CAPEX [mln. EUR]	1758.42	629.35*	143.40**	985.67*
Range CAPEX		40%	10%	40%
OPEX [mln. EUR/y]	29.74	11.33*	0.67**	17.74*

Description of costs and range [Promoter]

The range for the TRA-F-190 covers mainly the possible extra works needed during the construction and the difference between expected cost and real contracted cost based on public procurement procedures.

For the Polish projects, the costs were calculated based on market prices and costs of similar investment projects. The costs are best estimate in this project phase.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **improves the diversification of entry capacities** (LICD indicator) in Slovakia and Poland.
It has a **positive impact reducing the dependence to Russia supply** for several countries in Europe. With the creation of an interconnection between Poland and Slovakia, Eastern Europe results being more integrated with the rest of Europe and can share, and consequently reduce, its supply dependence.
Slovenia and Bosnia and Herzegovina see **increasing the number of sources they have access to**. Thanks to the interconnection with the rest of Europe those countries can benefit from more LNG.

> **Security of Supply:**

The projects group **improves the remaining flexibility** of Poland (in all demand scenarios and in both peak day and 2 week cold spell situation), in Lithuania (in EUCO30 and Sustainable Transition scenarios) and in Germany and in Czech Republic but only in the Sustainable Transition scenario. Additionally, in the Sustainable Transition scenario, due to the expected gas consumption, Poland presents risk of demand curtailment. The project group allows to **fully mitigate such risk**. The project has positive benefits, especially for Poland and Lithuania, also in **mitigating the impact in case of supply disruptions** from the Belarus or Ukrainian routes or in case of disruption of imports to Baltic states and Finland.
In the Sustainable Transition scenario and in case of supply disruption from Ukraine it is observed in Europe an overall risk of demand curtailment due to the increase in gas consumption. The projects group allows for **further mitigation of such risk** in many European Countries in the range of 0-2%. When countries can share the same level of demand curtailment (no infrastructure bottlenecks) the benefits stemming from the realisation of the projects in terms of avoided curtailed demand have an impact on Europe as a whole and there are several possible ways to allocate them at country level. The results show one possible configuration of this allocation. In Poland and Lithuania, depending on the scenarios, the projects **decrease or fully mitigate the risk of demand curtailment also in case of disruption of the main largest infrastructures** (respectively Kotlovka and Point of Interconnection (PWP) (PL)). Additionally, the project group allows also for full mitigation of risk of demand curtailment in many other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod (UA) - Velké Kapušany (SK)) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The group potentially **reduces the cost of gas supply** by around 20 Mln EUR/y (on average) in case of LNG minimisation or Russian gas maximisation. The project group allows respectively to benefit from a possible decrease of Russian gas price or from substituting LNG when more expensive. Those benefits are triggered by transmission tariffs savings by using the new alternative route. This can be seen in the sensitivity analysis where benefits increase in case of even lower tariffs while appear to be zero in case of more expensive tariffs compared to the other possible routes.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe (exceeding in some cases 50% of the energy mix). Similar conditions hold true for instance in the power generation and heating sectors.
This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as the PL-SK interconnection are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries.
The project impact area on both sides of the PL-SK border are polluted by heavy industry and coal power plants. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low emission fuels. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources and overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil) in the vicinity of the project area.
This is confirmed, in particular, under the Sustainable Transition and Distributed Generation scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia	43%	31%	-11%				47%	35%	-12%	40%	27%	-13%				39%	27%	-12%				40%	31%	-9%
Czechia	44%	31%	-13%	41%	28%	-13%	47%	35%	-12%	40%	26%	-14%				46%	27%	-19%				48%	31%	-17%
Hungary	45%	32%	-13%	41%	29%	-12%	47%	35%	-12%	41%	27%	-14%				40%	27%	-13%				40%	31%	-9%
Romania	45%	43%	-2%	41%	35%	-6%																		
Slovakia	45%	31%	-14%	41%	28%	-13%	47%	35%	-12%	41%	26%	-15%				46%	27%	-19%				48%	31%	-17%
LNG and Interconnection Capacity Diversification (LICD)																								
Poland	3304	2500	-804	3304	2500	-804	3304	2500	-804	3304	2500	-804	3304	2500	-804	3304	2500	-804	3304	2500	-804	3304	2500	-804
Slovakia	5000	3334	-1666	5000	3334	-1666	5000	3333	-1667	5000	3333	-1667	5000	3346	-1654	5000	3333	-1667	5000	3334	-1666	5000	3333	-1667
Supply Source Access (SSA)																								
Bosnia Herzegovina				4	5	1																		
Slovenia							2	3	1															

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Poland																			3%	0%	-3%			
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania													2%	0%	-2%				4%	0%	-4%			
Poland																			3%	0%	-3%			
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania																			12%	2%	-10%			
Poland													7%	0%	-7%				10%	0%	-10%			
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania													17%	6%	-11%				19%	8%	-11%			
Poland													17%	5%	-12%				18%	7%	-11%			
Belarus Disruption Curtailment Rate Peak Day (%)																								
Belgium							2%	0%	-2%															
Lithuania							2%	0%	-2%				24%	14%	-10%				26%	16%	-10%			
Netherlands							1%	0%	-1%															
Poland													23%	13%	-11%				26%	16%	-10%			
Curtailment Rate Peak Day (%)																								
Poland																			3%	0%	-3%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland	82%	100%	18%	84%	100%	16%	70%	90%	20%	80%	98%	19%	10%	22%	13%	69%	88%	19%	6%	18%	12%	51%	68%	17%
Remaining Flexibility Peak day (%)																								
Czechia																			97%	100%	3%			
Germany																			37%	39%	3%			
Italy							29%	32%	3%															
Lithuania													63%	100%	37%				68%	100%	32%			
Poland	66%	85%	19%	68%	88%	19%	52%	69%	17%	63%	80%	18%	2%	13%	12%	55%	72%	17%	0%	8%	8%	36%	51%	15%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania																			12%	2%	-10%			
Poland													7%	0%	-7%				7%	0%	-7%			
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													16%	5%	-12%				17%	10%	-8%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Belgium							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%															
Sweden							2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Poland													2%	0%	-2%				3%	0%	-3%			
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Czechia							6%	4%	-2%															
Germany							7%	5%	-1%															
Greece							6%	4%	-2%															
Hungary							8%	6%	-2%															
Luxembourg							8%	6%	-2%															
Poland													7%	0%	-7%				12%	6%	-5%			
Slovenia							8%	6%	-2%															
Switzerland							8%	6%	-2%															

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Poland	2129	1781	-348	2129	1781	-348	2129	1781	-348	2129	1781	-348	2129	1781	-348	2129	1781	-348	2129	1781	-348	2129	1781	-348
Slovakia	3333	2500	-833	3333	2500	-833	3333	2500	-833	3333	2500	-833	3333	2508	-825	3333	2500	-833	3333	2501	-833	3333	2500	-833
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Italy																80%	81%	1%				89%	89%	1%
Poland													59%	72%	13%				53%	65%	12%			
Remaining Flexibility Peak day (%)																								
Italy																62%	63%	1%				62%	63%	1%
Poland													47%	58%	12%				39%	50%	11%	95%	100%	5%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference						
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	6.9	31.2	22.2	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.0	4.6	2.1	0.0	0.0	0.0
2 Weeks	0.0	44.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	6.2	26.5	3.0	5.0	21.4	2.5
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	2.9	0.3	0.0	0.0	0.0	0.0
Supply Maximization	0.7	0.0	57.3	0.0	33.1	7.0	15.6	3.5
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.6	0.0	4.6	0.0	2.6	0.0	4.6	0.0
2 Weeks	44.0	0.0	44.0	0.0	46.9	0.0	44.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	26.5	3.0	26.5	3.0	28.7	3.0	26.5	3.0
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	21.4	2.5	21.4	2.5	23.2	2.5	21.4	2.5
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-275	Transmission infrastructure	372 km, DN 1000	Project crosses: > Natura 2000 sites (Beskid Niski, Bieszczady, Dorzecze Górnego Sanu), > Nature Parks (Beskidu Niskiego, Wschodniobeskidzki), > Landscape Park (Ciśniańsko-Wetliński), > groundwater bodies, > surface water bodies.
TRA-N-245	Transmission infrastructure	725 km, DN 700/1000	Project crosses: > Natura 2000 sites (Wisłok Środkowy z Dopływami, Wisłoka z dopływami, Jaroszowiec, Pustynia Błędowska, Pogórze Przemyskie, Góry Słonne, Ostoja Przemyska, Góry Słonne, Rzeka San), > Landscape parks (Dłubniański, Orlich Gniazd, Pogórza Przemyskiego, Gór Słonnych); > Nature Parks (Czarnorzecki, Pogórza Ciężkowickiego, Jastrząbsko-Żdżarski, Doliny Wisły, Koszycko – Opatowiecki, Jastrzębsko – Żdżarski, Przemysko – Dynowski, Wschodniobeskidzki); > Ecological sites (Posada Rybotycka, Trójca), > groundwater bodies, > surface water bodies.
TRA-F-190	Transmission infrastructure	45 km	Project crosses: > NATURA 2000 sites (Laborecká vrchovina, Vihorlatské vrchy, Ondavská rovina, Senianske rybníky, Medzibodrožie, Beskyd, Košariská, Horný tok Výravy, Svetlica, Lázky, Latorica, Hubková, Drieňová,Humenský Sokol, Humenská,partially Hubková, Krivoštianka, Brekovský hradný vrch, Stretavka, Raškovský luh) > National park (Poloniny)

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
PL: Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline. **SK:** Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline. Based on the document "Assessment Report of Environmental Impacts", which was worked out in 03/2018 pursuant to the Article 6.3. of the Council Directive 92/43/EEC about significant negative impact on NATURA 2000 sites is not foreseen.	**PL:** To ensure appropriate protection of environmentally sensitive areas during the construction GAZ-SYSTEM S.A. implements following mitigation measures: > narrowed width of construction site in particularly valuable areas; > transplantation of habitats and re-transplantation on the surface after the construction; > preparing a site for construction, e.g. cutting down shrubs and trees, removing swards, beyond breeding season to protect birds; > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur; > construction beyond 15/03 – 15/10 in breeding and wintering areas of amphibians; > construction beyond breeding season of birds in a selected area; > technical facilities' and storages' location i.a. out of rivers' valleys, flood areas, natural habitats, habitats of protected species, breeding and wintering areas of amphibians etc.; > crossing selected habitats (i.a. rivers' valleys, forests) with a trenchless technology (e.g. HDD); > construction in a wet trenches, in trenches with a sheet piles or during winter to avoid dewatering; > works that cause high level of noise emission (apart from trenchless technology HDD) nearby areas requiring protection against noise will be carried out during 6am – 22 pm; > supervision of hydrologist during dewatering, crossing rivers, construction nearby water intakes, reservoirs, marshy areas; > environmental supervision during pipeline's construction. **SK:** In order to eliminate negative impacts on environment especially on NATURA 2000 sites, Eustream will follow mitigation measures such as: > access roads and plant depots will be situated about as good as it can be outside protected sensitive areas in order to eliminate noise, emissions or direct land occupation; > transplantation of habitats and re-transplantation on the surface after the construction; > elimination of waste dumps > protecting the construction site with temporary sheet piles in places, where increased amphibians' migration may occur; > construction out breeding and wintering time period; > narrowed width of construction site and minimalization of handling belt in particularly valuable areas; > no utilization of fertilizers during recultivation close to biotops of national and European importance; > environmental supervision during pipeline's construction.	NA	NA

Environmental Impact explained [Promoter]

There are no pending issues for compliance with EU and national legislation; the preparation of related documents has been carried out in accordance with the applicable Environmental Laws of Poland and Slovakia, i.e. adopted in accordance with EU legislation. Construction of the pipelines will have limited environmental impact on natural habitats and wild flora and fauna. Minimizing this impact is of utmost priority for both promoters. Mitigation measures were outlined in the EIA Final Statement. Most of such measures were then assigned to contractors that are implementing the project. The remaining mitigation measures were assigned to the Environmental Supervisor. Compliance with environmental regulations is ensured by presence of technical managers of contractors, technical supervisors of the project promoter and of an independent external environmental supervisor.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

GAZ-SYSTEM is currently developing Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland and a number of other PCI projects, namely the Baltic Pipe, expansion of the LNG Terminal in Świnoujście, Poland-Lithuania Interconnection (GIPL), Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland. These projects are parts of infrastructure priority corridors defined by the EC, i.e. North-South Gas Interconnections in Central Eastern and South Eastern Europe ("NSI East Gas"), Baltic Energy Market Interconnection Plan in Gas ('BEMIP Gas').
Due to the strategic location of the Polish gas grid between the Baltic and CEE regions, the implementation of all of them will create the synergy effect by interlinking both priority gas corridors. Implementation of a direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and the implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay the foundations for the Polish market to become a regional gas distribution centre in the medium term providing the access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on the hub rules, for the Baltic and CEE countries, as it is on the mature Western gas markets.
The creation of a regional gas hub with a high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to the implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

Eustream: https://www.eustream.sk/en_transmission-system/en_pl-sk-interconnector
GAZ-SYSTEM: http://en.gaz-system.pl/our-investments/integration-with-european-gas-tramsmission-system/poland-slovakia/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_02

Reasons for grouping [ENTSOG]

The project group represents an interconnection between Poland and Czech Republic and includes the two sides of the investments (TRA-N-273 and TRA-N-136) as well as an enabler project (TRA-N-247) in Poland. The interconnection will increase the transmission capacity between the two countries.

Objective of the project(s) in the group [Promoter]

The aim of the project is to increase the cross-border capacity between Poland and the Czech Republic by establishing a large transportation corridor and facilitate safe and reliable transmission of gas between the two countries.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0247	North - South Gas Corridor in Western Poland	GAZ-SYSTEM S.A.	PL	FID	6.2.11	2020	2020	NA
TRA-N-0136	Czech-Polish Gas Interconnector (CPI)	NET4GAS, s.r.o.	CZ	Advanced	6.2.10 6.2.12	2022	2022	Delayed
TRA-N-0273	Poland - Czech Republic Gas Interconnection (PL section)	GAZ-SYSTEM S.A.	PL	Advanced	6.2.10	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0247	1000	192	64
TRA-N-0136	1000	207	24
TRA-N-0273	1000	54	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0247	GAZ-SYSTEM S.A.	Aggregated Distribution (PL)	2020	-	-
TRA-N-0136	NET4GAS, s.r.o.	Hať	2022	153.2	219.1
TRA-N-0273	GAZ-SYSTEM S.A.	Hať	2022	219.1	153.2

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-273	TRA-N-136	TRA-F-247
CAPEX [mln. EUR]	769.65	81.86*	257.14	430.65*
Range CAPEX		5%	20%	15%
OPEX [mln. EUR/y]	9.75	1.47*	0.52	7.75*

Description of costs and range [Promoter]

The costs were calculated based on market prices and costs of similar investment projects. The costs are best estimate in this project phase.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **improves the diversification of capacities** (LICD indicator) in entry in Poland and Czech Republic.

It allows a **decrease of the dependence to Russia supply** for Croatia, Czech Republic, Hungary and Slovakia allowing those countries to mitigating their dependence sharing it with Poland.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Poland in all demand scenarios.

The project has positive benefits, especially for Poland and Lithuania, also in **mitigating the impact in case of supply disruptions** from the Belarus or Ukrainian routes or in case of disruption of imports to Baltic states and Finland. The project, in fact, allows those countries to further cooperate with the rest of Europe. Depending on the demand scenarios the risk is partially or fully mitigated.

In Poland and Lithuania, the projects **decrease or fully mitigate the risk of demand curtailment also in case of disruption of the main largest infrastructures** (respectively Kotlovka and Point of Interconnection (PWP) (PL)).

> **Market Integration:**

The project group will estabilish bidirectionality between CZ and PL.

In the reference situation, the projects group allows for a limited decrease of the marginal price in Poland thanks to more capacity available on a cheaper route (CZ-PL). The project group **reduces the cost of gas supply** by 5 Mln EUR/y in low infrastructure level and Sustainable Transition scenario while by around 7 Mln EUR/y (on average) in the advanced infrastructure level (in all demand scenarios) thanks to the implementation of enhancing projects included in the advanced infrastructure level. Further increasing interconnection capacity, the project group allows respectively to benefit from a possible decrease of Russian gas price or from substituting LNG when more expensive. Those benefits are triggered by transmission tariffs savings by increasing the capacity of a relatively cheaper and already existing route. This can be seen in the sensitivity analysis where benefits increase in case of even lower tariffs while appear to be zero in case of more expensive tariffs compared to the other possible routes.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

EU Member States share the same climate and energy objectives in the long run. However, they do have different starting points in their paths towards the energy transition. High-emission sources of energy represent a large share of the national energy mix in Central-Eastern Europe. In some countries, including Poland and the Czech Republic, these sources exceed 50% of the energy mix. Similar conditions hold true for instance in the power generation and heating sectors.

This shows that the implementation of long-term climate and energy objectives can be led through the promotion of natural gas and its infrastructure. Such policy will contribute significantly towards substantial emission reductions in the long-term perspective. In this context the planned investments such as the PL-CZ interconnection are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries.

The Northern Moravia and Silesian region on both sides of Czech-Polish border are heavily polluted by heavy industry and coal power plants. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low (natural gas which can be delivered by Czech-Polish Interconnection project to the polluted regions) or zero emissive fuels. Furthermore, the project will help accommodate the increasing uptake of renewable energy sources as a back-up energy source and together these two sources can overcome air quality problems resulting from the use of low-quality fuels (e.g. solid fuels, heating oil) in the vicinity of the project area.

This is confirmed, in particular, under the Sustainable Transition and Distributed Generation scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia																27%	24%	-3%						
Czechia																27%	23%	-3%						
Hungary																27%	24%	-3%						
Slovakia																27%	24%	-3%						
LNG and Interconnection Capacity Diversification (LICD)																								
Czechia	5000	3646	-1354	5000	3625	-1375	5000	3696	-1304	5000	3706	-1294	5000	3371	-1629	5004	3803	-1201	5003	3800	-1203	5012	3824	-1188
Poland	2500	2115	-385	2500	2115	-385	2500	2115	-385	2500	2115	-385	2500	2115	-385	2500	2115	-385	2500	2115	-385	2500	2115	-385

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Lithuania																			2%	0%	-2%			
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Lithuania													6%	0%	-6%				8%	0%	-8%			
Poland													5%	0%	-5%				7%	0%	-7%			
Belarus Disruption Curtailment Rate Peak Day (%)																								
Lithuania													14%	11%	-3%				16%	4%	-12%			
Poland													13%	0%	-13%				16%	4%	-12%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland							90%	100%	10%	98%	100%	2%	22%	38%	16%	88%	100%	12%	18%	33%	15%	68%	90%	21%
Remaining Flexibility Peak day (%)																								
Germany							35%	38%	3%															
Poland	85%	100%	15%	88%	100%	12%	69%	91%	22%	80%	100%	20%	13%	28%	15%	72%	94%	22%	8%	21%	14%	51%	70%	19%
Single Largest Infrastructure Disruption (SLID)-Lithuania																								
Lithuania																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-Poland																								
Poland													5%	0%	-5%				10%	0%	-10%			
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Slovakia							6%	4%	-2%															

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Czechia	3480	2735	-745	3463	2714	-749	3521	2787	-734	3529	2797	-732	3333	2523	-810	3616	2906	-710	3614	2903	-711	3636	2928	-708
Poland	2066	1781	-285	2066	1781	-285	2066	1781	-285	2066	1781	-285	2066	1781	-285	2066	1781	-285	2066	1781	-285	2066	1781	-285
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Poland													56%	72%	16%				50%	65%	15%			
Remaining Flexibility Peak day (%)																								
Poland													44%	58%	15%				36%	50%	14%	90%	100%	10%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference						
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	5.2	0.0	2.6	16.3	2.2
Supply Maximization	7.1	7.7	6.3	9.2	16.8	2.2
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.0	2.6	0.3	0.0	0.0	0.0
2 Weeks	0.0	26.8	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	14.8	32.6	5.6	11.2	27.4	4.3
Fuel Switch savings	0.6	1.5	3.4	0.6	1.0	2.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	12.1	0.0	6.0	0.0	5.2	0.0
Supply Maximization	1.9	0.0	33.0	0.0	8.8	5.6	3.9	3.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.6	0.0	2.6	0.0	0.1	0.0	2.6	0.0
2 Weeks	26.8	0.0	26.8	0.0	30.6	0.0	26.8	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	32.6	5.6	32.6	5.6	38.6	5.8	32.6	5.6
Fuel Switch savings	3.4	0.6	3.4	0.6	3.7	0.5	3.4	0.6

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	52.4	37.8	19.3	2.2	16.3	2.2
Supply Maximization	0.0	0.0	58.5	0.0	19.9	2.2	8.4	1.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	27.4	4.3	27.4	4.3	32.4	4.5	27.4	4.3
Fuel Switch savings	2.2	0.6	2.2	0.6	2.4	0.4	2.2	0.6

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-136	Transmission infrastructure	207 km, DN 1000	
TRA-N-273	Transmission infrastructure	54 km, DN 1000	Project crosses: Nature Park (Wronin-Maciowakrze); grounwater bodies; surface water bodies.
TRA-F-247	Transmission infrastructure	192 km, DN 1000	Project crosses: > Natura 2000 sites (Góra Św. Anny; Grądy w Dolinie Odry; Grądy Odrzańskie; Lasy Grędzińskie), > Landscape park (Góra Św. Anny, Stobrawski), > groundwater bodies, > surface water bodies.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
CZ Considering the assessment of the Ministry of the Environment, the environment along the pipeline will not be affected by the operation of the gas pipeline. The Project should not have detrimental effect on the environment, existing infrastructure, and residential construction.	CZ: Potential impact will be reduced by realization of the mitigation measures required by the Authority which are incorporated in planning documentation.		
PL: Due to type of infrastructure all impacts will occur at the construction stage as a result of: cutting down shrubs and trees, dewatering of trenches, emission of noise, air pollutions, sewages and wastes. Range of impacts will be limited to the construction site. At the stage of use / exploitation impact on the environment could occur only while breakdown of pipeline.	PL: To ensure appropriate protection of environmentally sensitive areas during the construction GAZ-SYSTEM S.A. will implement following mitigation measures: > environmental supervision during pipeline's construction; > technical facilities' and storages' location i.a. out of natural habitats, protected areas, wetlands, surface waters; > narrowed width of construction site in particularly valuable areas; > cutting down shrubs and trees beyond breeding season; > protecting the construction site with a temporary sheet piles in places, where increased amphibians' migration may occur; > habitats' reclamation by sowing of natural seeds after the construction; preparing a site for construction beyond breeding season.		

Environmental Impact explained [Promoter]

The Czech project was subjected to environmental impact assessment procedure. The EIA Documentation and a description of the project serve as a background for obtaining the planning/ joint planning and building permit. On December 13, 2012, based on the Expert Report the Ministry of Environment issued the approving final Decision (Ref. Nr. 3855/ENV/12) to the project. Due to the amendment to the Act no. 100/2001 Coll., on environmental impact assessment, which came into force from 1. 4. 2015, it was necessary to request from the competent authority, who led the assessment process pursuant to Act no. 100/2001 Coll. (the Ministry of the Environment) binding statement to confirm compliance. This was issued on 23.9.2015.

On the Polish side, there are no pending issues for compliance with EU and national legislation; the preparation of related documents has been carried out in accordance with the applicable Environmental Laws of Poland, i.e. adopted in accordance with EU legislation. Detailed conditions concerning avoidance, mitigation and compensation of impacts on biodiversity and protected areas during pipelines' construction stage are included into decisions on environmental condition approving the project.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

CZ: The CPI will reinforce the security of supply to Central and Northern Moravia and Silesia. Capacity of transmission network there is not enough for winter peak demand and currently depends on underground gas storage facilities. Moreover, according to the announcement of the storage system operator, a lower market interest on storage capacities in the Czech Republic is expected. Such situation may mean that part of the storage capacities will remain unused from 2020 at the latest. The CPI is therefore an element for ensuring the security of supply of the Czech Republic.

PL: GAZ-SYSTEM is currently developing Poland-Czech Republic Interconnection with North - South Gas Corridor in Western Poland and a number of other PCI projects, namely Baltic Pipe, expansion of LNG Terminal in Świnoujście, Poland – Lithuania Interconnection (GIPL), Poland-Slovakia Interconnection with North - South Gas Corridor in Eastern Poland. These projects are parts of infrastructure priority corridors defined by the EC, i.e. NSI East Gas, BEMIP Gas.
Due to strategic location of the Polish gas grid between the Baltic and CEE regions, the implementation of all of them will create synergy effect by interlinking both priority gas corridors. Implementation of direct gas connection with deposits on Norwegian Continental Shelf and significant LNG supply options (Świnoujście in PL, FSRU in PL, Klaipeda in LT) and implementation of currently developed cross-border pipeline projects connecting the Polish gas grid with Ukraine, Czechia, Slovakia and Lithuania (PCI projects), will lay foundations for the Polish market to become regional gas distribution centre in the medium term providing access to reliable sources of gas (NCS, LNG, Western Europe), traded according to price formulas based on hub rules, for the Baltic and CEE countries, as it is on mature Western gas markets.
Creation of regional gas hub with high level of liquidity and security will allow to materialize the EU concept of creating a single European gas market, ensuring maximum security of supply and fostering price convergence between domestic markets, as well as will contribute to implementation of the ACER-backed vision of the European gas market, composed of strong and liquid regional hubs.

F. Useful Links

CPI project at NET4GAS' website: https://www.net4gas.cz/en/projects/czech-polish-gas-interconnector/
CPI project at GAZ-SYSTEM website: http://en.gaz-system.pl/our-investments/integration-with-european-gas-tramsmission-system/the-polish-czech-interconnector/
Czech TYNDP 2019 – 2028: https://www.net4gas.cz/files/rozvojove-plany/ntyndp19-28_cz_181031schvalen.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_03

Reasons for grouping [ENTSOG]

The project group consists of projects aiming at expanding in both direction the capacity of the Slovakia-Hungary Interconnector at the IP Balassagyarmat/Velke Zlievce (TRA-N-524). Project TRA-N-123, TRA-N-1235) is considered an enabler of the interconnection.

Objective of the project(s) in the group [Promoter]

Project is driven by the confirmed market interest in the route from Hungary to the closest developed gas hubs in the CEE region via Slovakia. The route aims at maximizing the utilization of existing infrastructure and a route corridor in Hungary and Slovakia with the flexibility to ship gas to North-Western Europe, Southern Europe and Ukraine. Besides confirmed market interest in HU>SK direction, the project group aims at enhancing the security of supply within the CEE region, providing a significant alternative to existing routes and increases the existing SK>HU capacities too.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0524	Enhancement of Transmission Capacity of Slovak-Hungarian interconnector	Magyar Gaz Tranzit	HU	Less-Advanced	6.2.13	2022	2022	NA
TRA-N-0636	Development of Transmission Capacity at Slovak-Hungarian interconnector	Magyar Gaz Tranzit	HU	Less-Advanced	6.2.13	2022	2022	NA
TRA-N-0123	Városföld CS	FGSZ Ltd.	HU	Advanced	6.24.4	2022	2022	NA
TRA-N-1235	Firm transmission capacity increase at the IP Veľké Zlievce	eustream, a.s.	SK	Less-Advanced	NA	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0524	-	-	7
TRA-N-0636	-	-	-
TRA-N-0123	-	-	6
TRA-N-1235	-	-	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0524	MGT Hungarian Gas Transit Ltd.	Vecsés MGT / FGSZ	2022	102	26
TRA-N-0524	MGT Hungarian Gas Transit Ltd.	Balassagyarmat (HU) / Velké Zlievce (SK)	2022	26	102
TRA-N-0636	MGT Hungarian Gas Transit Ltd.	Balassagyarmat (HU) / Velké Zlievce (SK)	2022	26	102
TRA-N-1235	eustream, a.s.	Balassagyarmat (HU) / Velké Zlievce (SK)	2022	153	-
TRA-N-0123	FGSZ Ltd.	Vecsés MGT / FGSZ	2022	26	102

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-636	TRA-N-524	TRA-N-123	TRA-N-1235
CAPEX [mln. EUR]	104.8	0.6**	58.0**	20.0**	26.2**
Range CAPEX		30%	30%	25%	25%
OPEX [mln. EUR/y]	11.76	6.6**	0.1**	3.1**	1.95**

Description of costs and range [Promoter]

Project is scalable in the capacity, based on the confirmed market demand and the final technical solution implemented. The range reflects this flexibility.
The majority of OPEX are deriving from the operation of the compressors, based on the confirmed market interest, which is linked to TRA-N-524 project.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The projects group **improves the diversification of entry capacities** (LICD indicator) in Slovakia and in Hungary.

> **Security of Supply:**

The project group allows also for **full mitigation of risk of demand curtailment** in many other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod (UA) - Velké Kapušany (SK)) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe. The project increases the alternative capacities in case of disruption of the largest supply route to Hungary from Ukraine.

> **Market Integration:**

The **bidirectionality is improved** with the creation of capacity between Slovakia and Hungary.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

In order to meet the climatic and decarbonisation targets in the long term and still significant portion in the energy mix of the countries in the CEE region is allocated to the high emission sources and considering the differences of the economic status of respective countries comparing to the most developed EU countries the promotion and use of natural gas is important in the region and can contribute to the substantial emissions reduction in the long-term perspective.
In this context the planned investments such as the enhancement of the HU-SK interconnection are foreseen to provide incremental volumes of natural gas as a low emission fuel to the power, heating sectors and other industries.
This is confirmed in particular under the Sustainable Transition and Distributed Generation scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Slovakia	3334	2500	-833	3334	2500	-833	3333	2500	-833	3333	2500	-833	3346	2508	-838	3333	2500	-833	3334	2501	-834	3333	2500	-833
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	90%	1%
Remaining Flexibility Peak day (%)																								
Italy																			35%	36%	1%			
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%										2%	0%	-2%			
France							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%										2%	0%	-2%			
Slovenia							2%	0%	-2%										2%	0%	-2%			
Spain																			2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Market Integration																								
Bi-directionality Balance																								
Balassagyarmat (HU) / Velké Zlievce (SK)				0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Slovakia	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2508	2006	-502	2500	2000	-500	2501	2000	-500	2500	2000	-500
Market Integration																								
Bi-directionality Balance																								
Balassagyarmat (HU) / Velké Zlievce (SK)				0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Project benefits (Meur)	Reference					
SCENARIO	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
EU Bill Benefits (MEUR/y)						
Reference	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.0	1.9	1.3	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	0.3	0.5	0.7	1.1	1.3	1.3
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.3	1.3	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	4.1	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.9	0.0	1.9	0.0	0.0	0.0	1.9	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.7	0.3	0.7	0.3	0.7	0.3	0.7	0.3
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	2.6	1.3	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	4.9	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.3	1.1	1.3	1.1	1.3	1.1	1.3	1.1
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

On the Slovak side no significant environmental impact is expected as the project will be built in the existing pipeline corridor.
On the Hungarian side no significant environmental impact is expected as all three projects will be implemented in the existing infrastructure.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project in comparison with an alternative corridor can provide flexible capacity for lower investment costs, by utilizing existing systems. Project represents an unparalleled market connection with further flexibility via the existing Slovak pipeline system to ship gas to Ukraine, North-Western, Southern and in the near future also to the Northern European countries.
The project uses the existing infrastructure and capacity increase will be secured by increasing the compression power via investments to the compression units.

Project gives the highest value for invested money among competing projects for the same demand. There is market demand for the transport capacities, not related to an exact route, for new gas sources from Black Sea area and potentially from south of Europe (former South Stream, White Stream, potentially Eastring, Turkish Stream) by means of which gas could flow to the closest liquid market hub (Baumgarten). This market demand could be saturated by implementation of different projects on the territory of Hungary, Slovakia and Austria.

With regards to TRA-N-636, current HU>SK capacities are offered on an interruptible base, due to its long lead time availability. By the implementation of the project HU>SK capacities would be increase to 52 GWh/d on a firm base which is required for the better integration for the SK and HU market. This would enable to fulfil the Security of Supply Regulation requirements to have the system permanent- bi directional. Therefore, this project is separated from the (Project TRA-N-524, TRA-N-123, TRA-N-1235) projects and its commissioning will not be dependent on the market interested above listed other projects. This project received positive FID after the submission of the 2018 TYNDP on 26th July 2018.

F. Useful Links

Eustream: https://www.eustream.sk/en_media/en_news/huskat-route-received-positive-response-from-the-market-bid-submission-window-ii--results
Eustream market demand assessment: https://www.eustream.sk/en_transmission-system/en_development-of-the-network/en_network-development-plandevelopment-plan
Gaztranzit project page: http://www.gaztranzit.hu/en/balmenu/huskat/project-description/Lapok/default.aspx
Gaztranzit TYNDP and PCI page : http://www.gaztranzit.hu/en/balmenu/about-us/10year/Lapok/default.aspx

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_04

Reasons for grouping [ENTSOG]

The project group represents a bidirectional interconnector between Austria and Czech Republic and includes the two sides of the investments.

Objective of the project(s) in the group [Promoter]

The project BACI aims at establishing the first direct connection between the Czech Republic and Austria, hence it aims at creating a well-functioning internal market in the CEE region due to access to existing and new import infrastructure. It will facilitate better market integration and competition.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year	Last Comm. Year	Compared to TYNP 2017
TRA-N-0133	Bidirectional Austrian Czech Interconnection (BACI)	NET4GAS, s.r.o.	CZ	Advanced	6.04	2021	2021	Rescheduled
TRA-N-0021	Bidirectional Austrian-Czech Interconnector (BACI)	GAS CONNECT AUSTRIA	AT	Advanced	6.04	2021	2021	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0021	800	49	-
TRA-N-0133	800	12	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0133	NET4GAS, s.r.o.	Poštorná / Reintal	2021	201.42	201.42
TRA-N-0021	Gas Connect Austria GmbH	Poštorná / Reintal	2021	201.42	201.42

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[1]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-21	TRA-N-133
CAPEX [mln. EUR]	198.5	180.0	18.5
Range CAPEX		25%	20%
OPEX [mln. EUR/y]	8.12	8.0	0.12

Description of costs and range [Promoter]

The costs were calculated based on market prices from 2017 and costs of similar investment projects. The costs are best estimate in this project phase.

[1] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Austria and Czech Republic.
It also allows to **decrease dependence to Russian gas** for Croatia, Czech Republic, Hungary, Poland and Slovakia by at least 2%. The interconnection allows in fact those countries to partially share the dependence with Austria and Slovenia that see their dependence to Russian gas potentially increasing.

> **Security of Supply:**

The projects group **slightly increases the remaining flexibility** of Demark and Poland in Distributed Generation and of Germany but only in Sustainable Transition.
Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in many European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod (UA) - Velké Kapušany (SK)) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The realisation of the new interconnection allows some countries to benefit from a new alternative and cheaper route. This has a **positive effect in terms of a moderate reduction of marginal prices** in the impacted countries. The analysis of the Advanced infrastructure level shows such benefits even more widespread among the scenarios. The project brings a **decrease in the cost of the gas supply** by around 30 Mln EUR/y (on average) in the reference situation. Such reduction is mainly driven by tariffs saving. The new interconnection allows in fact for the utilisation of this new alternative route.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

Considerable share of electricity in the Czech Republic is produced from coal and the country is polluted by coal power plants and heavy industry. Most of the facilities burning fuels polluting atmosphere (hard coal, lignite) are planned to be substituted by low (natural gas) or zero emissive fuels. Because of bigger use of gas power plants there will be a decrease of CO2 emissions. The project group shows CO2 and fuel savings in all demand scenarios, but the highest savings are identified in Distributed Generation and amounts to 13 Mil EUR/y.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030												2040					
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia										27%	25%	-2%				27%	23%	-4%	48%	45%	-3%	31%	27%	-4%
Czechia																27%	23%	-4%				31%	27%	-4%
Hungary				29%	26%	-3%				27%	24%	-3%				27%	23%	-4%	48%	45%	-3%	31%	27%	-4%
Poland				28%	25%	-3%													48%	45%	-3%	30%	27%	-3%
Slovakia																27%	23%	-4%	48%	45%	-3%	31%	27%	-4%
LNG and Interconnection Capacity Diversification (LICD)																								
Austria	3333	2500	-833	3333	2500	-833	3333	2500	-833	3333	2500	-833	3345	2507	-838	3333	2500	-833	3333	2500	-833	3333	2500	-833
Czechia	5000	3480	-1520	5000	3463	-1537	5000	3521	-1479	5000	3529	-1471	5000	3333	-1667	5004	3616	-1388	5003	3614	-1389	5012	3636	-1376
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Remaining Flexibility Peak day (%)																								
Germany							35%	39%	4%										39%	43%	4%			
Poland										80%	81%	1%												
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															

ADVANCED Infrastructure Level

	2025						2030												2040					
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Czechia													16%	13%	-3%				26%	21%	-5%			
Denmark																			26%	21%	-5%			
Estonia													16%	13%	-3%				26%	21%	-5%			
Finland																			27%	21%	-6%			
Latvia													16%	13%	-3%				26%	22%	-4%			
Lithuania													16%	13%	-3%				27%	22%	-5%			
Poland													16%	13%	-3%				27%	22%	-5%			
Slovakia													16%	13%	-3%				27%	22%	-5%			
Sweden																			21%	19%	-2%			
LNG and Interconnection Capacity Diversification (LICD)																								
Austria	2501	2001	-500	2500	2000	-500	2501	2000	-500	2500	2000	-500	2531	2020	-511	2500	2000	-500	2500	2000	-500	2500	2000	-500
Czechia	3646	2735	-911	3625	2714	-911	3696	2787	-909	3706	2797	-908	3371	2523	-848	3803	2906	-897	3800	2903	-897	3824	2928	-896
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Italy																80%	81%	1%				89%	89%	1%
Remaining Flexibility Peak day (%)																								
Italy																62%	63%	1%				62%	63%	1%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	26.0	36.5	27.5	57.2	65.8	60.9
Supply Maximization	29.4	38.3	27.5	66.3	66.3	66.2
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.0	2.3	1.3	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	13.5	8.4	6.4	9.6	6.1	5.0
Fuel Switch savings	0.8	2.4	4.6	0.8	1.7	3.1

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	17.3	4.2	54.6	31.8	36.5	26.0	36.5	26.0
Supply Maximization	17.3	0.0	54.9	0.0	38.3	27.5	19.2	13.7
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.3	0.0	2.3	0.0	0.7	0.0	2.3	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	13.5	6.4	13.5	6.4	13.5	6.4	13.5	6.4
Fuel Switch savings	4.6	0.8	4.6	0.8	4.6	0.8	4.6	0.8

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.5	0.4	4.9	4.7	65.8	57.2	65.8	57.2
Supply Maximization	1.6	0.2	6.0	0.0	66.3	66.2	33.1	33.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	9.6	5.0	9.6	5.0	9.6	5.0	9.6	5.0
Fuel Switch savings	3.1	0.8	3.1	0.8	3.1	0.5	3.1	0.8

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-133	Transmission infrastructure	12 km, DN 800	

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Considering the assessment of Regional Authority of South Moravia, the environment along the pipeline will not be affected by the operation of the BACI gas pipeline. The Project should not have detrimental effect on the environment, existing infrastructure, and residential construction.	Potential impact will be reduced by realization of the mitigation measures required by the Authority which are incorporated in draft planning permit design.		

Environmental Impact explained [Promoter]

Generally, the gas pipelines are considered as environmentally and technologically safe, when complying with the specific conditions and quality of the implementation, given in detailed engineering and design documentation. Concerning the Czech section, a Fact-finding procedure according to Act No. 100/2001 Coll. was carried out by the Environmental department of the Regional Authority of South Moravian Region. The screening procedure was describing and evaluating anticipated environmental impacts of the planned high-pressure gas pipeline in the South Moravia. It came out that the BACI project is not a subject to the EIA proceedings according to the EIA Act 100/2001 Coll. implicitly Council Directive 85/337/EC. In the period of the procedure preparation, no facts were identified that would, from the environmental point of view, obstruct the preparation and execution, operation concerning the objective being assessed.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

According to study published in 2017 by E-Control the calculated welfare gains for CZ-AT market integration are 62 mil €/year. This means the payback period for BACI would be approximately 3 years after its commissioning. The Preparation for the Investment Request for BACI from December 2015 by Deloitte identified that CEE will benefit with 642.3 mil € in total from market integration and price convergence during 20 years of BACI operation.
There is clearly market demand for direct cross-border capacity between CZ and AT. This was confirmed by the large market response to a new alternative product called Trading Regional Upgrade (TRU). On October 1, 2018 N4G and GCA started a one-year pilot phase offering a small amount of TRU capacity (112 000 kWh/h/y). Even prior to the launch, N4G received positive feedback from many shippers. In the annual auction N4G received bids exceeding the capacity offered by 2.5 times (290,000 kWh/h/y). The demand in the annual auction was surprisingly high as shippers had signalled that they would only be interested in booking TRU capacity on a monthly and daily basis. Unfortunately, N4G had almost no TRU capacity left to offer on monthly and daily auctions. Otherwise, significantly more CZ-AT cross-border capacity would have been sold.
The final comprehensive evaluation of the TRU service and its business case will be done after the end of the pilot phase of the TRU on October 1, 2019.

F. Useful Links

BACI project at N4G's website: https://www.net4gas.cz/en/projects/austrian-czech-interconnection/
BACI project at GCA's website: https://www.gasconnect.at/en/network-access/transmission-network/capacity-projects/baci/
Study Assessment of Market Integration Options and Simplified Cost-benefit Analysis by E-Control: https://www.e-control.at/documents/20903/443907/ECA+Studie+Marktintegration+-+Analyse+von+Marktintegrationsvorhaben+inkl+vereinfachter+CBA_kurz_en.pdf/3f1060bb-319e-368d-4656-0e2be000f32e
Czech TYNDP 2019 – 2028: https://www.net4gas.cz/files/rozvojove-plany/ntyndp19-28_cz_181031schvalen.pdf
Austrian TYNDP: https://www.gasconnect.at/en/network-information/network-development/network-development-plan/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_05a

Reasons for grouping [ENTSOG]

Project group represents the first phase of the Krk LNG terminal development in Croatia. It includes the LNG terminal (LNG-N-82), the evacuation pipeline connecting the LNG facility to the transmission grid (TRA-N-90) and the enabler project TRA-F-334. This phase is assessed separately from the 2nd phase so as to evaluate the incremental impact of each phase.

Objective of the project(s) in the group [Promoter]

Project Group EAST_05b represents a group of gas infrastructure projects aiming at enabling unloading, storage and regasification of LNG and transmission of regasified natural gas from the LNG terminal to the countries of Central Eastern and Southeastern Europe. The gas pipeline TRA-N-90 will connect the LNG terminal on the island of Krk, that is FSRU vessel, and the existing Croatian gas transmission system. Implementation of this project together with the project TRA-F-334 (compressor station 1 at the Croatian gas transmission system) aims at enabling the supply of the Croatian and Hungarian gas markets and other gas markets in the NSI East group with gas from the LNG terminal on the island of Krk.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0334	Compressor station 1 at the Croatian gas transmission system	Plinacro Ltd	HR	FID	6.5.5	2019	2019	Rescheduled
TRA-N-0090	LNG evacuation pipeline Omišalj - Zlobin (Croatia)	Plinacro Ltd	HR	Advanced	6.5.1	2019	2019	NA
LNG-N-0082	LNG terminal Krk	LNG Hrvatska	HR	Advanced	6.5.1	2019	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0334	-	-	4
TRA-N-0090	1000	18	-

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0082	7	160000	160000

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2019	-	82
TRA-F-0334	Plinacro Ltd	Dravaszerdahely	2019	-	13.6
TRA-N-0090	Plinacro Ltd	Dravaszerdahely	2019	-	40.76
TRA-N-0090	Plinacro Ltd	Croatia LNG	2019	81.51	-
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2020	-	110
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2023	-	220

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-82	TRA-N-90	TRA-F-334
CAPEX [mln. EUR]	286.3	234	27.3*	25
Range CAPEX		15%	0%	0%
OPEX [mln. EUR/y]	17.99	15	0.49*	2.5

Description of costs and range [Promoter]

> LNG-N-82 LNG terminal Krk

Expected costs of the LNG terminal will amount at first development phase 234 mil. EUR.
Description of CAPEX: 100% of the CAPEX of the LNG terminal Krk refers to FSRU vessel, designing and engineering, civil, assembly and installation works, material and equipment, and the construction of a connecting gas pipeline from the LNG terminal to gas node Omišalj.
Description of OPEX: 100% of the cost refers to operational and maintenance costs, labour costs, other fees and insurance.

> TRA-N-90 LNG evacuation pipeline Omišalj-Zlobin (Croatia)

Description of CAPEX: 100% of the CAPEX for the Gas pipeline Omišalj-Zlobin that includes also gas nodes Omišalj and Zlobin refers to designing and engineering, civil, assembly and installation works, material and equipment.
Description of OPEX: 100% of the cost refers to operation and maintenance cost. There are no additional costs of own consumption (fuel gas) and labour cost.
Detailed CAPEX values for Omišalj-Zlobin pipeline has been taken from the PLINACRO-s TYNDP.
Detailed OPEX for Omišalj-Zlobin pipeline has been calculated according to the actual Plinacro-s per km cost for gas transmission pipelines.

> TRA-F-334 Compressor station 1 at the Croatian gas transmission system

Description of CAPEX: 100% of the CAPEX for the Compressor station 1 refers to designing and engineering, civil, assembly and installation works, material and equipment (compressor units and drives), supervision and control system.
Description of OPEX: 70% of the costs refer to the cost of CS-1 operation (consumption of fuel gas and electric power), 22% of the costs refer to the maintenance cost, and 8% are labour costs, other fees and insurance (CS-1 will be a new facility on the Croatian gas transmission system).
Detailed CAPEX values for the Compressor station 1 have been taken from PLINACRO´s TYNDP.
Detailed OPEX for the Compressor station 1 has been calculated by considering maintenance costs and expected CS working hours and gas costs.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Croatia and Hungary. Additionally, it **reduces dependency from Russian gas** mainly for Croatia, Hungary, Slovakia and Poland in all demand scenarios while Cech Republic, Austria and Slovenia in some of them due to the different gas consumption evolution in the respective scenarios and countries.
Depending on the considered demand scenarios the projects group also **increases the number of supply sources** Croatia, Hungary, Serbia, Bosnia Herzegovina and Slovenia have access to.

> **Security of Supply:**

The project group **fully mitigates the risk of demand curtailment** and **increases the remaining flexibility** for Croatia for all disruption cases. Bosnia Herzegovina, Bulgaria, Hungary, Serbia and Slovenia see the risk of demand curtailment decreasing in case of Ukrainian Disruption in Peak day.

> **Market Integration:**

The **bidirectionality is improved** by 71%.
The projects group **decreases significantly the gas price** in Croatia and in all scenarios and for all supply configuration. The new supply route allows for a more direct access to gas for Croatia that is reflected in lower transportation costs and therefore a lower marginal price. The **reduction of the cost of gas supply** in the reference situation can be mainly explained by the lower transportation costs thanks to the access to the terminal and can be estimated around 70-75 Mln EUR/y (on average). The sensitivity on tariffs shows in fact that those benefits are sensitive to the level of tariffs assumed for the project group. Compared to the reference supply configuration, in case of LNG cheaper than other sources more LNG is used allowing for a further reduction in the cost of gas supply between 50 and 100 Mln EUR/y (on average) depending on the spread between LNG and the other more expensive sources.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project group EAST_05a will enhance gas diversification and reduction of gas prices in South-Eastern Europe which will enable new development of gas fired power plants and have an impact on the reduction of CO2 emissions.
The project group will enable fuel switch savings in the maximal amount of 2.5 Mln EUR/y in Global Climate scenario and low infrastructure level scenario and minimal savings in the amount of 1.2 MEUR in Sustainable Transition scenario and advanced infrastructure level scenario.
It will also enable CO2 savings in the maximal amount of 16.5 MEUR in Global Climate scenario and low infrastructure level and minimal savings in the amount of EUR 5.8 MEUR in Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																										
	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Austria																32%	23%	-9%									
Bosnia Herzegovina	37%	28%	-9%																								
Croatia				29%	23%	-6%				35%	25%	-10%	27%	5%	-22%	32%	23%	-9%	27%	12%	-15%	48%	28%	-20%	31%	15%	-16%
Czechia				31%	28%	-4%	29%	25%	-4%	35%	32%	-3%	26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
Denmark										34%	31%	-3%															
Hungary	37%	27%	-9%	32%	29%	-3%	30%	25%	-5%	35%	32%	-3%	27%	22%	-5%	34%	31%	-3%	27%	14%	-13%	48%	28%	-20%	31%	16%	-15%
Poland				31%	28%	-3%	29%	25%	-4%	34%	32%	-2%	26%	21%	-5%	33%	31%	-2%									
Romania	36%	27%	-9%																								
Serbia	37%	28%	-9%																								
Slovakia				32%	28%	-4%	29%	25%	-4%	35%	32%	-3%	26%	22%	-4%	34%	31%	-3%	27%	20%	-7%				31%	28%	-3%
Slovenia																32%	23%	-9%									
LNG and Interconnection Capacity Diversification (LICD)																											
Croatia	5070	3372	-1698	5156	3432	-1724	5124	3400	-1725	5156	3432	-1724	5156	3432	-1724	5101	3388	-1713	5156	3432	-1724	5156	3432	-1724	5156	3432	-1724
Hungary	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806	3838	3032	-806
Supply Source Access (SSA)																											
Bosnia Herzegovina																4	5	1									
Croatia																						2	3	1			
Hungary										2	3	1										2	3	1			
Serbia				3	4	1				3	4	1										3	4	1			
Slovenia																						2	3	1			

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	4%	-29%
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	3%	-30%	36%	9%	-27%
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	4%	-29%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	3%	-30%	36%	9%	-27%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	4%	-29%
Belarus Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	3%	-30%	36%	9%	-27%
Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	4%	-29%
Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	3%	-30%	36%	9%	-27%
Remaining Flexibility 2-Week Cold Spell (%)																											
Croatia	13%	56%	43%	0%	28%	28%	0%	38%	38%	0%	10%	10%	0%	11%	11%	6%	55%	49%	0%	18%	18%	0%	2%	2%			
Italy																			81%	82%	1%						
Slovenia				66%	100%	34%	69%	100%	31%	61%	99%	38%	92%	100%	8%				57%	100%	43%	52%	60%	9%			
Remaining Flexibility Peak day (%)																											
Croatia	5%	45%	40%	0%	21%	21%	0%	26%	26%	0%	3%	3%	0%	3%	3%	0%	44%	44%	0%	13%	13%						
Hungary	87%	96%	10%	83%	88%	6%	92%	99%	7%																		
Italy				39%	40%	1%	41%	41%	1%										62%	63%	2%						
Slovenia	82%	100%	18%	48%	100%	52%	50%	100%	50%	43%	56%	13%	68%	83%	15%				29%	72%	43%						
Single Largest Infrastructure Disruption (SLID)-Croatia																											
Croatia	32%	0%	-32%	33%	13%	-19%	34%	10%	-24%							41%	0%	-41%	33%	22%	-11%						
Single Largest Infrastructure Disruption (SLID)-Slovenia																											
Croatia	21%	0%	-21%	23%	2%	-21%	24%	0%	-24%	21%	18%	-3%	20%	17%	-2%	29%	0%	-29%	23%	10%	-13%						
Slovenia													46%	42%	-4%										52%	47%	-5%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	4%	-29%
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Bosnia Herzegovina				10%	5%	-5%	6%	4%	-2%																		
Bulgaria				10%	6%	-4%																					
Croatia				13%	4%	-9%	10%	0%	-10%	28%	6%	-22%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	7%	-26%	36%	9%	-27%
Hungary				9%	4%	-5%	5%	0%	-5%																		
Luxembourg																						8%	6%	-2%			
Serbia				10%	4%	-6%	6%	4%	-2%													8%	6%	-2%			
Slovenia																						8%	6%	-2%			

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																											
Bi-directionality Balance																											
Dravaszerdahely	0%	71%	71%	0%	71%	71%	0%	71%	71%				0%	71%	71%	0%	71%	71%	0%	71%	71%	0%	71%	71%	0%	71%	71%

ADVANCED Infrastructure Level

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Austria																14%	11%	-3%									
Bosnia Herzegovina	19%	16%	-3%													14%	11%	-3%									
Croatia																14%	11%	-3%									
Czechia	19%	17%	-2%																			23%	21%	-3%			
Germany																13%	11%	-2%				22%	20%	-2%			
Hungary	19%	16%	-3%													14%	11%	-3%									
Serbia	19%	16%	-3%													14%	11%	-3%									
Slovenia																14%	11%	-3%									
Sweden																14%	11%	-3%									
LNG and Interconnection Capacity Diversification (LICD)																											
Croatia	5070	3372	-1698	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500
Hungary	3838	3032	-806																								
Supply Source Access (SSA)																											
Bulgaria				2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
FYROM				1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1
Security of Supply																											
Remaining Flexibility 2-Week Cold Spell (%)																											
Croatia	13%	56%	43%																								
Italy																			80%	81%	1%				89%	89%	1%
Remaining Flexibility Peak day (%)																											
Croatia	5%	45%	40%																								
Hungary	87%	96%	10%																								
Italy																			62%	63%	1%				62%	63%	1%
Slovenia	82%	100%	18%																								
Single Largest Infrastructure Disruption (SLID)-Croatia																											
Croatia	32%	0%	-32%																								
Single Largest Infrastructure Disruption (SLID)-Slovenia																											
Croatia	21%	0%	-21%																								
Market Integration																											
Bi-directionality Balance																											
Dravaszerdahely	0%	71%	71%																								

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	78.6	61.6	71.7	66.3	82.7	72.8
	Supply Maximization	104.3	101.8	102.3	112.2	101.7	110.2
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.3	2.3	2.3	0.2	0.2	0.2
	2 Weeks	1.8	20.6	15.6	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	11.2	14.2	16.5	5.8	7.3	8.4
	Fuel Switch savings	2.0	2.2	2.5	2.0	1.2	1.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	37.4	20.5	101.7	83.5	87.1	66.4	78.6	61.6
Supply Maximization	62.7	1.6	132.6	26.1	115.5	111.4	52.2	50.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.3	2.3	2.3	2.3	2.1	1.6	2.3	2.3
2 Weeks	20.6	1.8	20.6	1.8	25.7	17.7	20.6	1.8
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	16.5	11.2	16.5	11.2	18.8	13.1	16.5	11.2
Fuel Switch savings	2.5	2.0	2.5	2.0	2.8	1.8	2.5	2.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	46.8	30.7	157.6	125.4	92.7	73.1	82.7	66.3
Supply Maximization	63.0	0.0	180.6	0.0	124.0	109.8	56.1	50.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.2	0.2	0.2	0.2	0.0	0.0	0.2	0.2
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.4	5.8	8.4	5.8	9.3	6.6	8.4	5.8
Fuel Switch savings	2.0	1.2	2.0	1.2	1.3	0.9	2.0	1.2

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-90	Transmission pipeline	18 km	No
TRA-F-334	Compressor station 1		No
LNG-N-82	LNG terminal Krk		No

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Major influences of the project TRA-N-90 and LNG-N-82 on the economic and environmental dimensions are to be felt during the construction period (disturbance, traffic disturbance where secondary roads are cut, and impacts due to the dust, noise, transport machinery, and other machineries). On the other hand, major influence of the Compressor station 1 on the environment will be during its operation. Most likely, the impact on the environment will be emissions of the exhaust gases from the compressor drives.

The impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents. The proposed Environmental protection measures include measures prescribed by national law and other regulations, protection measures in accidental situations, plans and technical solutions for environmental protection as well as other protective measures. Protection measures for reducing the possible impacts to the lowest possible level are proposed in the EIA procedures.

EIA procedures have been carried out for all projects, and positive Decisions on acceptability for the environment have been issued by the line Ministry.

All EIA procedures were carried out in accordance with national legislation, that is, aligned with EU Directives on the environmental protection.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Gas infrastructure projects within the Project Group EAST_05b will enable unloading, storage and regasification of LNG and transmission of natural gas in the volume of up to 2.6 bcm/a from the LNG terminal on the island of Krk to the gas markets of Croatia, Hungary and other CEE and SEE countries.
By implementing the group, the following objectives will be achieved: diversification of the natural gas supply for Central Eastern and South-Eastern Europe and other neighbouring countries and reduction of the dependence on Russian gas supplies; increase of security of gas supply; shortages in gas supply to the region in case of disruptions of gas supplies from Russia can be flexibly compensated; more effective integration of key infrastructure projects like North-South Gas Interconnections in Central Eastern and South-Eastern Europe ("NSI East Gas") into the regional gas market; enhancement of diversification and security of gas supply by connecting the Baltic, Adriatic and Black Sea regions to the rest of Europe; strengthened energy solidarity between Central Eastern and South-Eastern Europe creating solid basis for further single energy market development; improvement of technical reliability of gas supply for the customers by diversifying the imported gas supply options; increase of market opportunities for market players in Central Eastern and Southeastern Europe and of their competitiveness in the region; offering LNG as a sustainable alternative fuel for transport and logistics stakeholders.
The group will bring many positive externalities and benefits to the EU Member States and the neighbouring third countries. The monetized and non-financial economic benefits make a significant contribution to the improvement of the operation of the gas market in the region, contribution to the regional security of gas supply and they also contribute to the European Energy Policy goals. The major benefits of the group come from its contribution to the reduction of average gas price due to diversification of gas supply. The group diversifies gas supply sources and routes in the region, thus enabling import of gas at different prices. The implementation of this project group will also enable reduction of emissions other than CO_2 such as reduction of SO_2, NO_x emissions and other particulate matter.

F. Useful Links

Krk LNG project page: https://www.lng.hr/en/about-us
Plinacro Krk LNG project page: http://www.plinacro.hr/default.aspx?id=909
Plinacro compressor station project page: http://www.plinacro.hr/default.aspx?id=910

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

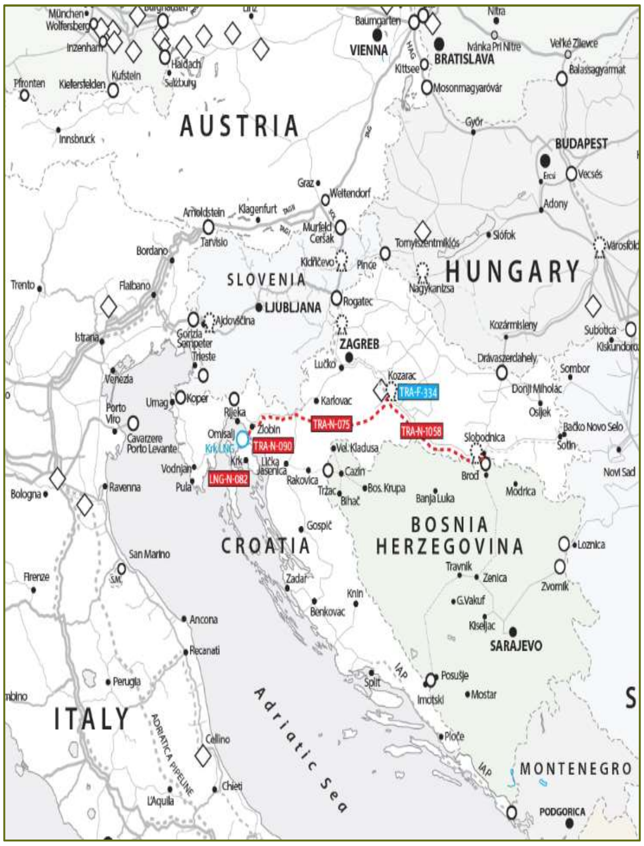
Project Group EAST_05b

Reasons for grouping [ENTSOG]

Project group represents the first and second phases of the Krk island LNG terminal development in Croatia. It includes the LNG terminal (LNG-N-82), the evacuation pipelines connecting the LNG facility to the transmission grid (TRA-N-90, TRA-N-75, TRA-N-1058) and the enabler project TRA-F-334.

Objective of the project(s) in the group [Promoter]

The group aims at enabling the unloading, storage and regasification of LNG and transmission of regasified natural gas from the LNG terminal to the countries of Central Eastern and South Eastern Europe. The evacuation pipelines (TRA-N-90, TRA-N-75, TRA-N-1058) will connect the terminal and the existing HU-HR interconnection Varosföld - Dravaszerdahely-Donji Miholjac-Slobodnica. Together with project TRA-F-334, it will enable transmission of up to 6.5 bcm/a of gas from LNG terminal Krk to the Hungarian gas market and other gas markets in the countries of the NSI East Group. Also, Project group_05b is a Croatian part of the Baltic-Adriatic gas connection that aims to connect Polish and Croatian LNG terminals. Objectives of this project are to provide viable and secure gas supply to CEE and SEE countries and to provide diversification of gas supply and thus competitive and lower gas price.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0334	Compressor station 1 at the Croatian gas transmission system	Plinacro Ltd	HR	FID	6.5.5	2019	2019	Rescheduled
TRA-N-0090	LNG evacuation pipeline Omišalj - Zlobin (Croatia)	Plinacro Ltd	HR	Advanced	6.5.1	2019	2019	NA
LNG-N-0082	LNG terminal Krk	LNG Hrvatska	HR	Advanced	6.5.1	2019	2023	Rescheduled
TRA-N-0075	LNG evacuation pipeline Zlobin-Bosiljevo-Sisak-Kozarac	Plinacro Ltd	HR	Advanced	6.5.6	2020	2020	On time
TRA-N-1058	LNG Evacuation Pipeline Kozarac-Slobodnica	Plinacro Ltd	HR	Advanced	6.5.6	2023	2023	NA

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0334	-	-	4
TRA-N-0075	800	180	-
TRA-N-0090	1000	18	-
TRA-N-1058	800	128	-

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0082	7	160000	160000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2019	-	82
TRA-F-0334	Plinacro Ltd	Dravaszerdahely	2019	-	13.6
TRA-N-0090	Plinacro Ltd	Dravaszerdahely	2019	-	40.76
TRA-N-0090	Plinacro Ltd	Croatia LNG	2019	81.51	-
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2020	-	110
TRA-N-0075	Plinacro Ltd	Dravaszerdahely	2020	-	54.34
TRA-N-0075	Plinacro Ltd	Croatia LNG	2020	27.17	-
LNG-N-0082	LNG Hrvatska d.o.o.	Croatia LNG	2023	-	220
TRA-N-1058	Plinacro Ltd	Dravaszerdahely	2023	135.85	54.34
TRA-N-1058	Plinacro Ltd	Croatia LNG	2023	54.34	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-82	TRA-N-90	TRA-F-334	TRA-N-75	TRA-N-1058
CAPEX [mln. EUR]	625.77	344.00	27.29*	25.00	198.40*	141.08*
Range CAPEX		15%	0%	0%	0%	0%
OPEX [mln. EUR/y]	24.10	15.00	0.49*	2.50	3.57*	2.54*

Description of costs and range [Promoter]

> LNG-N-82 LNG terminal Krk

Description of CAPEX: 100% of the CAPEX of the LNG terminal Krk refers to FSRU vessel, designing and engineering, civil, assembly and installation works, material and equipment, and the construction of a connecting gas pipeline from the LNG terminal to gas node Omišalj.
Description of OPEX: 100% of the cost refers to operational and maintenance costs, labour costs, other fees and insurance.

> TRA-N-90 LNG evacuation pipeline Omišalj-Zlobin (Croatia); TRA-N-75 LNG evacuation pipeline Zlobin-Bosiljevo-Sisak-Kozarac; TRA-N-1058 LNG evacuation pipeline Kozarac-Slobodnica

Description of CAPEX: 100% of the CAPEX of projects TRA-N-90, TRA-N-75, TRA-N-1058 refers to designing and engineering; civil, assembly and installation works, material and equipment, supervision and control systems.
Description of OPEX: 100% of the cost refers to operation and maintenance cost. There are no additional costs of own consumption (fuel gas) and labour cost.
Detailed CAPEX values for gas pipelines Omišalj-Zlobin, Zlobin-Bosiljevo-Sisak-Kozarac and Kozarac-Slobodnica has been taken from PLINACRO's TYNDP. Detailed OPEX for gas pipelines Omišalj-Zlobin, Zlobin-Bosiljevo-Sisak-Kozarac and Kozarac-Slobodnica has been calculated according to the actual Plinacro´s cost per kilometre for gas transmission pipelines.

> TRA-F-334 Compressor station 1 at the Croatian gas transmission system

Description of CAPEX: 100% of the CAPEX for the Compressor station 1 refers to designing and engineering, civil, assembly and installation works, material and equipment (compressor units and drives), supervision and control system.
Description of OPEX: 70% of the costs refer to the cost of CS-1 operation (consumption of fuel gas and electric power), 22% of the costs refer to the maintenance cost, and 8% are labour costs, other fees and insurance (CS-1 will be a new facility on the Croatian gas transmission system).
Detailed CAPEX values for the Compressor station 1 have been taken from PLINACRO´s TYNDP. Detailed OPEX for the Compressor station 1 has been calculated by considering maintenance costs and expected CS working hours and gas costs.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Croatia and Hungary.
The project group **decreases the dependence of LNG** for Croatia in Best Estimate (gas before coal) and in Sustainable Transition scenarios (2030 et 2040).
Depending on the considered demand scenarios the projects group also **increases the number of supply sources** Croatia, Hungary, Serbia, Bosnia Herzegovina and Slovenia have access to.

> **Security of Supply:**

The project group **fully mitigates the risk of demand curtailment** and **increases the remaining flexibility** for Croatia for all disruption cases. Also, Slovenia and Hungary see their remaining Flexibility increased in 2-week cold spell.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Hungary, Bulgaria, Serbia and Bosnia Herzegovina,
Always in case of Ukrainian disruption but in Sustainable Transition, Europe could overall face a curtailed demand. The projects group allows to mitigate such risk and has positive impact on other countries such as Germany and Italy.

> **Market Integration:**

The **bidirectionality is improved** by 71%.
The projects group **decreases significantly the gas price** in Croatia and in all scenarios and for all supply configuration. The new supply route allows for a more direct access to gas for Croatia that is reflected in lower transportation costs and therefore a lower marginal price. The **reduction of the cost of gas supply** in the reference situation can be mainly explained by the lower transportation costs thanks to the access to the terminal and can be estimated around 80 Mln EUR/y (on average). The sensitivity on tariffs shows in fact that those benefits are sensitive to the level of tariffs assumed for the project group. Compared to the reference supply configuration, in case of LNG cheaper than other sources more LNG is used allowing for a further reduction in the cost of gas supply between 70 and 120 Mln EUR/y (on average) depending on the spread between LNG and the other more expensive sources.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

Implementation of the project group EAST_05b will enhance gas diversification and reduction of gas prices in South Eastern Europe which will enable new development of gas fired power plants and have an impact on the reduction of CO2 emissions.
The project group will enable fuel switch savings in the maximal amount of EUR 4.9 Mln EUR/y in a Global Climate scenario and low infrastructure level and minimal savings in the amount of 1.9 Mln EUR/y in a Sustainable Transition scenario and advanced infrastructure level scenario.
It will also enable CO2 savings in the maximal amount of 33.2 Mln EUR/y in the Global Climate scenario and low infrastructure level and minimal savings in the amount of 10.4 Mln EUR/y in the Distributed Generation and advanced infrastructure level scenario.

C.2. Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to LNG (%)all																											
Croatia				5%	0%	-5%				13%	0%	-13%										13%	0%	-13%			
Dependence to RU (%)																											
Austria																32%	16%	-16%	2%	0%	-2%						
Bosnia Herzegovina	37%	28%	-9%																								
Croatia				29%	23%	-6%				35%	24%	-11%	27%	5%	-22%	32%	16%	-16%	27%	0%	-27%	48%	21%	-27%	31%	0%	-31%
Czechia				31%	27%	-5%	29%	22%	-7%	35%	31%	-4%	26%	21%	-5%				27%	20%	-7%				31%	28%	-3%
Denmark				29%	26%	-3%				34%	30%	-4%															
Hungary	37%	27%	-9%	32%	23%	-9%	30%	11%	-19%	35%	24%	-11%	27%	5%	-22%	34%	16%	-18%	27%	0%	-27%	48%	21%	-27%	31%	0%	-31%
Poland				31%	26%	-5%	29%	22%	-7%	34%	31%	-3%	26%	21%	-5%	33%	31%	-2%									
Romania	36%	27%	-9%																								
Serbia	37%	28%	-9%																								
Slovakia				32%	27%	-5%	29%	22%	-7%	35%	31%	-4%	26%	22%	-4%	34%	31%	-3%	27%	20%	-7%				31%	28%	-3%
Slovenia																32%	16%	-16%	3%	0%	-3%						
Sweden				30%	26%	-4%				34%	31%	-3%															
LNG and Interconnection Capacity Diversification (LICD)																											
Croatia	5070	3372	-1698	5156	3540	-1615	5124	3400	-1725	5156	3585	-1571	5156	3477	-1679	5101	3388	-1713	5156	3525	-1630	5156	3643	-1513	5156	3579	-1577
Hungary	3838	3032	-806	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027	3838	2811	-1027
Supply Source Access (SSA)																											
Bosnia Herzegovina				3	4	1										4	5	1									
Croatia																						2	3	1			
Hungary										2	3	1										2	3	1			
Serbia				3	4	1				3	4	1															
Slovenia																						2	3	1			

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Belarus Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Remaining Flexibility 2-Week Cold Spell (%)																											
Croatia	13%	56%	43%	0%	100%	100%	0%	100%	100%	0%	97%	97%	0%	98%	98%	6%	100%	94%	0%	100%	100%	0%	83%	83%	0%	69%	69%
Italy																			81%	82%	1%	69%	69%	1%			
Slovenia				66%	100%	34%	69%	100%	31%	61%	100%	39%	92%	100%	8%				57%	100%	43%	52%	100%	48%	98%	100%	2%
Remaining Flexibility Peak day (%)																											
Croatia	5%	45%	40%	0%	100%	100%	0%	100%	100%	0%	84%	84%	0%	83%	83%	0%	100%	100%	0%	100%	100%	0%	73%	73%	0%	59%	59%
Hungary	87%	96%	10%	83%	97%	15%	92%	100%	8%																		
Italy				39%	40%	1%	41%	41%	1%	32%	33%	1%							62%	64%	2%	35%	37%	1%	62%	62%	1%
Slovenia	82%	100%	18%	48%	100%	52%	50%	100%	50%	43%	100%	57%	68%	100%	32%				29%	100%	71%	26%	100%	74%	47%	100%	53%
Single Largest Infrastructure Disruption (SLID)-Croatia																											
Croatia	32%	0%	-32%	33%	0%	-33%	34%	0%	-34%	30%	0%	-30%	29%	0%	-29%	41%	0%	-41%	33%	0%	-33%	28%	2%	-26%	26%	9%	-17%
Single Largest Infrastructure Disruption (SLID)-Slovakia																											
Belgium																						2%	0%	-2%			
Luxembourg																						2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-Slovenia																											
Croatia	21%	0%	-21%	23%	0%	-23%	24%	0%	-24%	21%	0%	-21%	20%	0%	-20%	29%	0%	-29%	23%	0%	-23%	19%	0%	-19%	17%	0%	-17%
Slovenia													46%	42%	-4%										52%	47%	-5%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Austria										6%	4%	-2%										6%	4%	-2%			
Bosnia Herzegovina				10%	5%	-5%	6%	4%	-2%													8%	6%	-2%			
Bulgaria				10%	6%	-4%																8%	6%	-2%			
Croatia				13%	0%	-13%	10%	0%	-10%	28%	6%	-22%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	6%	-27%	36%	0%	-36%
Czechia																						6%	4%	-2%			
Germany																						6%	5%	-1%			
Hungary				9%	0%	-9%	5%	0%	-5%																		
Italy										6%	4%	-2%															
Luxembourg																						8%	6%	-2%			
Serbia				10%	4%	-6%	6%	4%	-2%													8%	6%	-2%			
Slovakia										6%	4%	-2%										6%	4%	-2%			
Slovenia																						8%	6%	-2%			

Row Labels	2020 BEST ESTIMATE (CbG) WITHOUT	WITH	DELTA	2025 BEST ESTIMATE (GbC) WITHOUT	WITH	DELTA	2025 BEST ESTIMATE (CbG) WITHOUT	WITH	DELTA	2030 SUSTAINABLE WITHOUT	WITH	DELTA	2030 DISTRIBUTED WITHOUT	WITH	DELTA	2030 EUCO30 WITHOUT	WITH	DELTA	2040 CLIMATE WITHOUT	WITH	DELTA	2040 SUSTAINABLE WITHOUT	WITH	DELTA	2040 DISTRIBUTED WITHOUT	WITH	DELTA
Market Integration																											
Bi-directionality Balance																											
Dravaszerdahely	0%	71%	71%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

ADVANCED Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Austria																14%	11%	-3%									
Bosnia Herzegovina	19%	16%	-3%													14%	11%	-3%									
Croatia																14%	11%	-3%									
Czechia	19%	17%	-2%																			23%	21%	-3%			
Germany																13%	11%	-2%				22%	20%	-2%			
Hungary	19%	16%	-3%													14%	11%	-3%									
Serbia	19%	16%	-3%													14%	11%	-3%									
Slovenia																14%	11%	-3%									
Sweden																14%	11%	-3%									
LNG and Interconnection Capacity Diversification (LICD)																											
Croatia	5070	3372	-1698	2524	2000	-524	2500	2000	-500	2539	2000	-539	2507	2000	-507	2500	2000	-500	2519	2000	-519	2561	2000	-561	2537	2000	-537
Hungary	3838	3032	-806	2722	2165	-557	2722	2165	-557	2722	2165	-557	2722	2165	-557	2722	2165	-557	2722	2165	-557	2722	2165	-557	2722	2165	-557
Supply Source Access (SSA)																											
Bulgaria				2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
FYROM				1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1
Security of Supply																											
Remaining Flexibility 2-Week Cold Spell (%)																											
Croatia	13%	56%	43%																								
Italy																			80%	81%	1%				89%	89%	1%
Remaining Flexibility Peak day (%)																											
Croatia	5%	45%	40%																						86%	100%	14%
Hungary	87%	96%	10%																								
Italy																			62%	63%	1%				62%	63%	1%
Slovenia	82%	100%	18%																								
Single Largest Infrastructure Disruption (SLID)-Croatia																											
Croatia	32%	0%	-32%																								
Single Largest Infrastructure Disruption (SLID)-Slovenia																											
Croatia	21%	0%	-21%																								
Market Integration																											
Bi-directionality Balance																											
Dravaszerdahely	0%	71%	71%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	90.7	73.7	86.0	66.3	82.7	72.8
Supply Maximization	141.8	145.8	135.3	112.2	101.7	110.2
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	3.9	4.5	3.8	0.2	0.2	0.2
2 Weeks	2.0	20.6	15.6	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	22.5	28.5	33.2	10.4	13.1	15.1
Fuel Switch savings	3.8	4.1	4.9	3.8	1.9	2.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	40.4	22.1	149.9	111.6	102.9	81.1	90.7	73.7
Supply Maximization	74.8	3.2	219.0	26.2	170.3	151.0	72.9	67.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.5	3.8	4.5	3.8	2.5	1.6	4.5	3.8
2 Weeks	20.6	2.0	20.6	2.0	28.3	17.7	20.6	2.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	33.2	22.5	33.2	22.5	38.3	26.7	33.2	22.5
Fuel Switch savings	4.9	3.8	4.9	3.8	5.6	3.6	4.9	3.8

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR)								
Reference	17.3	4.6	121.4	100.6	92.7	73.1	82.7	66.3
Supply Maximization	40.7	1.1	152.1	0.0	124.0	109.8	56.1	50.9
Mitigation in Disrupted Demand (MEUR)								
Peak Day	0.2	0.2	0.2	0.2	0.0	0.0	0.2	0.2
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR)								
CO_2 Savings	15.1	10.4	15.1	10.4	17.0	12.1	15.1	10.4
Fuel Switch savings	3.8	1.9	3.8	1.9	2.4	1.5	3.8	1.9

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Major influences of the projects LNG-N-82, TRA-N-90, TRA-N-75, TRA-N-1058 on the economic and environmental dimensions are to be felt during the construction period (disturbance, traffic disturbance where secondary roads are cut, and impacts due to the dust, noise, transport machinery, and other machineries). On the other hand, major influence of the Compressor station 1 on the environment will be during its operation. Most likely, the impact on the environment will be emissions of the exhaust gases from the compressor drives.

The impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents. The proposed Environmental protection measures include measures prescribed by national law and other regulations, protection measures in accidental situations, plans and technical solutions for environmental protection as well as other protective measures. Protection measures for reducing the possible impacts to the lowest possible level are proposed in the EIA procedures.

For the projects LNG-N-82, TRA-N-90, TRA-N-75, TRA-N-1058 and TRA-F-334, EIA procedures have been carried out, and positive Decisions on acceptability for the environment have been issued by the line Ministry. All EIA procedures were carried out in accordance with national legislation, that is, aligned with EU Directives on the environmental protection.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Gas infrastructure projects within the Project Group EAST_05b will enable unloading, storage and regasification of LNG and transmission of natural gas in the volume of up to 6.5 bcm/a from the LNG terminal on the island of Krk to the gas markets of Croatia, Hungary and other CEE and SEE countries.
By implementing the group, the following objectives will be achieved: diversification of the natural gas supply for Central Eastern & South Eastern Europe and other neighbouring countries and reduction of the dependence on Russian gas supplies; increase of security of gas supply; shortages in gas supply to the region in case of disruptions of gas supplies from Russia can be flexibly compensated; more effective integration of key infrastructure projects like North-South Gas Interconnections in Central Eastern and South Eastern Europe ("NSI East Gas") into the regional gas market; enhancement of diversification and security of gas supply by connecting the Baltic, Adriatic and Black Sea regions to the rest of Europe; strengthened energy solidarity between Central Eastern and South Eastern Europe creating solid basis for further single energy market development; improvement of technical reliability of gas supply for the customers by diversifying the imported gas supply options; increase of market opportunities for market players in Central Eastern and South Eastern Europe and of their competitiveness in the region; offering LNG as a sustainable alternative fuel for transport and logistics stakeholders.
The group will bring many positive externalities and benefits to the EU Member States and the neighbouring third countries. The monetized and non-financial economic benefits make a significant contribution to the improvement of the operation of the gas market in the region, contribution to regional security of gas supply and they also contribute to the European Energy Policy goals. The group diversifies gas supply sources and routes in the region, thus enabling import of gas at different prices. Group will have significant positive impact to the competitiveness of gas in Croatia by reducing the marginal price for all price scenarios. In reference scenario marginal price will be reduced by around 3 Eur/MWh in all years and demand scenario. In several price and demand scenarios group will also have positive impact on marginal price in Hungary and Slovenia.
The implementation of this project group will also enable reduction of emissions other than CO_2 such as reduction of SO_2, NO_x emissions and other particulate matter.

F. Useful Links

LNG Croatia LLC page: https://www.lng.hr/en/about-us
Plinacro compressor station project page: http://www.plinacro.hr/default.aspx?id=910
Plinacro Krk LNG project page: http://www.plinacro.hr/default.aspx?id=909
Plinacro Expansion of the capacity of LNG terminal on Krk project page:
http://www.plinacro.hr/default.aspx?id=911

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_06

Reasons for grouping [ENTSOG]

The project group represents the Greece - Bulgaria interconnector - IGB (TRA-F-378) and the Bulgarian side of the Bulgaria - Serbia interconnector (TRA-F-137). The Compressor Station in Kipi (TRA-N-128) is an enabler for the IGB while project TRA-N-298 enables the gas from IGB to further flow via the Bulgarian transmission system to the Bulgaria-Serbia interconnector.

Objective of the project(s) in the group [Promoter]

The objective of the group is to create an integrated, competitive and sustainable internal energy market within a region of the EU, every project being a milestone towards this objective. The group of projects aims at enhancing security of supply by securing additional volumes of natural gas in the region; contributing to diversification of entry routes and sources to the SEE region; improving market integration and reduce energy infrastructure bottlenecks; enhancing interoperability and system flexibility; enhancing competition, inter alia by introducing additional supply sources from the Caspian region, Middle East, East Mediterranean and LNG terminals (in Greece and/or Turkey)

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0128	Compressor Station Kipi	DESFA S.A.	GR	Less-Advanced	6.8.1	2020	2020	NA
TRA-F-0378	Interconnector Greece-Bulgaria (IGB Project)	ICGB AD	BG	FID	6.8.1	2020	2025	Delayed
TRA-F-0298	Rehabilitation, Modernization and Expansion of the NTS	Bulgartransgaz EAD	BG	FID	6.8.2	2021	2024	Delayed
TRA-F-0137	Interconnection Bulgaria - Serbia	Ministry of Energy of Bulgaria	BG	FID	6.10	2022	2022	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0137	700	170	-
TRA-F-0298	1000	20	-
TRA-F-0298	700	100	20
TRA-F-0378	813	182	12
TRA-N-0128	0	0	27

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0137	IBS Future Operator	Interconnector BG RS	2022	51	51
TRA-F-0298	Bulgartransgaz EAD	Strandzha (BG) / Malkoclar (TR)	2021	-	58.08
TRA-F-0298	Bulgartransgaz EAD	Kulata (BG) / Sidirokastron (GR)	2021	-	13.78
TRA-F-0298	IBS Future Operator	Interconnector BG RS	2024	19.36	19.36
TRA-F-0378	ICGB a.d.	Stara Zagora - IGB / BG	2020	-	90
TRA-F-0378	ICGB a.d.	Komotini - TAP / IGB	2020	90	-
TRA-F-0378	ICGB a.d.	Komotini (DESFA) - GR / IGB	2020	90	-
TRA-F-0378	ICGB a.d.	Stara Zagora - IGB / BG	2025	-	60
TRA-F-0378	ICGB a.d.	Komotini (DESFA) - GR / IGB	2025	60	-
TRA-N-0128	DESFA S.A.	Kipi (TR) / Kipi (GR)	2020	54.4	-
TRA-N-0128	DESFA S.A.	Komotini (DESFA) Bottleneck	2020	54.4	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-378	TRA-N-128	TRA-F-298	TRA-F-137
CAPEX [mln. EUR]	658.59	240.00	31.00	339.59	48.00
Range CAPEX	47%	10%	10%	7%	20%
OPEX [mln. EUR/y]	14.08	4.50	4.03*	4.55	1.00

Description of costs and range [Promoter]

The CAPEX of TRA-F-0298 includes all the costs for the implementation of the projects until their commissioning, incl. FEED, supervision, construction works, delivery of materials, project management, publicity, etc. The OPEX figures are a preliminary estimation by the project promoters. The range of Capex, indicated in the above table, reflects the uncertainty of costs due to the stage of the project development.

CAPEX of TRA-F-378 includes all the costs related to the implementation of the project namely : line pipe , block valves, stations and related facilities (Gas metering/ Automated gas regulation / pigging station and etc.), construction and installation, as well as other facilities- cathodic protection, SCADA system, external infrastructure connections etc; Project management and supervision during construction; The tender procedures related to the Line pipe supply, Engineering Procurement and Construction and Construction Supervision are still ongoing, the expected range of fluctuations in the CAPEX is around 10%. OPEX includes the following expenses: payroll; utilities; public services; hired and third-party services; expenditure for spare parts and materials and etc., the range of the OPEX is approx. 15%.

CAPEX of TRA-F-0137 includes the planned expenses for gas pipelines linear part; site objects (sewing facility Novi Iskar, automatic gas distribution station Slivnitsa, automatic gas distribution station Dragoman, gas measurement station and sewing facility Kalotina, line valves, Cathodic protection station).

CAPEX of TRA-N-128 is based on a design performed several years ago and will be reassessed before the FID.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Bulgaria and Serbia.
The project group **decreases the dependence of LNG** for FYROM and Greece in Best Estimate (gas before coal) and in Sustainable Transition scenarios (2030 et 2040) and Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, FYROM, Hungary, Poland, Romania, Serbia and Slovakia decrease their dependence from Russian gas.
Depending on the considered demand scenarios the projects group also **increases the number of supply sources** that Bosnia and Herzegovina, FYROM and Serbia have access to. In Advanced infrastructure level, Bulgaria **decreases its dependence from LNG** and Bulgaria, Greece and FYROM **decrease their dependence from Russia**. Bulgaria and Serbia **improve their diversification** with new entry point and FYROM **wins one source** (LNG).

> **Security of Supply:**

The project group **increases the remaining flexibility** for Bulgaria, Greece and Serbia.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bulgaria, FYROM and Romania.
The project group allows for **full mitigation of risk of demand curtailment** in Bulgaria in case of disruption of the single largest infrastructures at Negru Voda I (RO) / Kardam (BG). The project group **partially mitigates risk of demand curtailment** in Bosnia and Herzegovina and Serbia in case of disruption of the single largest infrastructures in Serbia (Kiskundorozsma (HU>RS)) and in Greece and FYROM in case of disruption of the single largest infrastructure in Greece (Agia Triada).
In the Advanced infrastructure level, the project group **increases Remaining Flexibility** for Bulgaria and Greece. Also, the project group **fully mitigates the risk of demand curtailment in case of Ukrainian disruption** in Bulgaria and FYROM. The project group **mitigates the risk of demand curtailment in Bulgaria** for all demand scenarios in case of disruption of the single largest infrastructures in Bulgaria (Negru Voda I (RO) / Kardam (BG)).

> **Market Integration:**

The project group brings benefits in monetised terms as a reduction of the cost of gas supply. In the reference supply price configuration this can be estimated around 111 Mln EUR/y (on average) in the low infrastructure level. Such benefits are driven by the fact that the project allows Europe (especially Greece-Bulgaria-Serbia) to connect to new supply sources from the South. These benefits are lower in the advanced infrastructure level (around 35 Mln EUR/y on average) where, given TYNDP 2018 supply potential available from Southern sources, more projects can share such supply potential to Europe. Additional benefits compared to the reference situation can be observed in the case of Southern supply Maximisation due to the new supply source diversification.
Reduction in the cost of gas supply can be partially explained also by savings in transportation costs thanks to the utilisation of this new alternative routes. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (decrease from 37 Mln EUR/y to 85 Mln EUR/y depending on the scenarios) that can be attributed to the connection to the new source(s).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realization of the project group will help expand the use of natural gas for domestic and industrial needs in the region, thus reducing the emissions of harmful substances in the atmosphere as a result of replacing the use of conventional fuels (replacing the fuel base with environmentally friendly fuel), thereby improving the quality of atmospheric air. An ecological effect (reduction of pollutants released into the atmosphere) will also be achieved by the implementation of the modernization project of the compressor stations thanks to the replacement of the old gas turbine compressor units with new, high efficiency and low emission gas turbine compressors. Increasing the efficiency by only 1% is expected to reduce the amount of fuel gas used at the same capacity of the compressor by about 3% and a proportional reduction of the harmful emissions, including the amount of CO2 released. The impact of the project group on climate change sustainability is reflected in the expected long-term and sustainable reduction of greenhouse gas emissions in the affected regions.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
FYROM	8%	3%	-5%				12%	6%	-6%										13%	0%	-13%			
Greece	7%	2%	-5%				12%	4%	-8%										11%	0%	-11%			
Dependence to RU (%)																								
Bosnia Herzegovina	34%	21%	-13%	31%	11%	-20%	37%	16%	-21%	29%	1%	-28%	35%	0%	-35%	31%	0%	-31%	50%	6%	-44%	33%	0%	-33%
Bulgaria	47%	21%	-26%	42%	11%	-31%	53%	15%	-38%	40%	0%	-40%	42%	0%	-42%	28%	0%	-28%	37%	5%	-32%	35%	0%	-35%
Croatia	34%	31%	-3%													31%	27%	-4%						
Czechia	34%	31%	-3%	31%	28%	-3%				29%	26%	-3%				31%	27%	-4%				33%	31%	-2%
FYROM	48%	22%	-26%	42%	12%	-30%	54%	16%	-38%	40%	0%	-40%	42%	0%	-42%	28%	0%	-28%	36%	6%	-31%	36%	0%	-36%
Hungary				31%	29%	-2%				29%	27%	-2%				31%	27%	-4%						
Poland	34%	31%	-3%	31%	28%	-3%				29%	26%	-3%										32%	30%	-3%
Romania	46%	43%	-3%	39%	35%	-3%																		
Serbia	34%	21%	-13%	31%	11%	-20%	37%	16%	-21%	29%	1%	-28%	35%	0%	-35%	31%	0%	-31%	50%	5%	-45%	33%	0%	-33%
Slovakia	34%	31%	-3%	31%	28%	-3%				29%	26%	-3%				31%	27%	-4%						
LNG and Interconnection Capacity Diversification (LICD)																								
Bulgaria	10000	4976	-5024	10000	4976	-5024	10000	5093	-4907	10000	4966	-5034	10000	4944	-5056	10000	4995	-5005	10000	5094	-4906	10000	4971	-5029
Serbia	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Supply Source Access (SSA)																								
Bosnia Herzegovina	2	3	1	4	5	1	2	3	1	4	5	1	2	4	2	3	5	2	2	3	1	4	5	1
Bulgaria	2	3	1	2	4	2	2	3	1	2	4	2	2	4	2	2	4	2				2	4	2
FYROM				1	2	1				1	2	1	1	2	1	1	2	1				1	2	1
Hungary	3	4	1																					
Serbia				4	5	1				4	5	1	3	5	2	3	5	2	2	3	1	4	5	1

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Bulgaria	32%	100%	68%	32%	100%	68%	31%	100%	69%	33%	100%	67%				40%	100%	60%	40%	100%	60%	36%	100%	64%
Greece	62%	81%	19%	90%	100%	10%	52%	69%	18%							71%	90%	19%	69%	89%	19%			
Serbia	71%	100%	29%	73%	100%	27%	75%	100%	25%	81%	100%	19%				71%	100%	29%	74%	100%	26%	72%	100%	28%
Remaining Flexibility Peak day (%)																								
Bulgaria	24%	88%	63%	24%	89%	65%	16%	74%	59%	17%	77%	59%	97%	100%	3%	19%	79%	60%	23%	81%	58%	19%	78%	59%
Greece	46%	64%	17%	54%	72%	18%	27%	41%	15%	51%	69%	17%				44%	60%	16%	37%	52%	16%	46%	62%	16%
Hungary	75%	83%	8%	84%	93%	8%																		
Italy													48%	49%	1%									
Poland										80%	81%	1%												
Serbia	57%	100%	43%	58%	100%	42%	59%	100%	41%	59%	100%	41%				58%	100%	42%	58%	100%	42%	58%	100%	42%
Single Largest Infrastructure Disruption (SLID)-Bulgaria																								
Bulgaria	57%	0%	-57%	57%	0%	-57%	59%	0%	-59%	57%	0%	-57%	30%	0%	-30%	52%	0%	-52%	52%	0%	-52%	55%	0%	-55%
Single Largest Infrastructure Disruption (SLID)-Greece																								
FYROM	6%	0%	-6%	2%	0%	-2%	9%	0%	-9%	20%	2%	-18%				22%	6%	-16%	28%	12%	-16%	22%	6%	-16%
Greece	27%	10%	-17%	23%	5%	-18%	36%	22%	-14%	21%	4%	-17%				23%	8%	-16%	29%	14%	-15%	22%	6%	-16%
Single Largest Infrastructure Disruption (SLID)-Serbia																								
Bosnia Herzegovina	73%	12%	-61%	74%	10%	-64%	73%	12%	-61%	74%	11%	-63%	26%	0%	-26%	74%	12%	-62%	74%	12%	-62%	74%	12%	-62%
Serbia	72%	12%	-60%	72%	10%	-62%	72%	10%	-62%	72%	10%	-62%	26%	0%	-26%	73%	12%	-61%	73%	12%	-61%	73%	11%	-61%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Bulgaria	60%	0%	-60%	60%	0%	-60%	59%	0%	-59%	55%	0%	-55%	35%	0%	-35%	50%	0%	-50%	50%	0%	-50%	53%	0%	-53%
FYROM	59%	33%	-26%	59%	33%	-25%	58%	33%	-25%	54%	0%	-54%	35%	0%	-35%	48%	0%	-48%	49%	0%	-49%	52%	0%	-52%
Romania	15%	12%	-4%	10%	6%	-4%	22%	19%	-4%	30%	27%	-3%	36%	34%	-2%	38%	34%	-4%	32%	28%	-4%	36%	33%	-3%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bulgaria	61%	10%	-51%	61%	6%	-55%	63%	10%	-53%	59%	7%	-51%	41%	0%	-41%	54%	5%	-49%	54%	8%	-46%	56%	6%	-50%
FYROM	62%	59%	-3%	62%	59%	-3%	64%	63%	-1%	58%	8%	-50%	40%	0%	-40%	52%	6%	-46%	53%	13%	-40%	56%	6%	-50%
Romania	26%	23%	-3%	24%	20%	-3%	32%	29%	-3%	38%	35%	-3%				46%	43%	-3%	41%	38%	-3%	43%	40%	-3%

ADVANCED Infrastructure Level

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Bulgaria							7%	2%	-5%										3%	0%	-3%			
Dependence to RU (%)																								
Bulgaria	20%	9%	-11%	11%	0%	-11%	20%	0%	-20%															
FYROM				10%	0%	-10%	21%	15%	-6%															
Greece				4%	0%	-4%																		
LNG and Interconnection Capacity Diversification (LICD)																								
Bulgaria	10000	3823	-6177	10000	3823	-6177	10000	3963	-6037	10000	3809	-6191	10000	3780	-6220	10000	3847	-6153	10000	3964	-6036	10000	3816	-6184
Serbia	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667	5000	3333	-1667
Supply Source Access (SSA)																								
FYROM	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1

Row Labels	2025						2030						2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																					
Remaining Flexibility 2-Week Cold Spell (%)																					
Bulgaria	74%	100%	26%	74%	100%	26%	73%	100%	27%	75%	100%	25%	81%	100%	19%	81%	100%	19%	77%	100%	23%
Greece	62%	81%	19%	90%	100%	10%	52%	69%	18%				71%	90%	19%	69%	89%	19%			
Remaining Flexibility Peak day (%)																					
Bulgaria	64%	100%	36%	64%	100%	36%	51%	100%	49%	53%	100%	47%	59%	100%	41%	59%	100%	41%	55%	100%	45%
Greece	46%	64%	17%	54%	72%	18%	27%	41%	15%	51%	69%	17%	44%	60%	16%	37%	52%	16%	46%	62%	16%
Single Largest Infrastructure Disruption (SLID)-Bulgaria																					
Bulgaria	17%	0%	-17%	17%	0%	-17%	23%	0%	-23%	21%	0%	-21%	16%	0%	-16%	16%	0%	-16%	20%	0%	-20%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																					
Bulgaria	19%	0%	-19%	19%	0%	-19%	20%	0%	-20%	15%	0%	-15%	10%	0%	-10%	11%	0%	-11%	13%	0%	-13%
FYROM										14%	0%	-14%	11%	0%	-11%	11%	0%	-11%	11%	0%	-11%
Ukraine Disruption Curtailment Rate Peak Day (%)																					
Bulgaria	22%	0%	-22%	22%	0%	-22%	27%	0%	-27%	24%	0%	-24%	19%	0%	-19%	20%	0%	-20%	22%	0%	-22%
FYROM										22%	0%	-22%	20%	3%	-17%	20%	13%	-7%	20%	0%	-20%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	102.8	118.4	111.9	34.3	36.6	33.4
	Supply Maximization	195.6	215.9	208.2	63.6	64.6	62.8
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	7.8	5.7	6.9	3.0	3.0	3.0
	2 Weeks	3.8	59.4	59.5	13.6	14.1	13.9
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	8.8	11.6	13.2	4.7	6.3	6.8
	Fuel Switch savings	3.2	6.0	5.3	3.2	3.2	2.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	85.3	37.2	146.0	125.0	121.1	101.5	118.4	102.8
Supply Maximization	180.6	0.1	249.2	42.2	225.0	198.4	107.9	97.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	7.8	5.7	7.8	5.7	4.2	1.7	7.8	5.7
2 Weeks	59.5	3.8	59.5	3.8	60.7	60.2	59.5	3.8
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	13.2	8.8	13.2	8.8	14.3	11.7	13.2	8.8
Fuel Switch savings	6.0	3.2	6.0	3.2	7.6	2.9	6.0	3.2

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	17.5	8.3	64.7	51.9	32.6	27.6	36.6	33.4
Supply Maximization	54.4	3.2	105.8	0.0	58.0	44.4	32.3	31.4
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.0	3.0	3.0	3.0	1.7	1.7	3.0	3.0
2 Weeks	14.1	13.6	14.1	13.6	13.3	13.1	14.1	13.6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	6.8	4.7	6.8	4.7	7.1	5.9	6.8	4.7
Fuel Switch savings	3.2	2.3	3.2	2.3	4.1	1.3	3.2	2.3

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-298	Gas pipeline section 58,3 km.	Length: 58.3 km	Protected areas are not affected.
TRA-F-0137	Gas pipeline	Length: 170 km (BG territory 62km) Area: 2238 - 2630 ha (include the areas of easements of the pipeline and facilities along the pipeline, as well as the area of expropriation)	Protected areas are not affected
TRA-N-128	Compressor station	The land plot, next to the existing Border Metering Station, is already owned by DESFA.	Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
The investment proposal is not likely to have a significant negative impact on natural habitats, populations and habitats of species subject to conservation in protected areas.	The EIA Decision No. 3-3/2018 lays down mandatory conditions for implementation during the design phase of the investment proposal and during execution of construction works, incl. measures regarding the environmental components. Information on the website of the competent authority MoEW: http://registers.moew.government.bg/ovos/lot/21192		
The impact on environmental components will have local effect (within the construction site and technological sites) and short-term, limited in the construction phase; The investment proposal is not likely to have a significant negative impact on natural habitats, populations and habitats of species subject to conservation in protected areas.	Strict compliance with the requirements and procedures provided in the environmental legislation; Mandatory implementation of the restrictive measures in the permits issued by the authorities (MoEW, Executive Environment Agency (ExEA), Regional Inspection on Environment and Waters (RIEW) and Basin Directorate for Water Management (BDWM); Minimization of sources of environmental impact; Applying the best technologies and practices in the design, construction and operation of the Project		
The ESIA for the compressor station has not yet been carried out. Possible impact concerns noise, air pollution and visual impact.	The installation of the turbo-compressor units in a building and additionally in individual insulated enclosures will limit the noise at the fence to acceptable levels. Moreover, the C/S location is at 3 km from the closest village. Chimney height will ensure a higher dispersion and a lower concentration of pollutants while low NOx emitting units will be selected.	Not yet available	Not yet available

Environmental Impact explained [Promoter]

> TRA-F-298 Rehabilitation, Modernization and Expansion of the NTS

The design phase of the project (activities included in Phase 2) is in the process of being finalized. The 58,3 km section was subject to an EIA. The EIA Decision No 3-3/2018г was issued on 29.10.2018 (information is provided in table 1). The 23,3 km section was subject to a procedure for assessing the necessity of environmental impact and Decision No. 14-ПР/2018 was issued according to which EIA is not required. For Stage 2 of the modernization of three compressor stations the following decisions were issued: Decision No. БД-26-ПР/2018, Decision No. 2-ПР/2018 and Decision No. 5-ПР/2018 for CS Petrich, CS Ihtiman, CS Lozenets respectively, stating that the investment proposals will not have harmful effect on the environment and EIA is not required.

> TRA-F-378 Interconnector Greece-Bulgaria (IGB Project)

For the Bulgarian section, the project was subject to an EIA and appropriate assessment. The EIA Decision No 1-1/2013 was issued on 06.02.2013. The decision includes a presentation of the project, the studied alternatives, the consultation process, and the measures compulsory to be implemented within the project to ensure minimum environmental impact and monitoring provisions, as well as the possibility of appeal. The decision also includes provisions on measures regarding the minimisation of the impact on Natura 2000 sites within the project area. The public was informed throughout the procedure, including public debates (in four locations along the pipeline route). No comments have been raised by the public. For the Greek section, the project was subject to an environmental assessment and the EIA Decision no.171379 was issued on 29.10.2013. No Appropriate Assessment has been carried out, since during the documentation preparation it was determined that the project is not likely to have adverse effects on closest Natura 2000 sites. The construction permit for the Bulgarian section is issued on 04.10.2017.

> TRA-F-0137 Interconnection Bulgaria - Serbia

During construction, unburdened dust and exhaust emissions from construction and transport equipment will be released. Air pollution will be local and insignificant; Construction activities affect the soil, the extent of the trenches, where the pipeline will be installed, and measures for re-cultivation are envisaged; The different types and quantities of generated waste will be managed in accordance with the applicable environmental legislation, which does not imply pollution of the areas; Environmental pollution from the operation of the facilities is not expected; In carrying out the implementation activities there is no direct damage to the previously known objects of the cultural and historical heritage; No risk to human health is expected from the health-hygiene point.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The group of projects improves the N-1 Infrastructure standard for Bulgaria.
In 2019 the N-1 infrastructure standard covered by the existing infrastructure in Bulgaria is fulfilled just by 50%.
The technical parameters of IGB pipeline will allow the transmission of 9.1 million cubic meters per day (with a load factor of 0.9) in the direction of Greece to Bulgaria or 3 billion cubic meters per year. Thus, the implementation of the project will lead to the increase of the N-1 infrastructure standard with approximately 44.83% in 2021 and Bulgaria will able to meet the threshold of 100%
Further it should be noted that four of the five shippers that have reserved capacity through IGB are new participants on the Bulgarian market. This is expected to lead to an increase in the competition between natural gas traders.

F. Useful Links

Ministry of Energy: https://www.me.government.bg/en
BulgartransgazEAD PCI 6.8.2: https://www.bulgartransgaz.bg/bg/pages/rehabilitaciya-modernizaciya-i-razshirenie-na-sashtestvuvash-133.html
BulgartransgazEAD National Development Plan: https://www.bulgartransgaz.bg/en/pages/desetgodishni-planove-za-razvitie-na-mrejite-na-bulgartransg-142.html
ICGB AD project page: http://www.icgb.eu/nachalo
DESFA National Development Plan 2016-2025: DESFA: http://www.desfa.gr/userfiles/5fd9503d-e7c5-4ed8-9993-a84700d05071/DP-2016-2025_-ver-140217_clear.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_07a

Reasons for grouping [ENTSOG]

Project group represents the Alexandroupolis LNG terminal development in Greece. It includes the LNG terminal (LNG-N-62), the evacuation pipeline connecting the LNG facility to the transmission grid (TRA-N-63) and the enabler projects TRA-N-1090 and TRA-N-128.

Objective of the project(s) in the group [Promoter]

The group aims to provide an alternative source of gas supply to the markets of Greece, Bulgaria, Serbia, FYROM and onward to Hungary and Ukraine. The group aims to further integrate the gas supply of the SEE markets and will offer to the region security of supply, diversification of gas routes and sources, price flexibility and will enhance competition and liquidity.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0128	Compressor Station Kipi	DESFA S.A.	GR	Less-Advanced	6.8.1	2020	2020	NA
TRA-N-1090	Metering and Regulating Station at Alexandroupoli	DESFA S.A.	GR	Less-Advanced	6.9.1	2020	2020	On time
LNG-N-0062	LNG terminal in northern Greece / Alexandroupolis - LNG Section	Gastrade S.A.	GR	Advanced	6.9.1	2021	2021	Delayed
TRA-N-0063	LNG terminal in northern Greece / Alexandroupolis - Pipeline Section	Gastrade S.A.	GR	Advanced	6.9.1	2021	2021	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0063	762	28	0
TRA-N-0128	0	0	27
TRA-N-1090	-	-	-

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0062	8.3	170000	170000

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0062	Gastrade S.A.	Alexandroupolis Amphitriti	2021	-	253.1
LNG-N-0062	Gastrade S.A.	Alexandropoulis LNG	2021	253.1	-
TRA-N-0063	Gastrade S.A.	Alexandroupolis Amphitriti	2021	-	253.1
TRA-N-0063	Gastrade S.A.	Alexandropoulis LNG	2021	253.1	-
TRA-N-0128	DESFA S.A.	Kipi (TR) / Kipi (GR)	2020	212.2	-
TRA-N-0128	DESFA S.A.	Komotini (DESFA) Bottleneck	2020	54.4	-
TRA-N-1090	DESFA S.A.	Alexandroupolis Amphitriti	2020	268	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-62	TRA-N-63	TRA-N-1090	TRA-N-128
CAPEX [mln. EUR]	408.50	300.00	70.00	7.50	31.00
Range CAPEX		10%	10%	25%	10%
OPEX [mln. EUR/y]	22.50	18.30	0.00	0.17	4.03*

Description of costs and range [Promoter]

> LNG-N-62 (LNG terminal in northern Greece / Alexandroupolis) and TRA-N-63 (LNG pipeline section)

The CAPEX costs for these sections have been estimated in the Front-End Engineering Design (FEED) study performed by the Wood Group Kenny LTD (completed in September 2017), at a total value of € 370 mil. and comprise the costs of the Floating Storage and Regasification Unit (FSRU), FSRU Mooring System and Integration Costs, Offshore EPCIC Contract, Onshore EPC Contract as well as CAPEX for Studies, Licenses and Other Costs. The OPEX costs include the personnel costs, energy costs, service boat costs, O&M costs, insurance, as well as general and administrative expenses.
The potential level of variability of the cost of the CAPEX and OPEX is estimated at 10%.
Capex of TRA-N-128 is based on a design performed several years ago. It will be reassessed once the need to implement the project will be confirmed.

> TRA-N-1090 Metering and Regulating Station at Alexandroupoli

Capex of TRA-N-1090 has been estimated by comparison with similar projects.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Greece.
The project group **decreases the dependence of LNG** for FYROM and Greece in Best Estimate (gas before coal) and in Sustainable Transition scenarios (2030 et 2040). The decrease in dependence from LNG is linked to the fact that such group, with the creation of capacity in Kipi (at the border with Turkey), enables the connection of Europe with Turkey region, allowing Europe to access new sources through Turkey. For the same reason, and in the same scenarios, project group also **increases the number of supply sources** for Greece.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Greece and helps to **mitigate of risk of demand curtailment** in Greece in case of disruption of the single largest infrastructures in Greece (Agia Triada). In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The **reduction of the cost of gas supply** in the reference situation can be mainly explained by the access to South gas (rather than LNG) through Turkey thanks to the realisation of capacity at Kipi. This benefit can be estimated around 78 Mln EUR/y (on average) in the reference supply configuration and around 170 Mln EUR/y (on average) in case of South gas maximisation, in the low infrastructure level. These benefits are lower in the advanced infrastructure level (around 60 Mln EUR/y on average) where, given TYNDP 2018 supply potential available through Turkey, more projects can connect such supply potential to Europe.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The Project provides benefits in relation to Fuel Switch (gas replacing more expensive fuels) and CO2 reductions (gas replacing more polluting fuels). The alternative fuels that the incremental natural gas consumption replaces are assumed to be:

- Lignite in the power sector;
- Heavy fuel oil in the industrial sector;
- Light fuel oil in the residential/ commercial sector.

The estimated monetized benefits in terms of fuel switch savings in the low Infrastructure level, range from 15 Mln EUR/y in the Distributed Generation scenario to 25 Mln EUR/y in the Global Climate scenario. In the advanced infrastructure level, the fuel switch savings benefits range from 15 Mln EUR/y in the Distributed Generation scenario to 17 Mln EUR/y in the Global Climate scenario.

The estimated monetized benefits in terms of CO_2 reductions in the low infrastructure level, range from 33 Mln EUR/y in the Distributed Generation scenario to 50 Mln EUR/y in the Global Climate scenario. In the advanced infrastructure level, the CO_2 emissions savings benefits range from 23 Mln EUR/y in the Distributed Generation scenario to 38 Mln EUR/y in the Global Climate scenario.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
FYROM	8%	3%	-5%				12%	6%	-6%										13%	0%	-13%			
Greece	7%	2%	-5%				12%	4%	-8%										11%	0%	-11%			
LNG and Interconnection Capacity Diversification (LICD)																								
Greece	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Supply Source Access (SSA)																								
Greece	2	3	1				2	3	1										2	3	1			

	2025						2030						2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																					
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																					
Croatia													19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																					
Croatia													22%	21%	-1%						
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																					
Croatia													19%	18%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																					
Croatia													22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																					
Croatia													19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																					
Croatia													22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																					
Croatia													19%	18%	-1%						
Curtailment Rate Peak Day (%)																					
Croatia													22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																					
Greece	62%	81%	19%	90%	100%	10%	52%	69%	18%				71%	90%	19%	69%	89%	19%			
Remaining Flexibility Peak day (%)																					
Bulgaria				88%	89%	1%															
Greece	46%	64%	17%	54%	72%	18%	27%	41%	15%	51%	69%	17%	44%	60%	16%	37%	52%	16%	46%	62%	16%
Poland										80%	81%	1%									
Single Largest Infrastructure Disruption (SLID)-Greece																					
FYROM										20%	0%	-20%	22%	0%	-22%	28%	0%	-28%	22%	0%	-22%
Greece	27%	0%	-27%	23%	0%	-23%	36%	0%	-36%	21%	0%	-21%	23%	0%	-23%	29%	0%	-29%	22%	0%	-22%
Single Largest Infrastructure Disruption (SLID)-Slovakia																					
Austria							2%	0%	-2%												
Belgium							2%	0%	-2%												
Germany							2%	0%	-2%												
Luxembourg							2%	0%	-2%												
Slovenia							2%	0%	-2%							2%	0%	-2%			
Sweden							2%	0%	-2%												
Switzerland							2%	0%	-2%												
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																					
Croatia													19%	18%	-1%						
Ukraine Disruption Curtailment Rate Peak Day (%)																					
Croatia													22%	21%	-1%						
Italy							6%	5%	-1%							3%	2%	-1%			
Serbia																			6%	5%	-1%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
FYROM				6%	0%	-6%																		
Greece				4%	0%	-4%																		
LNG and Interconnection Capacity Diversification (LICD)																								
Greece	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Greece	62%	81%	19%	90%	100%	10%	52%	69%	18%							71%	90%	19%	69%	89%	19%			
Remaining Flexibility Peak day (%)																								
Greece	46%	64%	17%	54%	72%	18%	27%	41%	15%	51%	69%	17%				44%	60%	16%	37%	52%	16%	46%	62%	16%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	62	99	75	14	11	11
	Supply Maximization	152	194	165	24	46	32
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2	4	3	0	0	0
	2 Weeks	0	0	0	0	0	0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	33	41	50	23	29	35
	Fuel Switch savings	15	23	25	15	16	17

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	86	40	105	58	99	62	99	62
Supply Maximization	181	0	200	10	194	152	97	76
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4	2	4	2	1	0	4	2
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	50	33	50	33	50	33	50	33
Fuel Switch savings	25	15	25	15	25	15	25	15

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	18	9	27	23	14	11	14	11
Supply Maximization	56	1	52	0	46	24	23	12
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0	0	0	0	0	0	0	0
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	35	23	35	23	35	23	35	23
Fuel Switch savings	17	15	17	15	17	11	17	15

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-062	LNG Terminal (FSRU)	15,000 m^2	The project is not expected to have significant impacts on a Natura 2000 site as documented in the Environmental Impact Assessment of the project. The EIA is environmentally approved by the competent Authorities through the environmental consent for the project (Environmental Terms).
TRA-N-063	Pipeline	224,000 m^2	
TRA-N-0128	Compressor station	The ESIA has not yet been prepared	Protected areas are not affected
TRA-N-1090	M/R Station	N/A	Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Impact on air and sea water	The FSRU will be equipped with a hybrid regasification system (50% sea water and 50% gas fired) in order to balance emissions to the atmosphere and water discharges in the sea	CAPEX = approx. 50 mil. Euro OPEX = approx. 4 mil. Euro / year (related to energy costs)	CO2 emission costs = approx. 2.5 mil. Euro / year
The compressor station operation will generate exhaust gas emissions and noise. The M/R station will not have any impact on air and sea water.	Noise will be mitigated by housing the station in a building and by using enclosures for the turbo-compressors. Moreover, the station will be located at 3 km distance from the closer village. Chimney height and selection of low NOx emitting units will mitigate the exhaust gas issues.	Not yet available	Not yet available

Environmental Impact explained [Promoter]

In the Environmental Impact Assessment (EIAS) of the project, alternative solutions were examined with regards to the environmental impacts of the project and the solution with the smaller environmental impacts was selected. As demonstrated by the EIA, the project is not expected to have significant negative environmental impacts. The area in which it is located does not belong to any part of the environmentally protected areas and priority habitats such as Posidonia oceanica meadows. Bio-communities and habitats of high ecological sensitivity are not affected. In the land part forest areas are avoided and no significant riparian vegetation is affected. The operation of the project will not have a significant impact on the quality of the atmosphere, seawater or terrestrial aquifers and water resources. Also, the route of the pipeline does not meet known archaeological sites or other findings, while negative effects on local tourism, recreation or aesthetics are not expected. As regards impacts on human activities, fishing is not materially affected, and any potential damage to crops from the installation of the pipeline will be extremely small, temporary and reversible. In any case, however, with the measures envisaged in this EIA, any, even minor, effects will either be eliminated or minimized. Preventive measures are foreseen in the EIAS for the prevention of environmental impacts. During the construction of the project, the Contractor will assume all additional costs related to the environmental rehabilitation and maintenance of the landscape and the monitoring of important environmental parameters. Also, under the terms of the EPC Contract, it is responsible for damages and / or compensation for damage in the event of an environmental accident. The Contractor will use an Environmental Management System based on ISO 14001: 2004 and will comply with the HSE Performance System.

Additional information (Environmental Impact) [Promoter]

Based on the “Thrace Water Department River Basin Management Plan (EL12)” the project is located in the Water System of Evros (EL1210), in the Underground Water System of Alexandroupolis (EL200130) and in the Coastal water system of Alexandroupolis Coast (EL1210C0008N). The project is compatible with the measures described in the approved Management Plan. The project is not expected to degrade the status of the water systems nor prevent the achievement of the objectives set for the water systems.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The group apart from the benefits described above is also anticipated to have a positive impact in Greece and Bulgaria, in a potential Ukraine disruption curtailment in a peak day and under specific circumstances that differ from ENTSOG analysis. More specifically:

> **Greece disruption:**

During the potential disruption, no natural gas supply will be available via the Sidirokastro entry point, which is the entry point for direct Russian gas supplies to Greece. In addition, in the case of such disruption, natural gas from other sources will also not be available via the Sidirokastro entry point as gas supply in Europe will be in shortage and neighbouring countries will not have any surplus gas to export to Greece.
It is further assumed that during the disruption of Russian gas, all remaining gas supply infrastructure in the country will supply gas at full capacity i.e 28.25 mcm/day:

- Kipi at 4.3 mcm/d;
- TAP at 4.8 mcm/d;
- Revithoussa at 19.2 mcm/d.

The disruption analysis is carried out on the basis of peak demand projections for Greece as it is possible that the disruption could occur during a period of high gas demand. Using 2023 as the reference year for the analysis we examine the following scenarios regarding peak demand for 2023:

1. Peak Demand 2023 = Peak Demand 2019 = 26.5 mcm/day
   Existing infrastructure covers peak demand by a small margin of 1.75 mcm/day.
2. As per DESFA's 10-year development study (2019-2028) demand growth between 2019 and 2023 is estimated at 7%. Peak Demand is adjusted at the same %, i.e. Peak Demand 2019 = 26.5 mcm/day x 1.07 = 28.4 mcm/day.
   Existing infrastructure marginally does not cover peak demand. Remaining gap at 0.15 mcm/day. No excess available for exports.
3. As per Gastrade's demand projections, growth between 2019 and 2023 is estimated at 14%. Peak Demand is adjusted at the same %, i.e. Peak Demand 2019 = 27 mcm/day x 1.14 = 30.8 mcm/day
   Existing infrastructure does not cover peak demand. Remaining gap at 2.55 mcm/day. No excess available for exports

Thus, the Project supports the security of supply in Greece in scenarios 2 & 3 and helps maintaining a positive remaining flexibility at peak day under such disruption in these scenarios.

> **Bulgaria disruption:**

During such disruption, it is assumed that no natural gas supply will be available via the Negru Voda 1,2,3 entry points and via IBS interconnector (from 2022 onwards) which are the routes for the transmission/transit of Russian gas supplies to/via the country.
In addition, in this scenario no other natural gas supplies will be available via these entry points as gas supply in Europe will be in shortage and neighbouring countries will not have any natural gas surpluses to export to Bulgaria. Shah Deniz supplies via TAP and IGB will be capped at the currently contracted supply to Bulgaria of 1.0 bcm/year or 2.9 mcm/d, since all other contracted volumes via TAP will be fully absorbed due to gas shortage in the wider region.
Imports from Greece via Sidirokastro will not be available as Greece will not have any natural gas surpluses to export to Bulgaria (see above re. Greece disruption analysis).
Thus, during the Ukraine disruption, the remaining gas supply infrastructure in the country will be able to provide, at full capacity, 17.3 mcm/day of gas, as follows: IBR: negligible;

Other benefits explained (*cont'd*) [Promoter]

- UGS Chiren: 3.4 mcm/d;
- Local production: 1.9 mcm/d;
- ITB: 9.1 mcm/d (from 2022) (*)
- IGB: (only via TAP): 2.9 mcm/day

Similarly, the disruption analysis is carried out on the basis of peak demand projections for Greece as it is possible that the disruption could occur during a period of high gas demand.

Using 2023 as the reference year for the analysis, according to Bulgartransgaz NDP, peak demand for 2023 is estimated at 19.7 mcm/day. Hence, existing infrastructure will not be able to cover the peak demand and the Project will support the security of supply in Bulgaria. Thus, the Project will cover the supply gap of 2.4 mcm/day via IGB (this supply gap assumes that there will be available surplus volumes from Turkey to export to Bulgaria via ITB, otherwise the supply gap will be bigger).

(*) If no surplus volumes or limited surplus volumes are available from Turkey to export to Bulgaria, the Project could cover the supply gap of Bulgaria for up to 6.4 mcm/day with the initial planned capacity of IGB and to the full extent i.e. 10.7 mcm/day should IGB be upgraded to 5 bcm/yr. Thus, in the case of Ukrainian disruption at peak day, the Project can offer the additional required capacity to safeguard the security of supply in Bulgaria.

In addition, the Project is anticipated to support the viability and/or commercial attractiveness of regional or inter-regional transmission and/or interconnection projects and provide an outlet for the transmission and marketing of new gas findings in

F. Useful Links

GASTRADE website: www.gastrade.gr
DESFA National Development Plan:
http://www.desfa.gr/en/national-natural-gas-system/development-of-the-nngs/development-plan

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_07b

Reasons for grouping [ENTSOG]

Project group represents the Alexandroupolis LNG terminal development in Greece. It includes the LNG terminal (LNG-N-62), the evacuation pipeline connecting the LNG facility to the transmission grid (TRA-N-63) and enabler projects TRA-N-1090 and TRA-N-128. In order to better capture the impact of the LNG terminal, Turkish supplies though Kipi have been capped.

Objective of the project(s) in the group [Promoter]

The Project aims to provide an alternative source of gas supply to the markets of Greece, Bulgaria, Serbia, FYROM and onward to Hungary and Ukraine. The Project aims to further integrate the gas supply of the SEE markets and to offer to the region security of supply, diversification of gas routes and sources, price flexibility and will enhance competition and liquidity.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0128	Compressor Station Kipi	DESFA S.A.	GR	Less-Advanced	6.8.1	2020	2020	NA
TRA-N-1090	Metering and Regulating Station at Alexandroupoli	DESFA S.A.	GR	Less-Advanced	6.9.1	2020	2020	On time
LNG-N-0062	LNG terminal in northern Greece / Alexandroupolis - LNG Section	Gastrade S.A.	GR	Advanced	6.9.1	2021	2021	Delayed
TRA-N-0063	LNG terminal in northern Greece / Alexandroupolis - Pipeline Section	Gastrade S.A.	GR	Advanced	6.9.1	2021	2021	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0063	762	28	0
TRA-N-0128	0	0	27
TRA-N-1090	-	-	-

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0062	8.3	170000	170000

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0062	Gastrade S.A.	Alexandroupolis Amphitriti	2021	-	253.1
LNG-N-0062	Gastrade S.A.	Alexandropoulis LNG	2021	253.1	-
TRA-N-0063	Gastrade S.A.	Alexandroupolis Amphitriti	2021	-	253.1
TRA-N-0063	Gastrade S.A.	Alexandropoulis LNG	2021	253.1	-
TRA-N-0128	DESFA S.A.	Kipi (TR) / Kipi (GR)	2020	212.2	-
TRA-N-0128	DESFA S.A.	Komotini (DESFA) Bottleneck	2020	54.4	-
TRA-N-1090	DESFA S.A.	Alexandroupolis Amphitriti	2020	268	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-62	TRA-N-63	TRA-N-1090	TRA-N-128
CAPEX [mln. EUR]	408.50	300.00	70.00	7.50	31.00
Range CAPEX		10%	10%	25%	10%
OPEX [mln. EUR/y]	22.50	18.30	0.00	0.17	4.03*

Description of costs and range [Promoter]

> LNG-N-62 (LNG terminal in northern Greece / Alexandroupolis) and TRA-N-63 (LNG pipeline section)

The CAPEX costs for these sections have been estimated in the Front-End Engineering Design (FEED) study performed by the Wood Group Kenny LTD (completed in September 2017), at a total value of € 370 mil. and comprise the costs of the Floating Storage and Regasification Unit (FSRU), FSRU Mooring System and Integration Costs, Offshore EPCIC Contract, Onshore EPC Contract as well as CAPEX for Studies, Licenses and Other Costs. The OPEX costs include the personnel costs, energy costs, service boat costs, O&M costs, insurance, as well as general and administrative expenses.
The potential level of variability of the cost of the CAPEX and OPEX is estimated at 10%.
Capex of TRA-N-128 is based on a design performed several years ago. It will be reassessed once the need to implement the project will be confirmed.

> TRA-N-1090 Metering and Regulating Station at Alexandroupoli

Capex of TRA-N-1090 has been estimated by comparison with similar projects.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of entry capacities** (LICD indicator) in Greece.

> **Security of Supply:**

The project group helps to mitigate **risk of demand curtailment** in Greece and FYROM in case of disruption of the single largest infrastructure in Greece (Agia Triada).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The Project provides benefits in relation to Fuel Switch (gas replacing more expensive fuels) and CO2 reductions (gas replacing more polluting fuels). The alternative fuels that the incremental natural gas consumption replaces are assumed to be:

- Lignite in the power sector;
- Heavy fuel oil in the industrial sector;
- Light fuel oil in the residential/ commercial sector.

The estimated monetized benefits in terms of fuel switch savings in the low Infrastructure level, range from 15 Mln EUR/y in the Distributed Generation scenario to 25 Mln EUR/y in the Global Climate scenario. In the advanced infrastructure level, the fuel switch savings benefits range from 15 Mln EUR/y in the Distributed Generation scenario to 17 Mln EUR/y in the Global Climate scenario.

The estimated monetized benefits in terms of CO_2 reductions in the low infrastructure level, range from 33 Mln EUR/y in the Distributed Generation scenario to 50 Mln EUR/y in the Global Climate scenario. In the advanced infrastructure level, the CO_2 emissions savings benefits range from 23 Mln EUR/y in the Distributed Generation scenario to 38 Mln EUR/y in the Global Climate scenario.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Greece	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Single Largest Infrastructure Disruption (SLID)-Greece																								
FYROM										20%	0%	-20%				22%	0%	-22%	28%	0%	-28%	22%	0%	-22%
Greece	27%	0%	-27%	23%	0%	-23%	36%	0%	-36%	21%	0%	-21%				23%	0%	-23%	29%	0%	-29%	22%	0%	-22%

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Greece	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	0	0	0	0	0	0
	Supply Maximization	0	0	0	0	0	0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2	3	3	0	0	0
	2 Weeks	0	0	0	0	0	0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	33	41	50	23	29	35
	Fuel Switch savings	15	23	25	15	16	17

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0	0	0	0	0	0	0	0
Supply Maximization	0	0	0	0	0	0	0	0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3	2	3	2	0	0	3	2
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	50	33	50	33	50	33	50	33
Fuel Switch savings	25	15	25	15	25	15	25	15

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0	0	7	3	0	0	0	0
Supply Maximization	0	0	10	0	0	0	0	0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0	0	0	0	0	0	0	0
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	35	23	35	23	35	23	35	23
Fuel Switch savings	17	15	17	15	17	11	17	15

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmen
by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the p

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive are
LNG-N-062	LNG Terminal (FSRU)	15,000 m^2	The project is not expected t documented in the Environm environmentally approved environmental consent for th
TRA-N-063	Pipeline	224,000 m^2	
TRA-N-0128	Compressor station	The ESIA has not yet been prepared	Protected areas are not affec
TRA-N-1090	M/R Station	N/A	Protected areas are not affec

Potential impact	Mitigation measures	Related costs in CAPEX a
Impact on air and sea water	The FSRU will be equipped with a hybrid regasification system (50% sea water and 50% gas fired) in order to balance emissions to the atmosphere and water discharges in the sea	CAPEX = approx. 5 OPEX = approx. 4 (related to energy
The compressor station operation will generate exhaust gas emissions and noise. The M/R station will not have any impact on air and sea water.	Noise will be mitigated by housing the station in a building and by using enclosures for the turbo-compressors. Moreover, the station will be located at 3 km distance from the closer village. Chimney height and selection of low NOx emitting units will mitigate the exhaust gas issues.	Not yet available

Environmental Impact explained [Promoter]

In the Environmental Impact Assessment (EIAS) of the project, alternative solutions were examined with regards to the environmental impac
environmental impacts was selected. As demonstrated by the EIA, the project is not expected to have significant negative environmental
belong to any part of the environmentally protected areas and priority habitats such as Posidonia oceanica meadows. Bio-communities a
affected. In the land part forest areas are avoided and no significant riparian vegetation is affected. The operation of the project will no
atmosphere, seawater or terrestrial aquifers and water resources. Also, the route of the pipeline does not meet known archaeological sites
tourism, recreation or aesthetics are not expected. As regards impacts on human activities, fishing is not materially affected, and any poter
pipeline will be extremely small, temporary and reversible. In any case, however, with the measures envisaged in this EIA, any, even mino
Preventive measures are foreseen in the EIAS for the prevention of environmental impacts. During the construction of the project, the Con
the environmental rehabilitation and maintenance of the landscape and the monitoring of important environmental parameters. Also, unde
for damages and / or compensation for damage in the event of an environmental accident. The Contractor will use an Environmental Manag
comply with the HSE Performance System.

Additional information (Environmental Impact) [Promoter]

Based on the “Thrace Water Department River Basin Management Plan (EL12)” the project is located in the Water System of Evros (EL1210), in the Underground Water System of Alexandroupolis (EL200130) and in the Coastal water system of Alexandroupolis Coast (EL1210C0008N). The project is compatible with the measures described in the approved Management Plan. The project is not expected to degrade the status of the water systems nor prevent the achievement of the objectives set for the water systems.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The group, apart from the benefits described above, is also anticipated to have significant benefits to the EU Bill indicator, as per group EAST_07a assessment. Currently, and as per forward projections for the next 1-2 years, LNG pricing in Greece, whether short term or long term, is materially lower than pipeline gas pricing originating from other sources through Turkey. Please note that this is not the case for existing legacy LNG supply contract to Greece, which was agreed 20 years ago and therefore is significantly more expensive than today's LNG pricing. Hence, curtailing supplies from Turkey, could also not detriment the benefits to the EU bill by the project group, as Turkish pipeline gas into Greece, assumed in the reference supply situation considered in TYNDP 2018 is priced at the same level as Algerian LNG in Greece, and it is assumed to remain at a premium to current and forward LNG prices in Greece.

In addition, the group, apart from the benefits described above, is also anticipated to have a positive impact in Greece and Bulgaria, in a potential Ukraine disruption curtailment in a peak day and under specific circumstances that differ from ENTSOG analysis. More specifically:

- **Greece disruption:**

During the potential disruption, no natural gas supply will be available via the Sidirokastro entry point, which is the entry point for direct Russian gas supplies to Greece. In addition, in the case of such disruption, natural gas from other sources will also not be available via the Sidirokastro entry point as gas supply in Europe will be in shortage and neighbouring countries will not have any surplus gas to export to Greece.
It is further assumed that during the disruption of Russian gas, all remaining gas supply infrastructure in the country will supply gas at full capacity i.e 28.25 mcm/day:

- Kipi at 4.3 mcm/d;
- TAP at 4.8 mcm/d;
- Revithoussa at 19.2 mcm/d.

The disruption analysis is carried out on the basis of peak demand projections for Greece as it is possible that the disruption could occur during a period of high gas demand. Using 2023 as the reference year for the analysis we examine the following scenarios regarding peak demand for 2023:

1. Peak Demand 2023 = Peak Demand 2019 = 26.5 mcm/day
   Existing infrastructure covers peak demand by a small margin of 1.75 mcm/day.
2. As per DESFA's 10-year development study (2019-2028) demand growth between 2019 and 2023 is estimated at 7%. Peak Demand is adjusted at the same %, i.e. Peak Demand 2019 = 26.5 mcm/day x 1.07 = 28.4 mcm/day.
   Existing infrastructure marginally does not cover peak demand. Remaining gap at 0.15 mcm/day. No excess available for exports.
3. As per Gastrade's demand projections, growth between 2019 and 2023 is estimated at 14%. Peak Demand is adjusted at the same %, i.e. Peak Demand 2019 = 27 mcm/day x 1.14 = 30.8 mcm/day
   Existing infrastructure does not cover peak demand. Remaining gap at 2.55 mcm/day. No excess available for exports

Thus, the Project supports the security of supply in Greece in scenarios 2 & 3 and helps maintaining a positive remaining flexibility at peak day under such disruption in these scenarios.

- **Bulgaria disruption:**

During such disruption, it is assumed that no natural gas supply will be available via the Negru Voda 1,2,3 entry points and via IBS interconnector (from 2022 onwards) which are the routes for the transmission/transit of Russian gas supplies to/via the country.

Other benefits explained (*cont'd*) [Promoter]

In addition, in this scenario no other natural gas supplies will be available via these entry points as gas supply in Europe will be in shortage and neighbouring countries will not have any natural gas surpluses to export to Bulgaria. Shah Deniz supplies via TAP and IGB will be capped at the currently contracted supply to Bulgaria of 1.0 bcm/year or 2.9 mcm/d, since all other contracted volumes via TAP will be fully absorbed due to gas shortage in the wider region.

Imports from Greece via Sidirokastro will not be available as Greece will not have any natural gas surpluses to export to Bulgaria (see above re. Greece disruption analysis).
Thus, during the Ukraine disruption, the remaining gas supply infrastructure in the country will be able to provide, at full capacity, 17.3 mcm/day of gas, as follows: IBR: negligible;

> UGS Chiren: 3.4 mcm/d;
> Local production: 1.9 mcm/d;
> ITB: 9.1 mcm/d (from 2022) (*)
> IGB: (only via TAP): 2.9 mcm/day

Similarly, the disruption analysis is carried out on the basis of peak demand projections for Greece as it is possible that the disruption could occur during a period of high gas demand.
Using 2023 as the reference year for the analysis, according to Bulgartransgaz NDP, peak demand for 2023 is estimated at 19.7 mcm/day. Hence, existing infrastructure will not be able to cover the peak demand and the Project will support the security of supply in Bulgaria. Thus, the Project will cover the supply gap of 2.4 mcm/day via IGB (this supply gap assumes that there will be available surplus volumes from Turkey to export to Bulgaria via ITB, otherwise the supply gap will be bigger).

(*) If no surplus volumes or limited surplus volumes are available from Turkey to export to Bulgaria, the Project could cover the supply gap of Bulgaria for up to 6.4 mcm/day with the initial planned capacity of IGB and to the full extent i.e. 10.7 mcm/day should IGB be upgraded to 5 bcm/yr. Thus, in the case of Ukrainian disruption at peak day, the Project can offer the additional required capacity to safeguard the security of supply in Bulgaria.

F. Useful Links

GASTRADE website: www.gastrade.gr
DESFA National Development Plan:
http://www.desfa.gr/en/national-natural-gas-system/development-of-the-nngs/development-plan

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_08

Reasons for grouping [ENTSOG]

The project group includes the stand-alone UGS project aiming at expanding the capacity of the existing UGS in Chiren, BG. The submission includes also the evacuation pipeline connecting the UGS facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

UGS Chiren expansion is part of the concept of expanding the storage capacity in the Southeast European region. It is located in Bulgaria and is an integral part of the development of the regional gas system consisting of interconnections (IGB, ITB, IBS), LNG terminals (GR) and storage facilities.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
UGS-N-0138	UGS Chiren Expansion	Bulgartransgaz EAD	BG	Advanced	6.20.2	2024	2024	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0138	4.8	4.6	450

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
UGS-N-0138	Bulgartransgaz EAD	GMS Chiren	2024	48.9	51
UGS-N-0138	Bulgartransgaz EAD (SSO)	GMS Chiren	2024	51	48.9

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-138
CAPEX [mln. EUR]	226.40	226.40
Range CAPEX		20%
OPEX [mln. EUR/y]	3.08	3.08

Description of costs and range [Promoter]

The CAPEX includes all the costs for the implementation of the projects until their commissioning, incl. FEED, supervision, construction works, delivery of materials, project management, publicity, etc. The OPEX figures are a preliminary estimation by the project promoters. The range of CAPEX, indicated in the above table, reflects the uncertainty of costs due to the stage of the project development.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The project group **increases the remaining flexibility** for Bulgaria.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, Hungary and Serbia.

> **Market Integration:**

In case of cheap tariff sensitivity (compared to the 700 EUR/GWh reference tariff used) the project shows benefits in terms of reduction of cost of gas supply. The results show in fact that lower tariffs allow for a higher utilisation of the storage instead of alternative infrastructures to cover Bulgarian demand and exports to Serbia (that becomes more convenient than using Serbian storage capacity) and Bosnia Herzegovina (through Serbia).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The implementation of the project will help to increase the use of natural gas for the domestic and industrial needs of the region. The use of technologies and equipment based on best available techniques in the new drilling envisaged for construction will contribute to the environmentally friendly and efficient use of natural resources. Towards sustainability of the impact on climate change, long-term and sustainable reduction of greenhouse gas emissions is expected in the affected regions.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030						2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																					
Remaining Flexibility 2-Week Cold Spell (%)																					
Denmark																			89%	91%	1%
Remaining Flexibility Peak day (%)																					
Bulgaria	88%	100%	12%	88%	100%	12%	75%	100%	25%	77%	100%	23%	79%	100%	21%	81%	100%	19%	78%	100%	22%
Poland										80%	81%	1%									
Single Largest Infrastructure Disruption (SLID)-Slovakia																					
Austria							2%	0%	-2%												
Belgium							2%	0%	-2%												
Germany							2%	0%	-2%												
Luxembourg							2%	0%	-2%												
Slovenia							2%	0%	-2%							2%	0%	-2%			
Sweden							2%	0%	-2%												
Switzerland							2%	0%	-2%												
Ukraine Disruption Curtailment Rate Peak Day (%)																					
Bosnia Herzegovina	10%	6%	-4%	6%	2%	-4%	8%	6%	-2%	6%	0%	-6%	4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Bulgaria	10%	4%	-6%	6%	1%	-5%	9%	6%	-3%	7%	0%	-7%	5%	0%	-5%	8%	6%	-2%	6%	0%	-6%
Czechia																6%	5%	-1%			
FYROM										8%	0%	-8%	6%	3%	-3%				6%	0%	-6%
Germany																6%	5%	-1%			
Hungary	9%	4%	-5%	5%	0%	-5%															
Italy							6%	5%	-1%												
Luxembourg																8%	6%	-2%			
Serbia	10%	4%	-6%	6%	0%	-6%	8%	6%	-2%	6%	0%	-6%	4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Slovenia																8%	6%	-2%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	0.0	0.0	0.0	0.1	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.1	0.0	0.1
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.9	3.5	2.4	0.0	0.0	0.0
	2 Weeks	0.9	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.2	0.3	0.2	0.2	0.3	0.2
	Fuel Switch savings	0.0	0.3	0.0	0.0	0.3	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	6.3	5.6	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	6.3	4.5	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.5	0.9	3.5	0.9	1.9	0.9	3.5	0.9
2 Weeks	0.9	0.0	0.9	0.0	0.0	0.0	0.9	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.1	0.0	6.3	5.9	0.1	0.0	0.1	0.0
Supply Maximization	0.1	0.0	6.4	0.0	0.1	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.3	0.2	0.3	0.2	0.3	0.2	0.3	0.2
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0138	Underground gas storage	198 km^2	Sensitive areas are not affected.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The current status of the project is in the preparatory phase, including the completion of all necessary expansion studies (geological, geophysical and other, related to the preparation of the management works for the subsequent new parameters). As part of this phase, 3D seismic studies of the Chiren structure are being carried out and a notification for this has been made to the Competent Authority for the Environment. On 26.06.2014 a notification about the project for carrying out 3D field seismic surveys on the Chiren structure area was submitted to the MOEW, as two protected areas fall within the boundaries of the area to conduct studies of UGS Chiren: "Bozhiya most-Ponora" code BG0000594 and PA "Bozhite Mostove" BG0000487, but the environmental conditions are not affected. After the investigations by the MOEW, the competent authority issued an opinion No НСЗП-273 of August 21, 2014, stating that there is no need to perform EIA and the project can be implemented in compliance with the measures set out in the Opinion.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The implementation of the project will reduce emissions of harmful substances in the atmosphere as a result of replacing the use of conventional fuels and hence improving the ambient air quality.

F. Useful Links

PCI project webpage: https://www.bulgartransgaz.bg/en/pages/razshirenie-kapaciteta-na-pgh-chiren-poi-6-20-2--134.html
Bulgartransgaz TNDP2018-2027:
https://www.bulgartransgaz.bg/files/useruploads/files/amd/tyndp%202017/TYNDP_2018_2027_en.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_09

Reasons for grouping [ENTSOG]

The project group is composed by the UGS project in South Kavala (GR) and the enabler project (TRA-N-1092).

Objective of the project(s) in the group [Promoter]

The project group aims at improving the Security of supply and the competition in the Region by providing an important amount of storage space close to the existing and future interconnections of the Greek Transmission System with those of neighbouring countries.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-1092	Metering and Regulating Station at UGS South Kavala	DESFA S.A.	GR	Less-Advanced	6.20.3	2023	2023	Rescheduled
UGS-N-0385	South Kavala Underground Gas Storage facility	Hellenic Republic Asset Development Fund	GR	Less-Advanced	6.20.3	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-1092	450	-	74

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0385	5	4	360

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-1092	DESFA S.A.	UGS South Kavala (GR)	2023	44	55
UGS-N-0385	Hellenic Republic Asset Development Fund	UGS South Kavala (GR)	2023	55	44

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-385	TRA-N-1092
CAPEX [mln. EUR]	327.50	320.00	7.50
Range CAPEX		25%	25%
OPEX [mln. EUR/y]	4.98	4.80	0.18

Description of costs and range [Promoter]

Costs are representative of the best estimations of the promoters at the time of the data collection for the TYNDP 2018. Updated CAPEX and OPEX estimates will be available after the completion of the ongoing pre-feasibility phase, currently envisaged for Q4 2019.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The project group allows for **full mitigation of risk of demand curtailment** in Austria, Belgium, Germany, Luxembourg, Slovenia, Sweden and Switzerland in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod (UA) - Velké Kapušany (SK)) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects group is expected to allow for more extended replacement of fuels with higher carbon content such as oil (largely used in Greece for space heating) and lignite (used for power generation) by making available adequate quantities of natural gas at the peak demand periods occurring in winter. Similar benefits will be enabled in the neighbouring countries, through the existing and future interconnections of the Greek Transmission System with those of neighbouring countries. (IGB, Interconnector Greece – North Macedonia).

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels								
	2030			2040					
	SUSTAINABLE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply									
Single Largest Infrastructure Disruption (SLID)-Slovakia									
Austria	2%	0%	-2%						
Belgium	2%	0%	-2%						
Germany	2%	0%	-2%						
Luxembourg	2%	0%	-2%						
Slovenia	2%	0%	-2%	2%	0%	-2%			
Sweden	2%	0%	-2%						
Switzerland	2%	0%	-2%						

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	1.6	1.3	0.0	0.0	0.0
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	6.1	6.4	8.2	2.6	2.8	3.5
	Fuel Switch savings	2.1	3.9	4.4	2.1	1.7	1.9

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.6	0.0	1.6	0.0	0.0	0.0	1.6	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.2	6.1	8.2	6.1	8.2	6.1	8.2	6.1
Fuel Switch savings	4.4	2.1	4.4	2.1	4.4	2.1	4.4	2.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	3.5	2.6	3.5	2.6	3.5	2.6	3.5	2.6
Fuel Switch savings	2.1	1.7	2.1	1.7	1.9	0.9	2.1	1.7

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0385	Underground storage		Protected areas are not affected
	Metering Station	Not applicable	Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Noise, exhaust gas emissions	Turbo-compressor units placed in enclosures and housed in building, appropriate height of chimney and distance from inhabited areas.	Not yet estimated	Not yet estimated
Almost n**one**	Not applicable	Not applicable	Not applicable

Environmental Impact explained [Promoter]

Environmental impact could relate to noise and exhaust gas emissions during the injection period, which will be fully mitigated by taking measures such as enclosures for the turbo-compressor units and the appropriate height and distance from the inhabited areas of the chimney.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Additionally, to the benefits already captured, the project will have a positive impact on the level of competition in the region as it will enable more traders to take advantage of supply contracts with delivery terms that may not match the demand pattern, thus offering lower prices
Furthermore, the project will enhance diversification of gas sourcing in the region by allowing market participants to purchase and store gas quantities during off-peak periods.

Due to the substitution of fuels with higher carbon content, as a result of the increased availability of natural gas during peak demand periods, the project group is expected to have a substantially beneficial impact on the improvement of air quality with the reduction of pollutants like SOx, PMs and NOx.
Regarding the environmental impact during construction and operation, all available mitigation measures will be taken in order to avoid the noise and exhaust gas emission generated during the gas injection period like the use of enclosures for the turbo-compressor units, the appropriate height of the chimney etc.

The facilitation of the penetration of natural gas in the residential and commercial sector, by making available adequate quantities of gas during the peak demand period will enhance the substitution of the more polluting oil and the drastic reduction of the associated emissions of SOx, NOx and PMs which is not taken into account in the benefit monetization of the PS-CBA and should be considered for the drafting of the full picture of the project's environmental benefits.

F. Useful Links

South Kavala Natural Gas Storage project page: https://www.hradf.com/en/portfolio/view/26/south-kavala-natural-gas-storage

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

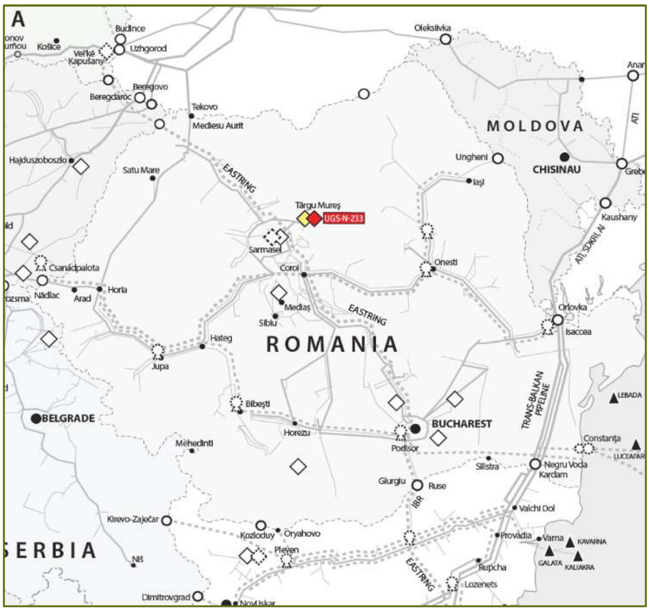
Project Group EAST_10

Reasons for grouping [ENTSOG]

The project group includes the stand-alone UGS project to be developed by Depomures in Romania. The submission includes also the evacuation pipeline connecting the UGS facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

The project group aims at increasing operational independence by building its own compression units as currently compression services are rented from a third party; expand the storage capacity up to 600 mcm; increase flexibility of the storage by increasing injection and withdrawal capacity up to 5 mcm / day.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year	Last Comm. Year	Compared to TYNP 2017
UGS-N-0233	Depomures	Engie Romania SA	RO	Advanced	6.20.4	2021	2024	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0233	3.3	3.3	300

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
UGS-N-0233	Depomures	UGS Targu Mures	2021	18.92	18.92
UGS-N-0233	Depomures	UGS Targu Mures	2024	15.78	15.78

Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[1]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-233
CAPEX [mln. EUR]	87.00	87.00
Range CAPEX		10%
OPEX [mln. EUR/y]	1.50	1.50

Description of costs and range [Promoter]

The CAPEX has been estimated following the FEED study and also includes the CAPEX already spent. The actual CAPEX is to be confirmed after procurement phase for the remaining investments to be implemented.
Regarding the incremental OPEX, the electricity cost is the most significant element (approximately 60 %). Hence, the OPEX range will mostly depend on the evolution of electricity price in the future.

[1] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The project group **increases the remaining flexibility** for Romania.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Romania.
The project group allows for **partially mitigates risk of demand curtailment** in Romania in case of disruption of the single largest infrastructures in Romania (VIP Mediesu Aurit - Isaccea (RO-UA)).
Higher benefits for security of supply are observed in case of 2-weeks peak situation where storages provide the necessary flexibility to ensure balance between supply and demand.

> **Market Integration:**

In case of cheap tariff sensitivity (compared to the 700 EUR/GWh reference tariff used) the project shows some benefits in terms of reduction of cost of gas supply. The results show in fact that lower tariffs allow for a higher utilisation of the storage instead of alternative infrastructures to Romanian demand.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The need for low carbon power generation calls for more flexibility in the gas market, particularly in Romania where the coal has a rather high share in the energy mix. Also, gas fired power plants, due to their responsiveness as well as their lower carbon contribution, will become a practical back up option for renewable energy, beyond being a valid part of the solution for climate change in its own right.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Romania	51%	55%	4%	60%	64%	4%	43%	47%	4%	28%	31%	4%	18%	21%	3%	19%	22%	3%	30%	34%	4%	23%	27%	4%
Remaining Flexibility Peak day (%)																								
Bulgaria																79%	81%	2%						
Poland										80%	81%	1%												
Romania	30%	33%	3%	34%	37%	3%	23%	26%	3%	12%	16%	3%	4%	7%	3%	2%	5%	3%	10%	13%	3%	8%	11%	4%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania	23%	20%	-3%	20%	17%	-3%	29%	26%	-3%	35%	32%	-3%	41%	38%	-3%	43%	40%	-3%	38%	36%	-3%	40%	36%	-4%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Romania	12%	7%	-4%	6%	2%	-4%	19%	15%	-4%	27%	23%	-4%	34%	30%	-3%	34%	31%	-3%	28%	24%	-4%	32%	28%	-4%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Romania	23%	20%	-3%	20%	17%	-3%	29%	26%	-3%	35%	32%	-3%	41%	38%	-3%	43%	40%	-3%	38%	36%	-3%	40%	36%	-4%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.5	2.1	1.9	0.0	0.0	0.0
	2 Weeks	0.7	10.0	9.9	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.6	0.5	0.8	0.3	0.3	0.4
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.1	1.5	2.1	1.5	0.8	0.6	2.1	1.5
2 Weeks	10.0	0.7	10.0	0.7	10.7	10.3	10.0	0.7
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.8	0.5	0.8	0.5	1.0	0.6	0.8	0.5
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.4	0.3	0.4	0.3	0.5	0.3	0.4	0.3
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The environmental impact has been assessed before launching the construction phase of the project. As per the environmental report issued in January 2012, in the proximity of the project site on which the new installations are to be built, there are no protected areas that might be impacted by the implementation of the project. On the other hand, according to the environmental permit obtained within the permitting procedure, the probability as well as the dimension and complexity of the impact has been considered reduced both during construction and operation. Consequently, there have been no particular investments imposed by authorities in terms of environmental impact, the obligations imposed to the operator referring mostly to monitoring activities.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

By increasing storage deliverability, transmission capacity in Southern Romania is relieved thus creating the premises for potential exports towards Bulgaria and Southern Europe in general and increasing resilience in general in various supply disruption scenarios thus contributing to a more integrated European gas market.
On the other hand, insufficient storage capacity may create uncertainty in terms of energy pricing and hence the region might face more volatile winter gas prices and, at least on the short and medium term, may become too dependent on energy imports.
The implementation of the project would also increase the competition on the Romanian storage market considering that currently there are only 2 players: Depomures, the private operator with ~10% market share and Romgaz, state owned, with ~90% market share.
Also, increased flexible storage services coupled with higher regional market integration and liberalization are key in the light of the future expected developments: offshore gas from the Black Sea and expected development of Southern Gas Corridor.
The project also contributes to sustainability as it replaces existing obsolete gas compressors with modern high-efficiency electro-compressors which will reduce emissions on one hand and on the other optimize OPEX. Further OPEX optimization will also result from the elimination of the dependency on the Depomures' sole third-party provider of compression services.

F. Useful Links

Engie Depomures PCI Project page: http://www.depomures.ro/pci.php

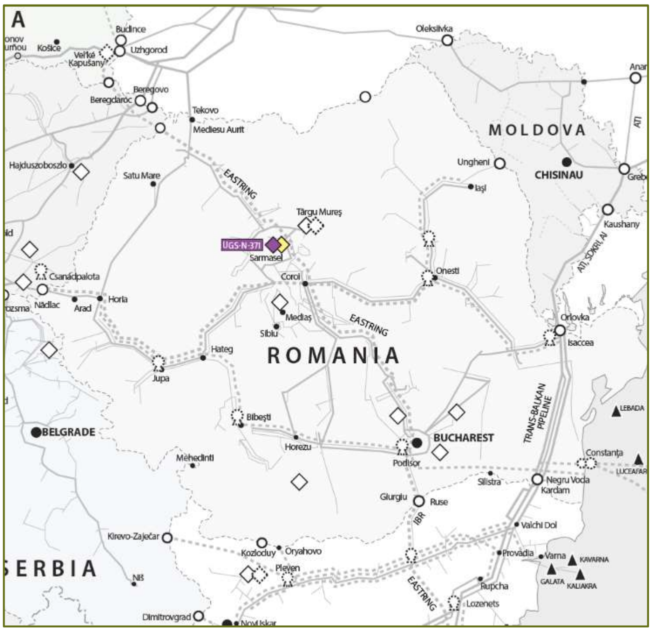
Transgaz National Development projects: http://www.transgaz.ro/ro/activitati/cooperare-internationala/proiecte-majore-de-dezvoltare

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_11

Reasons for grouping [ENTSOG]

The project group includes the stand-alone UGS project to be developed by DEPOGAZ PLOIESTI SRL (Romgaz Subsidiary) in Romania. The submission includes also the evacuation pipeline connecting the UGS facility to the transmission grid.



Objective of the project(s) in the group [Promoter]

(a) decongest existing storage capacities in South Romania which may become available for neighbouring countries, (b) increase the flexibility of the storage system, (c) contribute to the sustainability and flexibility of the transmission system, (d) reduce dependency on Russian gas (e) support Romania's gas export potential connecting new Black Sea resources to the EU infrastructure.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
UGS-N-0371	Sarmasel undeground gas storage in Romania	DEPOGAZ Ploiesti SRL	RO	Less-Advanced	6.20.6	2024	2024	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0371	4	3.2	650

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
UGS-N-0371	DEPOGAZ PLOIESTI SRL	UGS Sarmasel	2024	42.000	33.600

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-371
CAPEX [mln. EUR]	133.22	133.22*
Range CAPEX		20%
OPEX [mln. EUR/y]	2.66	2.66*

Description of costs and range [Promoter]

CAPEX value has been estimated based on historical costs for similar projects. A variation of 20% has been taken into account based on previous investments made in UGS facilities. OPEX value has been estimated based on current operating costs for existent similar storage facilities.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The project group **increases the remaining flexibility** for Romania in all demand scenarios and in Bulgaria only in Global Climate Action scenario.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Romania.
The project group allows for **partially mitigates risk of demand curtailment** in Romania in case of disruption of the single largest infrastructures in Romania (VIP Mediesu Aurit - Isaccea (RO-UA)).
Higher benefits for security of supply are observed in case of 2-weeks peak situation where storages provide the necessary flexibility to ensure balance between supply and demand.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The total energy produced by the storage capacity increment of 650 mcm is equivalent to the energy obtained through burning approximately 1,020,500 tons of coal; this implies a reduction of CO2 emissions by approximately 40%.
The development of the storage system will have a big impact on the role of natural gas in the electric energy mix after 2025 that will depend on the ETS emission certificate prices. The current projections show a continuous increase on the emissions' cost up to 40 EUR/tone CO_2 in 2030, to facilitate reaching the decarbonisation targets. At this ETS price, the natural gas will be very competitive compared to lignite, at a price level of 19 EUR/MWh. If the ETS price stays lower that currently estimated, coal would most likely stay part of the energy mix, since it is improbable to maintain a natural gas price under 15 €/MWh on a long-term basis. If the ETS emission price stays, at European level, at a value lower than needed to attain the decarbonisation targets, the GES emissions in ETS system will be higher. According to Romania's Energetic Strategy 2019-2030 and looking towards 2050, there aren't any and there is no need for national goals for GES emission covered in the ETS scheme.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Romania																1%	0%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Romania																1%	0%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																								
Romania																1%	0%	-1%						
Curtailment Rate Peak Day (%)																								
Romania																1%	0%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																								
Romania	46%	55%	9%	55%	64%	9%	38%	48%	9%	24%	31%	7%	14%	21%	7%	15%	22%	7%	26%	35%	9%	19%	26%	8%
Remaining Flexibility Peak day (%)																								
Bulgaria																72%	81%	9%						
Poland										80%	81%	1%												
Romania	26%	34%	8%	30%	38%	8%	19%	27%	8%	9%	15%	6%	0%	7%	6%	0%	5%	5%	7%	14%	8%	4%	11%	7%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania	27%	19%	-8%	25%	17%	-8%	33%	25%	-8%	39%	32%	-6%	45%	38%	-6%	45%	40%	-5%	42%	34%	-8%	43%	37%	-7%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Romania	16%	7%	-9%	11%	2%	-9%	23%	14%	-9%	31%	24%	-7%	38%	31%	-7%	38%	31%	-7%	32%	23%	-9%	36%	28%	-8%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Romania	27%	19%	-8%	25%	17%	-8%	33%	25%	-8%	39%	32%	-6%	45%	38%	-6%	46%	40%	-6%	42%	34%	-8%	43%	37%	-7%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	3.1	3.5	2.8	0.0	0.0	0.0
	2 Weeks	1.6	23.9	21.7	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	4.8	3.9	6.1	2.5	2.0	3.2
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.5	2.8	3.5	2.8	1.7	1.4	3.5	2.8
2 Weeks	23.9	1.6	23.9	1.6	23.9	21.2	23.9	1.6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	6.1	3.9	6.1	3.9	6.1	3.9	6.1	3.9
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	3.2	2.0	3.2	2.0	3.2	2.0	3.2	2.0
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations.
In order to give a comparable measure of project effects, the Table 2 shall be filled in by the promoter.

TYNDOP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The feasibility study that is undergoing throughout 2019 includes Evaluation of Environmental Impact Study. The project implementation will not be done in protected areas. The compressor installations included in the project will be built on the existent Compressor Station site at Sarmasel. The drilling of the new wells and the surface installations will be done on farm land. Measures to prevent the impact on the environment will been taken according to current environmental regulations.

Additional information (Environmental impact) [Promoter]

The impact on the environment is minor due to the fact that the project is an expansion of the existing deposit at Sarmasel (Brownfields versus Greenfields)

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The Sustainable Transition Scenario shows a low level of remaining flexibility between 2030 and 2040 at EU level. Renewable gases do not compensate for the decrease of conventional national production, and this results in an increasing need for seasonal flexibility ensured by gas storages.
Among the unquantified benefits of Sarmasel project, the daily delivery rate increase of approximately 25% would relieve stress on the Southern UGS and would allow a better management of resources in case of UA disruption that has an impact on all neighbouring countries: Bulgaria, Hungary, and Serbia.
Romania has a key role to play for energy security in the region, given its natural resources, strategic location and the transit pipelines crossing its land.
Sarmasel project makes use of the gas field's energy more efficiently and extends the continuous delivery time of the maximum deliverable quantity by 15%, decreasing the curtailment demand in all disruption scenarios.
An increase in Sarmasel storage capacity would allow larger quantities of gas to be delivered without compression, with a reduction in energy intake and CO_2 emissions
The impact on the environment is minor due to the fact that the project is an expansion of the existing deposit at Sarmasel.
All the benefits mentioned above contribute to achieving the goals of the Union energy policies. Because it concerns the storage infrastructure, the project does not influence the possibility to connect to another source; nevertheless, it provides stability and flexibility to the entire transmission system, as contemplated in NTS Development Plan of the RO TSO.

F. Useful Links

Depogaz Projects of Common Interest: https://www.depogazploiesti.ro/en/activity/projects-of-common-interest

Transgaz National Development Plan: https://www.transgaz.ro/sites/default/files/Downloads/PDSNT%202018-2027.pdf - starting with pg. 60

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_12a

Reasons for grouping [ENTSOG]

The project group represents a new interconnector between Hungary and Slovenia at IP Pince (SI) / Tornyszentmiklos (HU) and includes the two sides of the investments.

Objective of the project(s) in the group [Promoter]

The project group aims at (1) establishing bidirectional flows between the Hungarian (Central-East and South-European gas market) and Slovenian gas system and further with Italian gas system; (2) creating access of the Hungarian and Central-East and South-European gas suppliers to the new gas sources on the Western European gas markets (e.g. Italy) and access to the LNG sources in Italy and Northern Adriatic region; (3) enabling gas market integration and gas price differences mitigation between Italian gas hub and central European and Balkan price zone; (4) enabling access of Slovenian gas suppliers to Hungarian underground gas storage facilities; (5) increasing of the security of supply in Slovenia and the improvement of the N-1 infrastructure standard; (6) increase the gas security of supply in the region (regarding the possible events in the regional transmission systems);

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0112	R15/1 Pince - Lendava - Kidričevo	Plinovodi d.o.o.	SI	Less-Advanced	6.23	2022	2023	Rescheduled
TRA-N-0325	Slovenian-Hungarian interconnector	FGSZ	HU	Advanced	6.23	2022	2023	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0112	500	73	6
TRA-N-0325	600	191	12

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0112	Plinovodi d.o.o.	Pince (SI) / Tornyszentmiklos (HU)	2022	12.8	12.8
TRA-N-0112	Plinovodi d.o.o.	Pince (SI) / Tornyszentmiklos (HU)	2023	46.6	46.6
TRA-N-0325	FGSZ Ltd.	Pince (SI) / Tornyszentmiklos (HU)	2022	12.8	12.8
TRA-N-0325	FGSZ Ltd.	Pince (SI) / Tornyszentmiklos (HU)	2023	51.2	51.2

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-325	TRA-N-112
CAPEX [mln. EUR]	317.80	205.00**	112.80**
Range CAPEX		25%	10%
OPEX [mln. EUR/y]	11.28	10.00**	1.28**

Description of costs and range [Promoter]

For project TRA-N-112:

- Description of CAPEX: the pipeline (construction, connections and other costs) represents 70% of CAPEX, CS Kidričevo (civil works, equipment and other costs) represents 26% of the cost and BMRS Pince (civil works, equipment and other costs) represents 4% of the cost.
- Description of OPEX: 45% of costs represent the cost of own consumption of gas (for the operation of the compressor station – CS Kidričevo), 50% of costs represent operation and maintenance cost, and 5% are labor costs.

For project TRA-N-325:

- Description of CAPEX: the cost and range are based on feasibility study.
- Description of OPEX: the most significant impact on operating cost is the energy consumption of compressor stations

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Hungary and Slovenia.
With the creation of an interconnection between Slovenia and Hungary, Eastern Europe results being more integrated with the rest of Europe and can share, and consequently reduce, its supply dependence. The project group **decreases the dependence of Russian gas** for Croatia, Czech Republic, Hungary, Poland and Slovakia. The project group also allows **to reduce the already limited dependence of LNG** for Croatia and Slovenia in some of the scenarios

> **Security of Supply:**

The project group **increases the remaining flexibility** for Slovenia.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, Croatia, Hungary, Serbia and Slovenia.
The project group allows for **full mitigation of risk of demand curtailment** in Croatia and Slovenia in case of disruption of the single largest infrastructures in Slovenia (Murfeld (AT) / Ceršak (SI)).

> **Market Integration:**

In the reference situation, the project group brings benefits in monetised terms as a **reduction of cost of gas supply** from 1.2 Mln EUR/y to 22 Mln EUR/y in the low infrastructure level. Those benefits can be mainly explained by the lower transportation costs thanks to the utilisation of this alternative route. This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route. Benefits in the Advanced are even lower due to the presence of more projects sharing those benefits in the considered grid.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project will enable access to new gas supply sources, replacement of more expensive routes (reduction of gas prices) which will enable new development of gas fired power plants. That will result in reduction of CO2 emissions.
The group will enable fuel switch savings of maximal 0.6 Mln EUR/y in Global Climate scenarios and low infrastructure level.
It will also enable CO2 savings benefits of maximal 1.9 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings of 0.8 Mln EUR/y in Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Croatia	5%	0%	-5%																					
Slovenia	7%	3%	-4%										4%	0%	-4%									
Dependence to RU (%)																								
Croatia										27%	25%	-2%				27%	23%	-4%	48%	40%	-8%	31%	25%	-6%
Czechia																27%	23%	-4%				31%	28%	-3%
Hungary				29%	26%	-3%				27%	24%	-3%				27%	23%	-4%	48%	39%	-9%	31%	25%	-6%
Poland				28%	26%	-2%																		
Slovakia																27%	23%	-4%				31%	28%	-3%
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752
Slovenia	5031	3351	-1680	5024	3347	-1677	5051	3362	-1689	5001	3334	-1667	5000	3333	-1667	5022	3346	-1676	5055	3364	-1691	5000	3333	-1667

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	0%	-1%									
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	0%	-1%									
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	0%	-1%									
Curtailment Rate Peak Day (%)																								
Croatia													1%	0%	-1%									
Remaining Flexibility 2-Week Cold Spell (%)																								
Croatia													6%	8%	1%									
Italy																82%	82%	1%	69%	69%	1%			
Slovenia	66%	100%	34%	69%	100%	31%	61%	100%	39%	92%	100%	8%				57%	100%	43%	52%	100%	48%	98%	100%	2%
Remaining Flexibility Peak day (%)																								
Hungary	83%	86%	3%	92%	96%	3%																		
Italy	39%	40%	1%	41%	41%	1%	32%	33%	1%							63%	64%	1%	35%	37%	1%	62%	62%	1%
Slovenia	48%	100%	52%	50%	100%	50%	43%	100%	57%	68%	100%	32%				29%	100%	71%	26%	100%	74%	47%	100%	53%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%										2%	0%	-2%			
France							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%										2%	0%	-2%			
Slovenia							2%	0%	-2%										2%	0%	-2%			
Spain																			2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
United Kingdom							2%	0%	-2%															
Single Largest Infrastructure Disruption (SLID)-Slovenia																								
Croatia	23%	6%	-17%	24%	6%	-17%	21%	3%	-18%	20%	1%	-19%	29%	3%	-25%	23%	6%	-16%	19%	3%	-16%	17%	0%	-16%
Slovenia	51%	18%	-33%	51%	16%	-35%	52%	30%	-22%	46%	28%	-18%	30%	2%	-28%	55%	26%	-29%	57%	36%	-21%	52%	36%	-16%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina	10%	8%	-2%	6%	4%	-2%																		
Bulgaria	10%	8%	-2%	6%	5%	-1%																		
Croatia													1%	0%	-1%									
Hungary	9%	6%	-3%	5%	2%	-3%																		
Serbia	10%	6%	-4%	6%	4%	-2%																		
Slovenia																			8%	6%	-2%			

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365
Slovenia	3351	2511	-840	3347	2509	-839	3362	2517	-844	3334	2500	-834	3333	2500	-833	3346	2508	-838	3364	2519	-845	3333	2500	-833

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	1.2	22.4	9.5	0.8	0.0	2.1
	Supply Maximization	22.5	24.9	20.7	3.6	14.1	9.2
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.6	2.2	1.5	0.0	0.0	0.0
	2 Weeks	0.2	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	1.3	1.5	1.9	0.8	0.9	1.0
	Fuel Switch savings	0.0	0.1	0.6	0.0	0.1	0.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	10.0	0.0	29.6	2.0	23.3	1.0	22.4	1.2
Supply Maximization	10.0	0.0	32.8	2.0	25.5	20.8	12.5	10.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.2	1.5	2.2	1.5	0.2	0.2	2.2	1.5
2 Weeks	0.2	0.0	0.2	0.0	0.0	0.0	0.2	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.9	1.3	1.9	1.3	1.9	1.2	1.9	1.3
Fuel Switch savings	0.6	0.0	0.6	0.0	0.6	0.0	0.6	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.8	0.0	2.2	0.0	2.1	0.0
Supply Maximization	2.9	0.0	21.8	0.0	14.8	3.9	7.1	1.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.0	0.8	1.0	0.8	1.0	0.8	1.0	0.8
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDOP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The planned transmission pipeline crosses protected areas of nature (protected areas and Nature 2000 areas), so SEA and EIA will have to be implemented in the transmission pipeline planning process.
The conclusion of the environmental impact assessment shall be an environmental protection consent, in which all the necessary mitigation measures, to be taken into account in the implementation phase, shall be defined.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> Slovenia:

Herfindahl–Hirschman Index (HHI) is a commonly accepted measure of market concentration. The markets in which the HHI is between 750 and 1,800 points are considered moderately concentrated, markets in which the HHI is between 1,800 and 5,000 points are considered highly concentrated and markets in which the HHI is in excess of 5,000 points to be very highly concentrated. HHI index for Slovenia is without the projects, included in this group 6,573. Taking into account first phase of the SI-HU project the HHI index decrease to 5,757 and with second phase of the SI-HU project HHI index further decrease to 4,310.

The robustness of gas network to withstand the disruption of the largest infrastructure at national level represent N-1 standard. For Slovenia, the N-1 standard for gas year 2021 is 65.0%. With the first phase of SI-HU project as is defined in this document, the N-1 standard in year 2022 will increase to 87.3% and with second phase, the N-1 standard will further increase to 168.3% in gas year 2023.

Regarding the HHI and N-1 standard, the project will crucial contribute to improve the HHI and N-1 standard.

> Hungary:

With help of interconnector shippers trading on Hungarian market will reach the Slovenian market and they will increase gas-gas competition and flexibility in Slovenia and vice versa.

F. Useful Links

Plinovodi National Development Plan 2019-2028 link:
http://www.plinovodi.si/media/4763/plinovodi-tyndp-2019-2028_eng.pdf
Plinovodi PCI project link:
http://www.plinovodi.si/media/4765/pci-information-leaflet-623.pdf
FGSZ project link:
https://fgsz.hu/en/about-fgsz/activities-business-policy/international-projects/husit

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_12b

Reasons for grouping [ENTSOG]

The project group includes the two sides of a new interconnector between Hungary and Slovenia at IP Pince (SI) / Tornyszentmiklos (HU) (TRA-N-325 and TRA-N-112) as well as projects which enable increasing the flows on the route HU-SI-IT (TRA-N-92; TRA-N-108; TRA-N-1227).

Objective of the project(s) in the group [Promoter]

The project group aims at: (1) establishing bidirectional gas flows between the Hungarian, Central-East and South-European gas market with Italian gas market via Slovenian gas system; (2) enabling the access of the Hungarian and Central-East and South-European gas suppliers to the new gas sources on the Western European gas markets (e.g. Italy) and access to the LNG sources in Italy and Northern Adriatic region; (3) enabling market integration and gas price differences mitigation between Italian gas hub and central European and Balkan price zone; (4) enabling access of Slovenian gas suppliers to Hungarian underground gas storage facilities; (5) increasing the security of supply in Slovenia and the improvement of the N-1 infrastructure standard; (6) increasing the gas security of supply in the region (regarding the possible events in the regional transmission systems).

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0092	CS Ajdovščina, 1st phase of upgrade	Plinovodi d.o.o.	SI	Less-Advanced	NA	2022	2022	NA
TRA-N-0108	M3 pipeline reconstruction from CS Ajdovščina to Šempeter/Gorizia	Plinovodi d.o.o.	SI	Less-Advanced	NA	2022	2022	NA
TRA-N-1227	Gorizia plant upgrade	Snam Rete Gas	IT	Less-Advanced	NA	2022	2022	NA
TRA-N-0112	R15/1 Pince - Lendava - Kidričevo	Plinovodi d.o.o.	SI	Less-Advanced	6.23	2022	2023	Rescheduled
TRA-N-0325	Slovenian-Hungarian interconnector	FGSZ	HU	Advanced	6.23	2022	2023	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0092	-	-	5
TRA-N-0108	500	12	-
TRA-N-0112	500	73	6
TRA-N-0325	600	191	12
TRA-N-1227	-	-	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0108	Plinovodi d.o.o.	Gorizia (IT) /Šempeter (SI)	2022	36.6	39.2
TRA-N-0112	Plinovodi d.o.o.	Pince (SI) / Tornyszentmiklos (HU)	2022	12.8	12.8
TRA-N-0112	Plinovodi d.o.o.	Pince (SI) / Tornyszentmiklos (HU)	2023	46.6	46.6
TRA-N-0325	FGSZ Ltd.	Pince (SI) / Tornyszentmiklos (HU)	2022	12.8	12.8
TRA-N-0325	FGSZ Ltd.	Pince (SI) / Tornyszentmiklos (HU)	2023	51.2	51.2
TRA-N-1227	Snam Rete Gas S.p.A.	Gorizia (IT) /Šempeter (SI)	2022	44	17.3

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-325	TRA-N-112	TRA-N-92	TRA-N-108	TRA-N-1227
CAPEX [mln. EUR]	366.10	205.00**	112.80**	12.20**	33.10**	3.00
Range CAPEX		25%	10%	10%	10%	30%
OPEX [mln. EUR/y]	13.36	10.00**	1.28**	1.93**	0.14**	0.01

Description of costs and range [Promoter]

For project TRA-N-112:

> Description of CAPEX: the pipeline (construction, connections and other costs) represents 70% of CAPEX, CS Kidričevo (civil works, equipment and other costs) represents 26% of the cost and BMRS Pince (civil works, equipment and other costs) represents 4% of the cost.

> Description of OPEX: 45% of costs represent the cost of own consumption of gas (for the operation of the compressor station – CS Kidričevo), 50% of costs represent operation and maintenance cost, and 5% are labor costs.

For project TRA-N-92:

> Description of CAPEX: the compressor station CS Ajdovščina (civil works, equipment and other costs) represents 100% of the cost.

> Description of OPEX: 90% of costs represent the cost of own consumption of gas (for the operation of the compressor station – CS Ajdovščina), 10% of costs represent operation and maintenance cost. There are no additional labor costs – extension of existing compressor station.

For project TRA-N-108:

> Description of CAPEX: the pipeline (construction, connections and other costs) represents 83% of CAPEX and BMRS Vrtojba (civil works, equipment and other costs) represents 17% of the cost.

> Description of OPEX: 100% of costs represent operation and maintenance cost. There are no additional costs of own consumption of gas and labor cost – reconstruction of existing pipeline.

For project TRA-N-325:

> Description of CAPEX: the cost and range based on feasibility study.

> Description of OPEX: the most significant impact on operating cost is the energy consumption of compressor stations.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Hungary and Slovenia.
With the creation of an interconnection between Slovenia and Hungary, Eastern Europe results being more integrated with the rest of Europe and can share, and consequently reduce, its supply dependence. Compared to project group EAST_12a, the consideration of projects enabling the increase the flows on the route Italy-Slovenia-Hungary allows for higher **reduction in the dependence of Russian gas** for Croatia, Czech Republic, Hungary, Poland and Slovakia in the same scenarios.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Slovenia. Compared to EAST_12a, the project groups shows a limited increase in the remaining flexibility for Italy.
Depending on scenarios, the project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, Hungary, Serbia and Slovenia.
The project group allows for **full mitigation of risk of demand curtailment** in Slovenia in case of disruption of the single largest infrastructures in Slovenia (Murfeld (AT) / Ceršak (SI)).

> **Market Integration:**

The **bidirectionality is improved** with the creation of capacity between Slovenia and Italy (Gorizia (IT) / Šempeter (SI)).
In the reference situation, the project group brings benefits in monetised terms as a **reduction of cost of gas supply** from 1.2 Mln EUR/y to 22 Mln EUR/y in the low infrastructure level. Those benefits can be mainly explained by the lower transportation costs thanks to the utilisation of this alternative route. This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route..
Benefits in the Advanced are even lower due to the presence of more projects sharing those benefits in the considered grid.
Compared to EAST_12a, project group EAST_12b presents similar benefits in terms of reduction of cost of gas supply.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project will enable access to new gas supply sources, replacement of more expensive routes (reduction of gas prices) which will enable new development of gas fired power plants. That will result in reduction of CO2 emissions.
Group will enable fuel switch savings of maximal 1.5 Mln EUR/y in Sustainable Transition scenario and low infrastructure level and minimal savings of 1.4 Mln EUR/y in Distributed Generation scenario and advanced infrastructure level.
It will also enable CO2 savings benefits of maximal 3.6 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings of 1.4 Mln EUR/y in Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Croatia	31%	29%	-2%							27%	22%	-5%				27%	20%	-7%	48%	34%	-14%	31%	22%	-9%
Czechia				28%	24%	-4%				26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
Hungary	32%	29%	-3%	29%	24%	-5%				27%	22%	-5%				27%	20%	-7%	48%	34%	-14%	31%	22%	-9%
Poland				28%	23%	-5%	34%	32%	-2%	26%	22%	-4%												
Slovakia				28%	24%	-4%				26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752	3558	2805	-752
Slovenia	5031	3333	-1698	5024	3333	-1691	5051	3333	-1718	5001	3333	-1668	5000	3333	-1667	5022	3333	-1689	5055	3333	-1722	5000	3333	-1667

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	1%	-1%									
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	1%	-1%									
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia													1%	1%	-1%									
Curtailment Rate Peak Day (%)																								
Croatia													1%	1%	-1%									
Remaining Flexibility 2-Week Cold Spell (%)																								
Croatia													6%	7%	1%									
Denmark																						89%	91%	1%
Italy	56%	57%	1%	56%	57%	1%	55%	56%	1%	70%	71%	1%	70%	71%	1%	82%	83%	2%	69%	70%	1%	89%	90%	1%
Slovenia	66%	100%	34%	69%	100%	31%	61%	100%	39%	92%	100%	8%				57%	100%	43%	52%	100%	48%	98%	100%	2%
Remaining Flexibility Peak day (%)																								
Hungary	83%	89%	7%	92%	99%	7%																		
Italy	39%	40%	1%	41%	42%	1%	32%	33%	1%	51%	52%	1%	48%	49%	1%	63%	64%	1%	35%	37%	1%	62%	63%	1%
Slovenia	48%	100%	52%	50%	100%	50%	43%	100%	57%	68%	100%	32%				29%	100%	71%	26%	100%	74%	47%	100%	53%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%										2%	0%	-2%			
France							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%										2%	0%	-2%			
Portugal																			2%	0%	-2%			
Slovenia							2%	0%	-2%										2%	0%	-2%			
Spain																			2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
United Kingdom							2%	0%	-2%															
Single Largest Infrastructure Disruption (SLID)-Slovenia																								
Slovenia	51%	0%	-51%	51%	0%	-51%	52%	0%	-52%	46%	0%	-46%	30%	0%	-30%	55%	0%	-55%	57%	0%	-57%	52%	0%	-52%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina	10%	4%	-6%	6%	4%	-2%													8%	6%	-2%			
Bulgaria	10%	6%	-4%	6%	5%	-1%													8%	6%	-2%			
Croatia													1%	1%	-1%									
Hungary	9%	4%	-5%	5%	0%	-5%																		
Luxembourg																			8%	6%	-2%			
Serbia	10%	4%	-6%	6%	4%	-2%													8%	6%	-2%			
Slovenia																			8%	6%	-2%			
Market Integration																								
Bi-directionality Balance																								
Gorizia (IT) /Šempeter (SI)				71%	100%	29%				71%	100%	29%	71%	100%	29%	71%	100%	29%	71%	100%	29%	71%	100%	29%

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365	2530	2165	-365
Slovenia	3351	2500	-851	3347	2500	-847	3362	2500	-862	3334	2500	-834	3333	2500	-833	3346	2500	-846	3364	2500	-864	3333	2500	-833
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Italy	56%	57%	1%	56%	57%	1%	55%	56%	1%	70%	71%	1%	70%	71%	1%	81%	82%	1%	69%	70%	1%	89%	90%	1%
Remaining Flexibility Peak day (%)																								
Italy	40%	41%	1%	41%	42%	1%	41%	41%	1%	51%	52%	1%	48%	49%	1%	63%	64%	1%	50%	51%	1%	63%	64%	1%
Market Integration																								
Bi-directionality Balance																								
Gorizia (IT) /Šempeter (SI)				71%	100%	29%				71%	100%	29%	71%	100%	29%	71%	100%	29%	71%	100%	29%	71%	100%	29%

C.3 Monetised benefits

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	1.2	22.4	9.5	0.8	0.0	2.1
	Supply Maximization	23.6	25.2	20.9	3.6	17.5	10.5
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.3	2.4	1.7	0.0	0.0	0.0
	2 Weeks	0.4	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	2.0	3.2	3.6	1.4	2.2	2.3
	Fuel Switch savings	0.5	1.3	1.2	0.5	1.0	0.8

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEURy)								
Reference	10.0	0.0	31.1	2.7	23.3	1.0	22.4	1.2
Supply Maximization	10.0	0.0	34.6	2.7	25.6	21.0	12.6	10.4
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.4	1.3	2.4	1.3	0.4	0.4	2.4	1.3
2 Weeks	0.4	0.0	0.4	0.0	0.0	0.0	0.4	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	3.6	2.0	3.6	2.0	3.5	1.9	3.6	2.0
Fuel Switch savings	1.3	0.5	1.3	0.5	1.3	0.5	1.3	0.5

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	10.0	0.0	31.1	2.7	2.2	0.0	2.1	0.0
Supply Maximization	10.0	0.0	34.6	0.0	18.3	3.9	8.8	1.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	2.3	1.4	2.3	1.4	2.2	1.3	2.3	1.4
Fuel Switch savings	1.0	0.5	1.0	0.5	1.0	0.4	1.0	0.5

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDOP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The planned transmission pipeline crosses protected areas of nature (protected areas and Nature 2000 areas), so SEA and EIA will have to be implemented in the transmission pipeline planning process.
The conclusion of the environmental impact assessment shall be an environmental protection consent, in which all the necessary mitigation measures, to be taken into account in the implementation phase, shall be defined.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> Slovenia:

Herfindahl–Hirschman Index (HHI) is a commonly accepted measure of market concentration. The markets in which the HHI is between 750 and 1,800 points are considered moderately concentrated, markets in which the HHI is between 1,800 and 5,000 points are considered highly concentrated and markets in which the HHI is in excess of 5,000 points to be very highly concentrated. HHI index for Slovenia is without the projects, included in this group 6,573. Taking into account first phase of the HU-SI-IT project the HHI index decrease to 4,730 and with second phase of the HU-SI-IT project HHI index further decrease to 3,701.

The robustness of gas network to withstand the disruption of the largest infrastructure at national level represent N-1 standard. For Slovenia, the N-1 standard for gas year 2021 is 65 %. With the first phase of HU-SI-IT project as is defined in this document, the N-1 standard in year 2022 will increase to 151.1 % and with second phase, the N-1 standard will further increase to 232 % in gas year 2023.

Regarding the HHI and N-1 standard, the project will crucial contributed to improve the HHI and N-1 standard.

> Hungary:

With help of interconnector shippers trading on Hungarian market will reach the Slovenian market and they will increase gas-gas competition and flexibility in Slovenia and vice versa.

F. Useful Links

Plinovodi National Development Plan 2019-2028 link:
http://www.plinovodi.si/media/4763/plinovodi-tyndp-2019-2028_eng.pdf
Plinovodi PCI project link:
http://www.plinovodi.si/en/transmission-system/projects-of-common-interest-pci/
FGSZ project link:
https://fgsz.hu/en/about-fgsz/activities-business-policy/international-projects/husit

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_13a

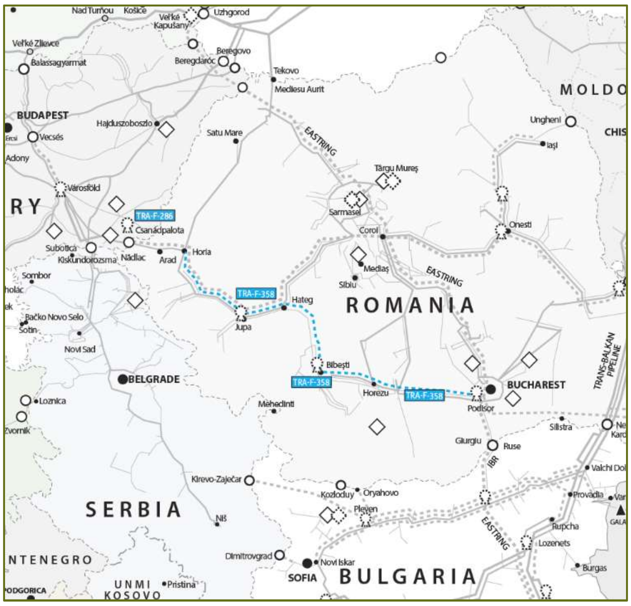
Reasons for grouping [ENTSOG]

The project group represents the first phase of BRUA project which aims at increasing the existing capacities at RO-HU IP Csanadpalota and IP Ruse (BG) / Giurgiu (RO). This phase is assessed separately from the 2nd phase so as to evaluate the incremental impact of each phase.

Objective of the project(s) in the group [Promoter]

The project group aims at improving market integration as a result of a decrease in the congestion of the energy infrastructure and an increase in interoperability and flexibility of the system.

The implementation of the project group aims at increasing security of supply and competition by ensuring the proper interconnections, by the diversification of supply sources, transmission routes and stakeholders thus reducing the market concentration.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0286	Romanian-Hungarian reverse flow Hungarian section 1st stage	FGSZ	HU	FID	6.24.1.1	2019	2019	On time
TRA-F-0358	Development on the Romanian territory of the NTS (BG–RO-HU-AT)-Phase I	SNTGN Transgaz SA	RO	FID	6.24.1.2	2019	2019	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0286	-	-	9
TRA-F-0358	800	479	28

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0286	FGSZ Ltd.	Csanadpalota	2019	48.9	-
TRA-F-0358	SNTGN Transgaz S.A.	Ruse (BG) / Giurgiu (RO)	2019	-	29.55
TRA-F-0358	SNTGN Transgaz S.A.	Csanadpalota	2019	-	50.59

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-286	TRA-F-358
CAPEX [mln. EUR]	499.60	21.00**	478.60
Range CAPEX		10%	10%
OPEX [mln. EUR/y]	14.32	2.55**	11.77

Description of costs and range [Promoter]

> Project TRA-F-0358:

Costs estimated in the Feasibility Study, the project is under construction and the costs are related to the contracts signed and to the personal in the Project Management Unit.

> Project TRA-F-286:

The project is under construction and the provided cost and range is based on construction contract.
The most significant impact on operating costs is the energy consumption of compressor stations.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Hungary.
Depending on the considered demand scenarios the projects group also **increases the number of supply sources** for Croatia and Hungary. Thanks to the realisation of the project group, Romania is in fact able to share its national production with other countries.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Hungary thanks to the expansion of the existing capacity in direction Romania-Hungary.

> **Market Integration:**

The **bidirectionality is improved** with the project group between Romania and Hungary *at* Csanadpalota.
The project brings benefits in monetised terms as a **reduction of the cost of gas supply**. Depending on the infrastructure level considered, in the reference supply price configuration, the benefits can be estimated around 2.5 Mln EUR/y (on average) in the low infrastructure level and around 4.9 Mln EUR/y in the advanced infrastructure level where other projects included in this second level allows for further propagation of the benefits created by the project group. Those benefits in terms of reduction in the cost of gas supply are mainly driven by a reduction in the transportation costs thanks to the utilisation of this alternative route to bring gas to Hungary than other and more expensive alternatives. This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route. Project group EAST_13a does not unlock all Romanian national production potential.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The access to new gas sources allows for the more expensive fuels to be replaced by natural gas, which is deemed cheaper, thus generating benefits for Hungary and for Bulgaria respectively. Moreover, it ensures the replacement of the polluting fuels with greener energy which involves the reduction of the CO2 emissions and cost savings for Hungary (all scenario) and for Bulgaria (advanced infrastructure level – all scenario).

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Bosnia Herzegovina	38%	35%	-3%																								
Hungary	38%	34%	-4%																								
Serbia	38%	35%	-3%																								
LNG and Interconnection Capacity Diversification (LICD)																											
Hungary	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974	4532	3558	-974
Supply Source Access (SSA)																											
Croatia				2	3	1	3	4	1				3	4	1										3	4	1
Hungary				3	4	1	3	4	1				3	4	1										3	4	1
Security of Supply																											
Remaining Flexibility Peak day (%)																											
Hungary	81%	87%	6%	77%	83%	5%	87%	92%	6%																		
Market Integration																											
Bi-directionality Balance																											
Csanadpalota	5%	100%	95%	5%	100%	95%	5%	100%	95%				5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%

ADVANCED Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																														
Dependence to LNG (%)all																														
Bulgaria													7%	2%	-5%										3%	0%	-3%			
Dependence to RU (%)																														
Bulgaria							19%	9%	-11%	9%	0%	-9%																		
FYROM										10%	6%	-3%																		
LNG and Interconnection Capacity Diversification (LICD)																														
Bulgaria							4976	3823	-1153	4976	3823	-1153	5093	3963	-1130	4966	3809	-1156	4944	3780	-1164	4995	3847	-1148	5094	3964	-1130	4971	3816	-1155
Hungary	3746	3032	-714																											
Security of Supply																														
Remaining Flexibility Peak day (%)																														
Hungary	91%	96%	6%																											
Market Integration																														
Bi-directionality Balance																														
Csanadpalota	5%	100%	95%																											
Ruse (BG) / Giurgiu (RO)				20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	3.6	0.8	3.1	4.8	4.9	4.9
	Supply Maximization	4.3	1.6	3.8	23.2	22.2	22.2
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.0	0.0	0.0	0.0	0.0	0.0
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.6	0.5	0.5	0.6	0.6	0.6
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.1	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	12.2	4.1	3.6	0.8	3.6	0.8
Supply Maximization	0.0	0.0	12.9	4.1	4.3	1.6	2.2	0.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.6	0.5	0.6	0.5	0.6	0.5	0.6	0.5
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	1.3	0.0	34.9	11.6	4.9	4.8	4.9	4.8
Supply Maximization	15.6	0.0	58.0	0.0	23.2	22.2	11.6	11.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Fuel Switch savings	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-0358	Pipeline and the enhancement of the 3 compressor stations	The total area of land which will be occupied by the works for the construction of the investment objective is of approximately 978 ha, out of which the temporary occupied area is of approximately 966 ha, and the permanently occupied area is of approximately 12 ha, according to Environmental Agreement.	Total surface: 147.8 ha.
TRA-F-0286	Compressor	Stack gas	Csanádpalota és Nagylak settlement and inhabitants

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Air (RO)	Compressor units equipped with SOLONOX system	included in the project CAPEX, and OPEX	No
Noise effect (RO)	Units will be installed indoor, and each compressor unit will be cased. Also Transgaz requested that at the Compressor Station fence the noise limit must not exceed the legal requirements.	included in the project CAPEX and OPEX	No
The impact on environmental factors shall have various intensities, which are however short and express themselves only in the areas of the execution works; through the measures proposed in the report on the evaluation of the impact and the adequate evaluation study, the impact shall be significantly reduced, both during the execution periods, as well as during the exploitation period	Water protection measures/ Air protection measures / Soil and undersoil protection measures / Protection measures against noise / Measures regarding waste management / Measures regarding the management of dangerous substances and chemicals / Measures related to framing in the landscape / Measures for the protection of the biodiversity	Included in the project CAPEX and OPEX	No

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
NOx (HU)	Compressor units equipped with SOLONOX system, unit installed in an existing building and chimney with noise reduction system	included the project CAPEX, OPEX	No

Environmental Impact explained [Promoter]

Project TRA-F-0358 has obtained Environmental Impact Assessment.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The utilization will be increased on the existing FGSZ and TRANSGAZ natural gas system.

F. Useful Links

Transgaz National Development Plan 2018-2027
http://www.transgaz.ro/sites/default/files/Downloads/PDSNT%202018-2027.pdf
Transgaz PCI 6.4.2
http://www.transgaz.ro/ro/dezvoltarea-pe-teritoriul-romaniei-sistemului-national-de-transport-gaze-pe-coridorul-conductei-de
Transgaz additional information
http://www.transgaz.ro/en/project-brha-management-documents
FGSZ project link:
https://fgsz.hu/en/about-fgsz/activities-business-policy/international-projects/brua
FGSZ National Development Plan :
https://fgsz.hu/en/about-fgsz/news/public-consultation-of-the-hungarian-ten-years-national-development-proposal.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_13b

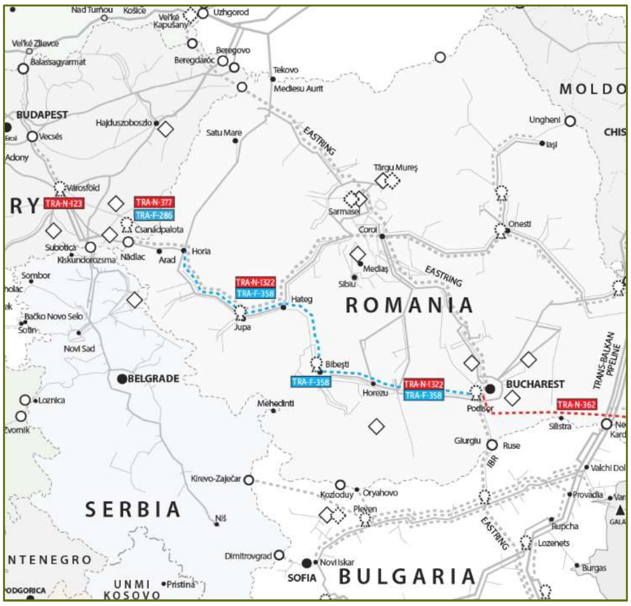
Reasons for grouping [ENTSOG]

The project group represents the development of the first and second phase of the BRUA supply chain which aims at increasing the existing capacities at RO-HU IP Csanadpalota and IP Ruse (BG) / Giurgiu (RO). In addition, supply of gas from the Black Sea is envisaged via this supply chain. The group includes projects to be developed for this purpose in RO and HU.

Objective of the project(s) in the group [Promoter]

The project group aims at improving market integration as a result of a decrease in the congestion of the energy infrastructure and an increase in interoperability and flexibility of the system.

Implementation of the project group aims at enhancing security of supply and competition by ensuring the proper interconnections, by the diversification of supply sources, transmission routes and stakeholders thus reducing the market concentration.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-0286	Romanian-Hungarian reverse flow Hungarian section 1st stage	FGSZ	HU	FID	6.24.1.1	2019	2019	On time
TRA-F-0358	Development on the Romanian territory of the NTS (BG–RO-HU-AT)-Phase I	SNTGN Transgaz SA	RO	FID	6.24.1.2	2019	2019	On time
TRA-N-0362	Development on the Romanian territory of the Southern Transmission Corridor	SNTGN Transgaz SA	RO	Advanced	6.24.4.5	2020	2021	On time
TRA-N-0123	Városföld CS	FGSZ	HU	Advanced	6.24.4.3	2022	2022	On time
TRA-N-0377	Romanian-Hungarian reverse flow Hungarian section 2nd stage	FGSZ	HU	Advanced	6.24.4.6	2022	2022	On time
TRA-N-1322	Development on the Romanian territory of the NTS (BG–RO-HU-AT)-Phase II	SNTGN Transgaz SA	RO	Advanced	6.24.4.4	2022	2022	Delayed

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0286	-	-	9
TRA-F-0358	800	479	28
TRA-N-0123	-	-	6
TRA-N-0362	1200/1000	308	-
TRA-N-0377	-	-	4
TRA-N-1322	800	50	14

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0286	FGSZ Ltd.	Csanadpalota	2019	48.9	-
TRA-F-0358	SNTGN Transgaz S.A.	Ruse (BG) / Giurgiu (RO)	2019	-	29.55
TRA-F-0358	SNTGN Transgaz S.A.	Csanadpalota	2019	-	50.59
TRA-N-0123	FGSZ Ltd.	Vecsés MGT / FGSZ	2022	25.9	102.9
TRA-N-0377	FGSZ Ltd.	Csanadpalota	2022	76.5	76.5
TRA-N-1322	SNTGN Transgaz S.A.	Csanadpalota	2022	78.12	75.88

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-F-286	TRA-F-358	TRA-N-123	TRA-N-1322	TRA-N-362	TRA-N-377
CAPEX [mln. EUR]	901.22	21.00**	478.60	20.00**	68.80	298.42	14.40**
Range CAPEX		10%	10%	25%	10%	20%	25%
OPEX [mln. EUR/y]	33.34	2.55**	11.77	3.10**	7.85	4.37	3.70**

Description of costs and range [Promoter]

> TRA-N-0362 - Development on the Romanian territory of the Southern Transmission Corridor

Costs estimated in the Fesability Study, based on company experience in similar projects and market evolution. OPEX includes the replacement costs.

> TRA-F-0358 - Development on the Romanian territory of the NTS (BG RO-HU-AT)-Phase I

Costs estimated in the Fesability Study, the project is under construction and the costs are related to the contracts signed and to the personal in the Project Management Unit.

> TRA-N-1322 - Development on the Romanian territory of the NTS (BG RO-HU-AT)-Phase II

Costs estimated in the Fesability Study, based on company experience in similar projects and market evolution.

> TRA-F-286 - Romanian-Hungarian reverse flow Hungarian section 1st stage

Project is under construction so this reason the cost and range based on construction contract.

> TRA-N-123 - Varosfold and TRA-N-377 - Romanian-Hungarian reverse flow Hungarian section 2nd stage

Construction will be later, the cost and range based on feasibility study. The most significant impact on operating costs is the energy consumption of compressor stations.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Hungary and Romania.
Fully unlocking Romanian national production potential (282 GWh/d) and expanding interconnection capacity between Romania and hungary, the project group **decreases the dependence of Russian gas** for Romania and for many other Eastern countries in 2025 and 2030. Depending on the considered demand scenarios the projects group **increases the number of supply sources** for Croatia, Hungary. Thanks to the realisation of the project group, Romania is in fact able to share its national production with other countries. Additionally, the increase of the existing capacity between in the direction Hungary-Romania, potentially allows Romania to have access to a more diversieifed number of sources in the future.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Romania and Hungary.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, FYROM, Hungary, Serbia and Romania (most impacted).
The project group allows for **full mitigation of risk of demand curtailment** in Romania in case of disruption of the single largest infrastructures in Romania (VIP Mediesu Aurit - Isaccea (RO-UA)).

> **Market Integration:**

The **bidirectionality is improved** with the project group between Romania and Hungary *at* Csanadpalota and between Bulgaria and Romania at Ruse (BG) / Giurgiu (RO).
Comapred to EAST_13a, where most of the benefits in terms of **reduction in the cost of gas supply** can be explained by transportation costs savings, the realisation of EAST_13b fully enables the Black Sea supply potential allowing for a significant reduction in the costs of gas supply that can replace more expensive imports. The increase in the capity in direction Romania-Hungery (up to 128 GWh/d) allows to share this supply potential with Hungary and other coutrnies in Europe. Those benefits can be measured in the low infrastructure level in around 301 Mln EUR/y (on average) in the reference supply situation. When considerinf the sensitivity with more expensive tariffs, the analysis shows benefits of around 255 Mln EUR/y that can be therefore attributed to the connection to the additional supply source.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The acces to new gas sources allows for the more expensive fuels to be replaced by natural gas, which is deemed cheaper, thus generating benefits for Hungary and for Bulgaria respectively. Moreover, it ensures the replacement of the polluting fuels with greener energy which involves the reduction of the CO2 emissions and cost savings for Romania, Hungary and for Romania, Bulgaria and Hungary.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Austria				25%	21%	-4%										33%	22%	-11%									
Bosnia Herzegovina	38%	25%	-13%																								
Croatia				31%	21%	-10%	24%	10%	-14%	35%	30%	-5%	27%	13%	-14%	33%	23%	-10%									
Czechia				31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	21%	-5%												
Denmark				29%	26%	-3%				34%	30%	-4%															
Hungary	38%	24%	-14%	32%	21%	-11%	29%	10%	-19%	35%	30%	-5%	27%	13%	-14%	34%	23%	-10%									
Poland				31%	26%	-5%	28%	22%	-6%	34%	31%	-3%	26%	21%	-5%												
Romania	27%	22%	-6%	43%	20%	-23%	35%	9%	-26%	54%	30%	-24%	41%	13%	-28%	50%	23%	-27%	53%	28%	-25%	64%	48%	-16%	49%	30%	-19%
Serbia	38%	25%	-13%																								
Slovakia				31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	22%	-4%												
Slovenia				25%	21%	-4%										33%	22%	-11%									
Sweden				30%	26%	-4%				34%	31%	-3%															
LNG and Interconnection Capacity Diversification (LICD)																											
Hungary	4532	3558	-974	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375	4532	3157	-1375
Supply Source Access (SSA)																											
Croatia				2	3	1	3	4	1	2	3	1	3	4	1	3	4	1	3	4	1	2	3	1	3	4	1
Hungary							3	4	1	2	3	1	3	4	1				3	4	1	2	3	1	3	4	1
Romania							2	4	2	2	3	1	2	4	2	2	3	1	2	4	2	1	3	2	2	4	2

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																											
Croatia																			19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Croatia																			22%	21%	-1%						
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia																			19%	18%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Croatia																			22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia																			19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																											
Croatia																			22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																											
Croatia																			19%	18%	-1%						
Curtailment Rate Peak Day (%)																											
Croatia																			22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																											
France	78%	79%	1%																								
Romania	75%	87%	12%	51%	100%	49%	60%	100%	40%	43%	84%	41%	28%	65%	36%	18%	54%	36%	19%	37%	18%	30%	51%	21%	23%	43%	20%
Remaining Flexibility Peak day (%)																											
Bulgaria																			79%	81%	2%						
Hungary	81%	87%	6%	77%	91%	14%	87%	100%	13%																		
Romania	44%	54%	10%	30%	78%	48%	34%	83%	49%	23%	58%	35%	13%	44%	31%	4%	36%	32%	2%	18%	15%	10%	28%	18%	8%	25%	17%
Single Largest Infrastructure Disruption (SLID)-Romania																											
Romania	11%	2%	-10%	23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	34%	3%	-31%	41%	9%	-32%	43%	27%	-15%	38%	21%	-18%	40%	22%	-17%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia																			19%	18%	-1%						
Romania				12%	0%	-12%	6%	0%	-6%	19%	0%	-19%	26%	0%	-26%	34%	0%	-34%	34%	16%	-18%	28%	7%	-21%	32%	12%	-20%
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Bosnia Herzegovina				10%	2%	-8%	6%	0%	-6%	8%	6%	-2%	6%	4%	-2%												
Bulgaria				10%	2%	-8%	6%	0%	-6%	9%	6%	-3%	7%	4%	-3%												
Croatia																			22%	21%	-1%						
FYROM	66%	64%	-2%										8%	4%	-4%												
Hungary				9%	0%	-8%	5%	0%	-5%																		
Romania	15%	5%	-10%	23%	0%	-23%	20%	0%	-20%	29%	6%	-23%	34%	4%	-30%	41%	9%	-32%	43%	27%	-15%	38%	21%	-18%	40%	22%	-17%
Serbia				10%	2%	-8%	6%	0%	-6%	8%	6%	-2%	6%	4%	-2%												

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																											
Bi-directionality Balance																											
Csanadpalota	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%

ADVANCED Infrastructure Level

	2020			2025									2030									2040								
	BEST ESTIMATE (CbG)			(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																														
Dependence to LNG (%)all																														
Bulgaria													8%	2%	-6%										4%	0%	-4%			
Dependence to RU (%)																														
Bosnia Herzegovina	19%	16%	-3%																											
Bulgaria							20%	9%	-11%	10%	0%	-10%																		
Czechia	19%	17%	-2%																											
FYROM										10%	6%	-3%																		
Hungary	19%	16%	-3%																											
Romania	19%	16%	-3%																											
Serbia	19%	16%	-3%																											
LNG and Interconnection Capacity Diversification (LICD)																														
Bulgaria							4976	3823	-1153	4976	3823	-1153	5093	3963	-1130	4966	3809	-1156	4944	3780	-1164	4995	3847	-1148	5094	3964	-1130	4971	3816	-1155
Hungary	3746	3032	-714				2732	2165	-567	2732	2165	-567	2732	2165	-567	2732	2165	-567	2732	2165	-567	2732	2165	-567	2732	2165	-567	2732	2165	-567
Romania							7383	5802	-1581	7151	5583	-1568	7401	5820	-1581	7069	5511	-1558	7119	5554	-1564	7048	5494	-1555	7431	5850	-1581	6952	5414	-1538
Supply Source Access (SSA)																														
Romania							2	4	2	3	4	1	2	4	2	3	4	1	2	4	2				1	3	2			
Security of Supply																														
Remaining Flexibility 2-Week Cold Spell (%)																														
Bulgaria	56%	57%	1%																											
Italy																												89%	89%	1%
Romania	75%	87%	12%																											
Remaining Flexibility Peak day (%)																														
Hungary	91%	96%	6%																											
Italy																												62%	63%	1%
Romania	44%	54%	10%																											
Single Largest Infrastructure Disruption (SLID)-Romania																														
Romania	11%	2%	-10%																											
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																														
Bulgaria	62%	62%	-1%																											
FYROM	62%	61%	-1%																											
Ukraine Disruption Curtailment Rate Peak Day (%)																														
FYROM	66%	64%	-2%																											
Romania	15%	5%	-10%																											
Market Integration																														
Bi-directionality Balance																														
Csanadpalota	5%	100%	95%				5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%	5%	100%	95%
Ruse (BG) / Giurgiu (RO)				20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%

C.3. Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	280.5	317.2	306.4	253.2	309.1	292.0
Supply Maximization	440.8	507.0	478.4	355.8	442.3	408.9
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	10.2	8.5	9.1	0.5	0.5	0.5
2 Weeks	5.5	39.5	38.4	0.1	0.1	0.1
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	7.6	6.8	9.7	4.5	4.2	5.7
Fuel Switch savings	0.0	0.0	0.0	0.0	0.1	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	312.7	255.7	323.8	289.1	340.8	301.2	317.2	280.5
Supply Maximization	502.5	55.0	643.8	89.8	557.4	483.6	253.5	220.4
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	10.2	8.5	10.2	8.5	5.9	4.2	10.2	8.5
2 Weeks	39.5	5.5	39.5	5.5	55.2	46.0	39.5	5.5
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	9.7	6.8	9.7	6.8	12.1	8.2	9.7	6.8
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	296.7	237.8	344.3	259.7	331.3	269.7	309.1	253.2
Supply Maximization	418.8	77.0	577.8	0.0	483.1	387.1	221.1	177.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.5	0.5	0.5	0.5	0.0	0.0	0.5	0.5
2 Weeks	0.1	0.1	0.1	0.1	0.0	0.0	0.1	0.1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	5.7	4.2	5.7	4.2	6.9	4.9	5.7	4.2
Fuel Switch savings	0.1	0.0	0.1	0.0	0.2	0.0	0.1	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations.
In order to give a comparable measure of project effects, the Table 2 shall be filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-0358 and TRA-N-1322	Pipeline and compressor stations	The total area of land which will be occupied by the works for the construction of the investment objective is of approximately 1085 ha, out of which the temporary occupied area is of approximately 1073 ha, and the permanently occupied area is of approximately 12 ha.	Total surface: 147.8 ha.
TRA-N-0362	308 km pipeline length	The total area of land which will be occupied by the works for the construction of the investment objective is of approximately 690,7 ha, out of which the temporary occupied area is of approximately 689,4 ha, and the permanently occupied area is of approximately 1,3 ha.	Total surface: 25. ha.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-0286	Compressor	stack gas	Csanádpalota és Nagylak settlement and inhabitants
TRA-N-123	Compressor	stack gas	Városföld settlement and inhabitants

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Air	Compressor units equipped with SOLONOX system	included the project CAPEX, OPEX	No
Noise effect	Units will be installed indoor, and each compressor unit will be cased. Also Transgaz requested that at the Compressor Station fence the noise limit must not exceed the legal requirements.	included the project CAPEX, OPEX	No
The impact on environmental factors shall have various intensities, which are however short and express themselves only in the areas of the execution works; through the measures proposed in the report on the evaluation of the impact and the adequate evaluation study, the impact shall be significantly reduced, both during the execution periods, as well as during the exploitation period	Water protection measures/ Air protection measures / Soil and undersoil protection measures / Protection measures against noise / Measures regarding waste management / Measures regarding the management of dangerous substances and chemicals / Measures related to framing in the landscape / Measures for the protection of the biodiversity	Included in CAPEX and OPEX	NO

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
NOx component	Compressor units equipped with SOLONOX system	included the project CAPEX, OPEX	No
NOx component, noise effect TRA-F-0286 TRA-N-123	Compressor units equipped with SOLONOX system, unit installed in an existing building and chimney with noise reduction system	included the project CAPEX, OPEX	No

Environmental Impact explained [Promoter]

Projects TRA-F-0358, TRA-N-1322 and TRA-N-0362 have obtained all the Environmental Impact Assessment

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The utilization will be increased on the existing FGSZ and TRANSGAZ natural gas system.

F. Useful Links

Transgaz Project link:
http://www.transgaz.ro/ro/conducta-tarmul-marii-negre-podisor-ro-pentru-preluarea-gazului-din-marea-neagra
Transgaz National Development Plan 2018-2027:
http://www.transgaz.ro/sites/default/files/Downloads/PDSNT%202018-2027.pdf
Transgaz additional information links:
http://www.transgaz.ro/ro/dezvoltarea-pe-teritoriul-romaniei-sistemului-national-de-transport-gaze-pe-coridorul-conductei-de
http://www.transgaz.ro/ro/extinderea-capacitatii-de-transport-gazelor-naturale-din-romania-catre-ungaria-pana-la-44-mldmcan
http://www.transgaz.ro/en/project-brha-management-documents
http://www.transgaz.ro/en/expansion-transmission-capacity-romania-towards-hungary-44-bcmyear-2nd-phase
FGSZ Project link:
https://fgsz.hu/en/about-fgsz/activities-business-policy/international-projects/brua
FGSZ National Development Plan:
https://fgsz.hu/en/about-fgsz/news/public-consultation-of-the-hungarian-ten-years-national-development-proposal.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

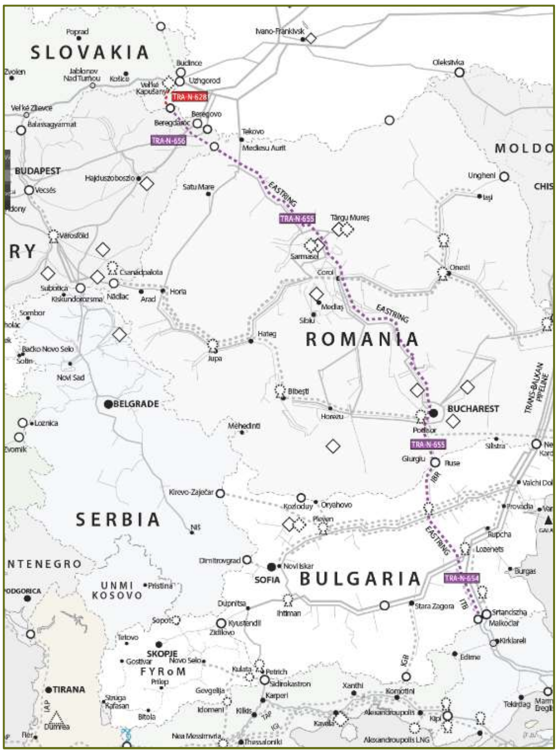
Project Group EAST_15

Reasons for grouping [ENTSOG]

The project group includes the different parts of the Eastring Project, a bi-directional transmission pipeline to connect existing gas transmission infrastructure in Slovakia, Hungary, Romania and Bulgaria with existing or new IPs at the external border of the EU.

Objective of the project(s) in the group [Promoter]

The objective of the project group is to secure natural gas supply for 100% of all Balkan countries' consumption and to provide western shippers with the possibility of supplying vulnerable Balkan countries incl. Turkey from European hubs. It aims at allowing additional utilization for existing transit and storage assets in Central and Eastern Europe (CZ, SK, PL, UA, RO, BG) for new alternative gas sources.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0628	Eastring - Slovakia	eustream, a.s.	SK	Advanced	6.25.1	2023	2028	Delayed
TRA-N-0654	Eastring - Bulgaria	Bulgartransgaz EAD	BG	Less-Advanced	6.25.1	2023	2028	Delayed
TRA-N-0655	Eastring - Romania	SNTGN Transgaz SA	RO	Less-Advanced	6.25.1	2023	2028	Delayed
TRA-N-0656	Eastring - Hungary	FGSZ	HU	Less-Advanced	6.25.1	2023	2028	Delayed

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0628	1400	19	52
TRA-N-0654	1400	257	88
TRA-N-0655	1400	651	-
TRA-N-0656	1400	112	0

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0628	Eastring B.V.	Eastring Cross-Border HU/EAR <> SK/EAR	2023	570	570
TRA-N-0628	Eastring B.V.	Eastring SK/EAR <-> Veľké Kapušany	2023	570	570
TRA-N-0628	Eastring B.V.	Eastring Cross-Border HU/EAR <> SK/EAR	2028	570	570
TRA-N-0628	Eastring B.V.	Eastring SK/EAR <-> Veľké Kapušany	2028	570	570
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border TR>BG/EAR	2023	570	-
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border BG/EAR>TR	2023	-	570
TRA-N-0654	Bulgartransgaz EAD	Eastring BG Domestic Point	2023	200	200
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border BG/EAR <> RO/EAR	2023	570	570
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border TR>BG/EAR	2028	570	-
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border BG/EAR>TR	2028	-	570
TRA-N-0654	Bulgartransgaz EAD	Eastring Cross-Border BG/EAR <> RO/EAR	2028	570	570
TRA-N-0655	SNTGN Transgaz S.A.	Eastring Cross-Border BG/EAR <> RO/EAR	2023	570	570
TRA-N-0655	SNTGN Transgaz S.A.	Eastring RO Domestic Point	2023	150	150
TRA-N-0655	SNTGN Transgaz S.A.	Eastring CrossnaBorder RO/EAR <> HU/EAR	2023	570	570
TRA-N-0655	SNTGN Transgaz S.A.	Eastring Cross-Border BG/EAR <> RO/EAR	2028	570	570
TRA-N-0655	SNTGN Transgaz S.A.	Eastring CrossnaBorder RO/EAR <> HU/EAR	2028	570	570
TRA-N-0656	FGSZ Ltd.	Eastring CrossnaBorder RO/EAR <> HU/EAR	2023	570	570
TRA-N-0656	FGSZ Ltd.	Eastring HU Domestic Point	2023	570	-
TRA-N-0656	FGSZ Ltd.	Eastring Cross-Border HU/EAR <> SK/EAR	2023	570	570
TRA-N-0656	FGSZ Ltd.	Eastring CrossnaBorder RO/EAR <> HU/EAR	2028	570	570
TRA-N-0656	FGSZ Ltd.	Eastring Cross-Border HU/EAR <> SK/EAR	2028	570	570

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-628	TRA-N-656	TRA-N-655	TRA-N-654
CAPEX [mln. EUR]	2019.63	123.92**	282.30	926.46**	686.95
Range CAPEX		25%	20%	25%	25%
OPEX [mln. EUR/y]	10.60	2.09**	5.10	1.03**	2.38

Description of costs and range [Promoter]

Based on the Eastring project maturity, costs will depend on chosen routing and the capacity for which it will be built that´s a reason why range is foreseen for 25%. The length of the pipeline system and installed power of compressor station influence costs. The most significant impact on operating costs is the energy consumption of compressor stations caused by different pipeline lengths.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Hungary, Slovakia and Romania. Enabling the connection of the European market with the Black Sea and Turkey Region, the project group **decreases the dependence of Russian gas** for Romania and for many Eastern countries in 2025 and 2030 and **the dependence of LNG** for many European countries. However, especially when compared to Russian dependency, the impacted countries already show a limited dependency to LNG. This dependency results higher than 10% only in the Sustainable Transition scenario, generally characterised by higher gas demand. Depending on the considered demand scenarios the projects group also **increases the number of supply sources** Romania can have access to.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Romania (in peak day and 2-week cold spell) and Bulgaria and Hungary in peak day. The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, FYROM, Hungary, Serbia and Romania (most impacted). The project group also **mitigate the risk of demand curtailment** for other European Countries in Sustainable Transition scenarios in 2030 and 2040.
The project group **mitigates the risk of demand curtailment** in Romania in case of disruption of the single largest infrastructures in Romania (VIP Mediesu Aurit - Isaccea (RO-UA)).

> **Market integration:**

The project group brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration this can be estimated around 195 Mln EUR/y (on average) in the low infrastructure level. Such benefits are driven by the fact that the project allows Europe to connect to new supply sources through the Turkish region. These benefits are lower in the advanced infrastructure level (around 50 Mln EUR/y on average) where, given TYNDP 2018 supply potential available through Turkey, more projects can connect such supply potential to Europe (like EAST_16). The availability of gas through Turkey in ENTSOG assessment is based on TYNDP 2018 supply potential and not on supply long-term contracts. ENTSOG notes that the benefits described are dependent on the actual availability of such quantities.
Additional benefits compared to the reference situation can be observed in the case of Southern supply Maximisation due to the new supply source diversification trough Turkey.
Reduction in the cost of gas supply can be partially explained also by savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (from 40 Mln EUR/y to 115 Mln EUR/y depending on the scenarios) that can be attributed to the connection to the new source(s).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The CO_2 benefits are largest in Romania and lowest in Slovakia among the host countries. The switch from solid fuels to natural gas can significantly contribute to $C0_2$ and other emissions reduction and still economically acceptable solution to mitigate the risks of energy poverty in the region.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria	7%	3%	-4%				13%	9%	-4%				4%	0%	-4%				13%	6%	-7%			
Belgium	7%	4%	-3%				13%	10%	-3%				4%	0%	-4%				13%	8%	-5%			
Croatia	5%	3%	-2%				13%	9%	-4%										13%	7%	-6%			
Czechia	7%	3%	-4%				12%	9%	-3%				4%	0%	-4%				13%	8%	-5%			
Denmark	7%	3%	-4%				13%	9%	-4%				4%	0%	-4%				13%	8%	-5%			
France	8%	4%	-4%				13%	10%	-3%				5%	0%	-5%				14%	8%	-6%			
FYROM	8%	4%	-4%				12%	10%	-3%										13%	6%	-7%			
Germany	7%	4%	-4%				13%	9%	-3%				4%	0%	-4%				13%	8%	-5%			
Greece	7%	3%	-4%				12%	9%	-3%										11%	6%	-5%			
Ireland	8%	4%	-4%				13%	10%	-3%				4%	0%	-4%				14%	8%	-6%			
Italy	7%	3%	-4%				13%	9%	-4%				4%	0%	-4%				13%	6%	-7%			
Luxembourg	7%	4%	-3%				13%	10%	-3%				4%	0%	-4%				13%	8%	-5%			
Netherlands	7%	4%	-3%				13%	10%	-3%				4%	0%	-4%				13%	8%	-5%			
Poland	7%	0%	-7%				12%	0%	-12%				4%	0%	-4%				13%	8%	-5%			
Slovakia	7%	0%	-7%				12%	0%	-12%				4%	0%	-4%				13%	0%	-13%			
Slovenia	7%	3%	-4%				13%	9%	-4%				4%	0%	-4%				13%	7%	-6%			
Sweden	7%	3%	-4%				13%	9%	-4%				4%	0%	-4%				13%	8%	-5%			
Switzerland	7%	4%	-3%				13%	9%	-4%				4%	0%	-4%				13%	7%	-6%			
United Kingdom	8%	4%	-4%				13%	10%	-3%				4%	0%	-4%				13%	8%	-5%			
Dependence to RU (%)																								
Austria	25%	19%	-6%				25%	15%	-10%	7%	0%	-7%	33%	8%	-25%	2%	0%	-2%	22%	16%	-6%			
Belgium	13%	10%	-2%				13%	8%	-4%	3%	0%	-3%							12%	9%	-3%			
Bosnia Herzegovina	21%	18%	-3%	11%	8%	-3%																		
Bulgaria	21%	18%	-3%	11%	8%	-3%																		
Croatia	31%	19%	-12%	24%	9%	-15%	35%	16%	-19%	27%	0%	-27%	33%	8%	-25%	27%	0%	-27%	48%	16%	-32%	31%	0%	-31%
Czechia	31%	19%	-12%	28%	9%	-19%	35%	15%	-20%	26%	0%	-26%	33%	8%	-25%	27%	0%	-27%	47%	17%	-30%	31%	0%	-31%
Denmark	29%	19%	-10%	21%	9%	-12%	34%	15%	-19%	13%	0%	-13%	33%	8%	-25%	18%	0%	-18%	33%	17%	-16%	5%	0%	-5%
France	14%	11%	-3%				15%	10%	-5%	3%	0%	-3%							13%	10%	-3%			
FYROM	22%	18%	-4%	12%	8%	-4%																		
Germany	25%	19%	-6%	16%	9%	-7%	28%	15%	-14%	9%	0%	-9%	24%	8%	-16%	9%	0%	-9%	27%	16%	-11%	2%	0%	-2%
Hungary	32%	19%	-13%	29%	9%	-20%	35%	15%	-20%	27%	0%	-27%	34%	8%	-26%	27%	0%	-27%	48%	16%	-32%	31%	0%	-31%
Italy	22%	18%	-4%	11%	8%	-2%	24%	15%	-9%	5%	0%	-5%	15%	8%	-7%				22%	16%	-6%			
Luxembourg	12%	10%	-2%				13%	9%	-4%	3%	0%	-3%							12%	9%	-3%			
Netherlands	21%	18%	-3%				24%	15%	-9%	5%	0%	-5%	16%	8%	-8%				22%	16%	-6%			
Poland	31%	19%	-12%	28%	9%	-19%	34%	16%	-18%	26%	0%	-26%	33%	8%	-25%	18%	0%	-18%	48%	26%	-22%	30%	0%	-30%
Romania	43%	19%	-24%	35%	9%	-26%	54%	16%	-38%	41%	0%	-41%	50%	8%	-42%	53%	0%	-53%	64%	21%	-44%	49%	0%	-49%
Serbia	21%	18%	-3%	11%	8%	-3%																		
Slovakia	31%	19%	-12%	28%	9%	-19%	35%	15%	-20%	26%	0%	-26%	33%	8%	-25%	27%	0%	-27%	48%	16%	-32%	31%	0%	-31%
Slovenia	25%	19%	-6%				25%	15%	-10%	7%	0%	-7%	33%	8%	-25%	3%	0%	-3%	22%	16%	-6%			
Sweden	30%	19%	-11%	22%	9%	-13%	34%	16%	-18%	13%	0%	-13%	33%	8%	-25%	18%	0%	-18%	33%	17%	-16%	5%	0%	-5%
Switzerland	22%	19%	-3%				24%	15%	-9%	5%	0%	-5%	16%	8%	-8%				22%	16%	-6%			
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	3558	3139	-419	3558	3057	-501	3558	3063	-494	3558	2923	-635	3558	2935	-623	3558	2836	-721	3558	3003	-554	3558	2885	-673
Romania	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963	7704	5741	-1963
Slovakia	3334	2500	-833	3334	2500	-833	3333	2500	-833	3333	2500	-833	3346	2508	-838	3333	2500	-833	3334	2501	-834	3333	2500	-833
Supply Source Access (SSA)																								
Romania							1	2	1	2	3	1	1	2	1	1	2	1	1	2	1			

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Croatia																19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	2%
Romania	51%	76%	25%	60%	86%	27%	43%	67%	25%	28%	50%	22%	18%	39%	22%	19%	39%	20%	30%	54%	23%	23%	44%	21%
Remaining Flexibility Peak day (%)																								
Bulgaria	88%	100%	12%	88%	100%	12%	75%	100%	25%	77%	100%	23%				79%	100%	21%	81%	100%	19%	78%	100%	22%
Hungary	83%	100%	17%	92%	100%	8%																		
Italy																			35%	41%	5%			
Poland										80%	81%	1%												
Romania	30%	51%	21%	34%	56%	22%	23%	44%	21%	12%	32%	20%	4%	22%	19%	2%	19%	17%	10%	30%	20%	8%	26%	19%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania	23%	1%	-21%	20%	0%	-20%	29%	8%	-21%	35%	15%	-20%	41%	22%	-19%	43%	26%	-17%	38%	19%	-20%	40%	21%	-19%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%										2%	0%	-2%			
EU export to Ukraine							2%	0%	-2%										2%	0%	-2%			
France							2%	0%	-2%										2%	0%	-2%			
Germany							2%	0%	-2%															
Ireland							2%	0%	-2%										2%	0%	-2%			
Luxembourg							2%	0%	-2%										2%	0%	-2%			
Portugal																			2%	0%	-2%			
Slovenia							2%	0%	-2%										2%	0%	-2%			
Spain																			2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
United Kingdom							2%	0%	-2%										2%	0%	-2%			
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Romania	12%	0%	-12%	6%	0%	-6%	19%	0%	-19%	27%	5%	-22%	34%	12%	-22%	34%	14%	-20%	28%	5%	-23%	32%	11%	-21%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria							6%	0%	-6%										6%	0%	-6%			
Bosnia Herzegovina	10%	0%	-10%	6%	0%	-6%	8%	0%	-8%	6%	0%	-6%				4%	0%	-4%	8%	0%	-8%	6%	0%	-6%
Bulgaria	10%	0%	-10%	6%	0%	-6%	9%	0%	-9%	7%	0%	-7%				5%	0%	-5%	8%	0%	-8%	6%	0%	-6%
Croatia																22%	21%	-1%						
Czechia							4%	0%	-4%										6%	0%	-6%			
FYROM										8%	0%	-8%				6%	3%	-3%				6%	0%	-6%
Germany							5%	0%	-5%										6%	0%	-6%			
Greece							4%	0%	-4%										2%	0%	-2%			
Hungary	9%	0%	-9%	5%	0%	-5%	6%	0%	-6%										6%	0%	-6%			
Italy							6%	0%	-6%										3%	0%	-3%			
Luxembourg							6%	0%	-6%										8%	0%	-8%			
Poland							2%	0%	-2%										6%	1%	-6%			
Romania	23%	1%	-21%	20%	0%	-20%	29%	8%	-21%	35%	15%	-20%	41%	22%	-19%	43%	26%	-17%	38%	19%	-20%	40%	21%	-19%
Serbia	10%	0%	-10%	6%	0%	-6%	8%	0%	-8%	6%	0%	-6%				4%	0%	-4%	8%	0%	-8%	6%	0%	-6%
Slovakia							6%	0%	-6%										6%	0%	-6%			
Slovenia							6%	0%	-6%										8%	0%	-8%			
Switzerland							6%	0%	-6%										6%	0%	-6%			

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria							7%	0%	-7%										3%	0%	-3%			
Belgium	3%	0%	-3%				7%	2%	-5%										3%	0%	-3%			
Bosnia Herzegovina							7%	0%	-7%															
Croatia							7%	0%	-7%															
Czechia							7%	0%	-7%										3%	0%	-3%			
Denmark							7%	0%	-7%										3%	0%	-3%			
Estonia							7%	0%	-7%															
Finland							7%	0%	-7%															
France	3%	0%	-3%				8%	2%	-6%										3%	0%	-3%			
FYROM							8%	2%	-6%															
Germany	3%	0%	-3%				7%	1%	-6%										3%	0%	-3%			
Greece	2%	0%	-2%				7%	2%	-5%															
Hungary							7%	0%	-7%															
Ireland	3%	0%	-3%				8%	2%	-6%										3%	0%	-3%			
Italy	3%	0%	-3%				7%	2%	-5%										3%	0%	-3%			
Latvia							7%	0%	-7%															
Lithuania							7%	0%	-7%															
Luxembourg	3%	0%	-3%				7%	2%	-5%										3%	0%	-3%			
Netherlands	3%	0%	-3%				7%	2%	-5%										3%	0%	-3%			
Poland							7%	0%	-7%										3%	0%	-3%			
Serbia							7%	0%	-7%															
Slovakia							7%	0%	-7%										3%	0%	-3%			
Slovenia							7%	0%	-7%										3%	0%	-3%			
Sweden							7%	0%	-7%										3%	0%	-3%			
Switzerland	3%	0%	-3%				7%	2%	-5%										3%	0%	-3%			
United Kingdom	3%	0%	-3%				8%	2%	-6%										3%	0%	-3%			
Dependence to RU (%)																								
Austria	19%	13%	-6%	8%	1%	-7%	21%	8%	-13%				13%	0%	-13%				21%	7%	-14%			
Belgium	18%	12%	-6%	5%	1%	-4%	11%	4%	-6%				6%	0%	-6%				12%	4%	-8%			
Bosnia Herzegovina	19%	12%	-7%	8%	0%	-8%	21%	7%	-14%				13%	0%	-13%				21%	7%	-14%			
Bulgaria	9%	0%	-9%																					
Croatia	19%	12%	-7%	8%	0%	-8%	21%	7%	-14%				12%	0%	-12%				21%	7%	-14%			
Czechia	19%	13%	-6%	9%	1%	-8%	21%	8%	-13%				13%	0%	-13%				21%	8%	-13%			
Denmark	19%	12%	-7%	8%	1%	-7%	21%	8%	-13%				13%	0%	-13%				21%	7%	-14%			
Estonia	19%	13%	-6%	8%	1%	-7%	21%	8%	-13%				13%	5%	-8%				21%	8%	-13%			
Finland	19%	13%	-6%	9%	1%	-8%	21%	8%	-13%										21%	8%	-13%			
France	18%	12%	-6%	5%	1%	-5%	12%	5%	-7%										9%	5%	-4%			
FYROM	18%	12%	-6%	6%	0%	-6%	15%	6%	-9%															
Germany	19%	13%	-6%	8%	1%	-7%	21%	8%	-13%				12%	0%	-12%				21%	8%	-14%			
Greece	18%	12%	-6%	4%	0%	-4%	9%	3%	-5%															
Hungary	19%	12%	-7%	8%	0%	-8%	21%	7%	-14%				12%	0%	-12%				21%	7%	-14%			
Italy	18%	13%	-6%	8%	1%	-7%	21%	8%	-13%				12%	0%	-12%				21%	7%	-14%			
Latvia	19%	13%	-6%	8%	1%	-7%	21%	8%	-13%				13%	6%	-7%				22%	8%	-14%			
Lithuania	19%	13%	-6%	9%	1%	-8%	21%	8%	-13%				13%	6%	-7%				22%	8%	-14%			
Luxembourg	18%	12%	-6%	4%	1%	-3%	11%	4%	-7%				6%	0%	-6%				12%	4%	-8%			
Netherlands	18%	12%	-6%	8%	1%	-7%	21%	8%	-13%				12%	0%	-12%				21%	7%	-14%			
Poland	19%	13%	-6%	9%	1%	-8%	21%	8%	-13%				13%	0%	-13%				22%	8%	-14%			
Serbia	19%	12%	-7%	8%	0%	-8%	21%	7%	-14%				12%	0%	-12%				21%	7%	-14%			
Slovakia	19%	13%	-6%	9%	1%	-8%	21%	8%	-13%				13%	0%	-13%				22%	7%	-15%			
Slovenia	19%	12%	-7%	8%	1%	-7%	21%	7%	-14%				13%	0%	-13%				21%	7%	-14%			
Sweden	19%	13%	-6%	8%	1%	-7%	19%	8%	-11%				13%	0%	-13%				19%	8%	-11%			
Switzerland	18%	13%	-5%	8%	1%	-7%	21%	8%	-13%				12%	0%	-12%				21%	7%	-14%			
LNG and Interconnection Capacity Diversification (LICD)																								
Hungary	2165	2010	-154	2165	1966	-199	2165	1969	-195	2165	1897	-267	2165	1903	-261	2165	1856	-309	2165	1938	-227	2165	1879	-286
Romania	5802	3922	-1880	5583	3743	-1841	5820	3938	-1882	5511	3687	-1825	5554	3720	-1834	5494	3673	-1820	5850	3963	-1886	5414	3614	-1800
Slovakia	3334	2500	-833	3334	2500	-833	3333	2500	-833	3333	2500	-833	3346	2508	-838	3333	2500	-833	3334	2501	-834	3333	2500	-833
Supply Source Access (SSA)																								
Finland																			2	3	1			
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Italy																81%	82%	1%						
Remaining Flexibility Peak day (%)																								
Italy																63%	64%	1%						

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	178	226	185	45	62	49
	Supply Maximization	492	575	498	75	86	74
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	10	28	17	0	0	0
	2 Weeks	6	52	50	0	0	0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	22	21	29	14	14	18
	Fuel Switch savings	0	1	0	0	1	0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	115	40	307	242	229	168	226	178
Supply Maximization	396	0	672	65	583	476	287	246
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	28	10	28	10	27	5	28	10
2 Weeks	52	6	52	6	62	56	52	6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	29	21	29	21	36	24	29	21
Fuel Switch savings	1	0	1	0	1	0	1	0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	10	0	142	103	59	39	62	45
Supply Maximization	60	0	179	0	79	59	43	37
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0	0	0	0	0	0	0	0
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	18	14	18	14	22	15	18	14
Fuel Switch savings	1	0	1	0	1	0	1	0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
		Nature protection	
		Archaeology	
		Deforestation intensity	
		Consistency with spatial plans	

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

At this phase of the Eastring project a feasibility study has been worked out which identifies some environmental impacts, mainly in following areas – nature protection, archaeology, deforestation intensity and consistency with special plans One of the recommendations of the feasibility study is to carry out the environmental impact assessment in order to obtain environmental permit before the application for statutory permit. However, environmental impacts, mitigation measures and related costs depend on a chosen routing. An appropriate assessment (AA) is required in order to assess potential adverse effects of the project on Special Areas of Conservation and Special Protection Areas.

Additional information (Environmental Impact) [Promoter]

At this phase of the Eastring project a feasibility study has been worked out which identifies some environmental impacts. However, environmental impacts, mitigation measures and related costs depend on a chosen routing. An appropriate assessment (AA) is required in order to assess potential adverse effects of the project on Special Areas of Conservation and Special Protection Areas. Taking into account a cross-border character of the Eastring project EIA is needed to be prepared with a target to reduce environmental impacts prior to the Eastring project approval.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Based on the conclusions of the Feasibility Study in 09/2018 the following additional benefits were identified:

The Eastring project would provide substantial benefits in case of a demand shock. Security of supply benefits are 908 million € on a host country level. The estimated total non-discounted economic benefit generated by new employment is 389.7million € for the construction period and 20 years of operation.

F. Useful Links

Eustream Project Link:
https://www.eustream.sk/sk_prepravna-siet/sk_rozvoj-siete/sk_plan-rozvoja-siete/sk_konzultacia-dokumentu
Eastring Project Link:
https://www.eastring.eu/
Bulgartransgaz National Development Plan 2018-2027:
https://www.bulgartransgaz.bg/en/pages/desetgodishni-planove-za-razvitie-na-mrejite-na-bulgartransg-142.html;
Bulgartransgaz PCI 6.25.1
https://www.bulgartransgaz.bg/bg/pages/proekt-eastring-balgariya-poi-6-25-1--136.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_16

Reasons for grouping [ENTSOG]

The project group represents the investment related to the construction of the Bulgarian gas hub concept. It includes new infrastructure starting at a new IP at Varna to a new IP at Bulgaria/Romanian border near Oryahovo city (TRA-N-593) and two enabler projects (TRA-N-592; TRA-N-954).

Objective of the project(s) in the group [Promoter]

The objective of the establishment of Balkan gas hub is to connect the markets from the Balkan region, Central and Eastern Europe, including Ukraine, with Western European markets through the construction of the required gas transmission infrastructure and through providing the required trade and regulatory environment, including a liquid and competitive gas exchange. It aims at enabling Bulgaria and the South and Central Europe countries to improve their security of supply, as well as diversify the sources and routes.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0592	Looping CS Valchi Dol - Line valve Novi Iskar	Bulgartransgaz EAD	BG	Advanced	6.25.4	2022	2022	On time
TRA-N-0593	Varna-Oryahovo gas pipeline	Bulgartransgaz EAD	BG	Advanced	6.25.4	2022	2022	On time
TRA-N-0594	Construction of a Looping CS Provadia – Rupcha village	Bulgartransgaz EAD	BG	Advanced	6.25.4	2022	2022	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0592	700	383	-
TRA-N-0593	1200	844	265
TRA-N-0594	1200	50	10
TRA-N-0594	1000	20	-

[1] [1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0592	Bulgartransgaz EAD	GMS Chiren	2022	44	44
TRA-N-0592	Bulgartransgaz EAD	Ruse (BG) / Giurgiu (RO)	2022	30.8	30.8
TRA-N-0593	Bulgartransgaz EAD	Varna	2022	1366	-
TRA-N-0593	Bulgartransgaz EAD	Oryahovo	2022	-	1366
TRA-N-0594	Bulgartransgaz EAD	Strandzha (BG) / Malkoclar (TR)	2022	-	192.5

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-593	TRA-N-592	TRA-N-594
CAPEX [mln. EUR]	1771.59	1152.83	523.14	95.61
Range CAPEX		30%	30%	30%
OPEX [mln. EUR/y]	71.51	46.54	21.12	3.86

Description of costs and range [Promoter]

The CAPEX includes all the costs for the implementation of the projects until their commissioning, including FEED, supervision, construction works, delivery of materials, project management, publicity, etc. The OPEX figures are a preliminary estimation by the project promoters. The range of CAPEX, indicated in the above table, reflects the uncertainty of costs due to the stage of the project development.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

The assessment carried out by ENTSOG was based on the information provided by the promoter during TYNDP 2018 project collection that the project "[…] *is based on the idea that significant quantities of natural gas from different sources to enter into a given real physical point in the region of Varna* […]". ENTSOG notes that the benefits described are dependent on the actual availability of such significant quantities in the region in the future.

> **Competition:**

The project group further **improves the diversification of capacities** (LICD indicator) in entry in Bulgaria and Romania. Enabling the connection of the European market with the Black Sea and Turkey Region, the project group **decreases the dependence of Russian gas** for Eastern countries in most scenarios. Depending on the considered demand scenarios the projects group also **increases the number of supply sources** for Romania.

> **Security of Supply:**

The project group **increases the remaining flexibility** for Romania (in peak day and 2-week cold spell) and Bulgaria in peak day only. The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Bosnia and Herzegovina, Bulgaria, FYROM, Hungary, Serbia and Romania (most impacted). The project group also **mitigate the risk of demand curtailment** for other European Countries in Sustainable Transition scenarios in 2030 and 2040.
The project group **mitigates the risk of demand curtailment** in Romania in case of disruption of the single largest infrastructures in Romania (VIP Mediesu Aurit - Isaccea (RO-UA)).

> **Market Integration:**

The **bidirectionality is improved** with the project group between Bulgaria and Romania at Ruse (BG) / Giurgiu (RO).
The project brings benefits in monetised terms as a **reduction of the cost of gas supply**. In the reference supply price configuration can be estimated around 122 Mln EUR/y (on average) in the low infrastructure level and around 66 Mln EUR (on average) in the advanced infrastructure level. These benefits are lower in the advanced infrastructure level (around 50 Mln EUR/y on average) where, given TYNDP 2018 supply potential available through Turkey, more projects can connect such supply potential to Europe (like EAST_15). Additional benefits compared to the reference situation can be observed in case Southern gas is cheaper than other sources. Reduction in the cost of gas supply can be partially explained also by savings in transportation costs thanks to the utilisation of this new alternative route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits (from 36 Mln EUR/y to 90 Mln EUR/y depending on the scenarios) that can be attributed to the connection to the new source(s).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The project implementation will enable expanding the use of natural gas for the domestic and industrial needs of the region, which will reduce emissions of harmful substances in the atmosphere as a result of replacing the use of conventional fuels and hence improve air quality. The use of technologies and equipment based on best available techniques in the envisaged for construction new CS, including installation of low emission GTCUs, will contribute to ensure environmentally friendly and efficient use of natural resources. Towards sustainability of the impact on climate change, long-term and sustainable reduction of greenhouse gas emissions is expected in the affected regions.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria													33%	22%	-11%									
Bosnia Herzegovina	21%	12%	-9%	11%	5%	-6%	16%	0%	-16%										6%	0%	-6%			
Bulgaria	21%	12%	-9%	11%	6%	-5%	15%	0%	-15%										5%	0%	-5%			
Croatia	31%	27%	-5%	24%	17%	-8%	35%	27%	-8%	27%	10%	-17%	33%	23%	-10%	27%	7%	-20%	48%	23%	-25%	31%	9%	-22%
Czechia	31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	21%	-5%				27%	20%	-7%				31%	28%	-3%
Denmark	29%	26%	-3%				34%	30%	-4%															
FYROM	22%	17%	-5%	12%	8%	-4%	16%	0%	-16%										6%	0%	-6%			
Hungary	32%	26%	-6%	29%	17%	-12%	35%	27%	-8%	27%	10%	-17%	34%	23%	-10%	27%	6%	-21%	48%	22%	-26%	31%	9%	-22%
Poland	31%	26%	-5%	28%	22%	-6%	34%	31%	-3%	26%	21%	-5%												
Romania	43%	0%	-43%	35%	0%	-35%	54%	0%	-54%	41%	0%	-41%	50%	0%	-50%	53%	0%	-53%	64%	0%	-64%	49%	0%	-49%
Serbia	21%	12%	-9%	11%	5%	-6%	16%	0%	-16%										5%	0%	-5%			
Slovakia	31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
Slovenia													33%	23%	-10%									
Sweden	30%	26%	-4%				34%	31%	-3%															
LNG and Interconnection Capacity Diversification (LICD)																								
Bulgaria	4976	3823	-1153	4976	3823	-1153	5093	3963	-1130	4966	3809	-1156	4944	3780	-1164	4995	3847	-1148	5094	3964	-1130	4971	3816	-1155
Romania	7704	7383	-321	7704	7151	-553	7704	7401	-302	7704	7069	-635	7704	7119	-585	7704	7048	-655	7704	7431	-273	7704	6952	-752
Supply Source Access (SSA)																								
Romania				2	3	1				2	3	1	1	2	1	1	2	1				2	3	1

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Croatia																19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																								
Romania	51%	100%	49%	60%	100%	40%	43%	100%	57%	28%	100%	72%	18%	100%	82%	19%	100%	81%	30%	100%	70%	23%	100%	77%
Remaining Flexibility Peak day (%)																								
Bulgaria	88%	100%	12%	88%	100%	12%	75%	87%	12%	77%	88%	11%				79%	93%	14%	81%	93%	12%	78%	89%	12%
Romania	30%	100%	70%	34%	100%	66%	23%	100%	77%	12%	100%	88%	4%	100%	96%	2%	100%	98%	10%	100%	90%	8%	100%	92%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania	23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	35%	0%	-35%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Romania	12%	0%	-12%	6%	0%	-6%	19%	0%	-19%	27%	0%	-27%	34%	0%	-34%	34%	0%	-34%	28%	0%	-28%	32%	0%	-32%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria							6%	4%	-2%										6%	4%	-2%			
Bosnia Herzegovina	10%	0%	-10%	6%	0%	-6%	8%	6%	-2%	6%	0%	-6%				4%	0%	-4%	8%	4%	-4%	6%	0%	-6%
Bulgaria	10%	0%	-10%	6%	0%	-6%	9%	6%	-3%	7%	0%	-7%				5%	0%	-5%	8%	4%	-4%	6%	0%	-6%
Croatia																22%	21%	-1%						
Czechia																			6%	4%	-2%			
FYROM										8%	0%	-8%				6%	3%	-3%				6%	0%	-6%
Germany							5%	5%	-1%										6%	5%	-1%			
Hungary	9%	0%	-9%	5%	0%	-5%	6%	4%	-2%										6%	3%	-3%			
Italy							6%	4%	-2%															
Luxembourg																			8%	6%	-2%			
Romania	23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	35%	0%	-35%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Serbia	10%	0%	-10%	6%	0%	-6%	8%	6%	-2%	6%	0%	-6%				4%	0%	-4%	8%	4%	-4%	6%	0%	-6%
Slovakia							6%	4%	-2%										6%	4%	-2%			
Slovenia																			8%	6%	-2%			

	2025			2030						2040								
	BEST ESTIMATE (CbG)			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																		
Bi-directionality Balance																		
Ruse (BG) / Giurgiu (RO)	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria																			6%	3%	-3%			
Belgium																			6%	3%	-3%			
Bosnia Herzegovina																			6%	2%	-4%			
Bulgaria							8%	2%	-6%										5%	0%	-5%			
Croatia																			5%	2%	-3%			
Estonia																			5%	2%	-3%			
Finland																			5%	2%	-3%			
France																			6%	3%	-3%			
FYROM																			6%	2%	-4%			
Germany																			6%	3%	-3%			
Greece																			5%	2%	-3%			
Hungary																			5%	2%	-3%			
Ireland																			6%	3%	-3%			
Italy																			6%	3%	-3%			
Latvia																			5%	2%	-3%			
Lithuania																			5%	2%	-3%			
Luxembourg																			6%	3%	-3%			
Netherlands																			6%	3%	-3%			
Poland																			5%	3%	-3%			
Romania	3%	0%	-3%				8%	0%	-8%										5%	0%	-5%			
Serbia																			5%	2%	-3%			
Slovenia																			6%	3%	-3%			
Sweden																			6%	3%	-3%			
Switzerland																			6%	3%	-3%			
United Kingdom																			6%	3%	-3%			
Dependence to RU (%)																								
Austria																			25%	21%	-4%			
Bosnia Herzegovina																			25%	21%	-4%			
Bulgaria	18%	9%	-9%	8%	0%	-8%	6%	0%	-6%															
Croatia																			25%	21%	-4%			
Czechia																			25%	21%	-4%			
Denmark																			25%	21%	-4%			
Estonia																			25%	21%	-4%			
Finland																			25%	21%	-4%			
Germany																			25%	21%	-4%			
Hungary																			25%	21%	-4%			
Latvia																			26%	22%	-4%			
Lithuania																			26%	22%	-4%			
Luxembourg																			14%	12%	-2%			
Netherlands																			25%	21%	-4%			
Poland																			25%	22%	-3%			
Romania	18%	0%	-18%	8%	0%	-8%	22%	0%	-22%	3%	0%	-3%	14%	0%	-14%	3%	0%	-3%	26%	0%	-26%			
Serbia																			25%	21%	-4%			
Slovakia																			25%	22%	-3%			
Slovenia																			25%	21%	-4%			
Sweden																			21%	19%	-2%			
LNG and Interconnection Capacity Diversification (LICD)																								
Bulgaria	4976	3823	-1153	4976	3823	-1153	5093	3963	-1130	4966	3809	-1156	4944	3780	-1164	4995	3847	-1148	5094	3964	-1130	4971	3816	-1155
Romania	8907	5802	-3106	8907	5583	-3324	8907	5820	-3087	8907	5511	-3396	8907	5554	-3353	8907	5494	-3413	8907	5850	-3057	8907	5414	-3493

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Italy																80%	81%	1%						
Romania							88%	100%	12%	69%	100%	31%	58%	100%	42%	42%	100%	58%	56%	100%	44%	47%	100%	53%
Remaining Flexibility Peak day (%)																								
Italy																62%	63%	1%						
Romania	81%	100%	19%	86%	100%	14%	61%	100%	39%	48%	100%	52%	38%	100%	62%	22%	100%	78%	31%	100%	69%	29%	100%	71%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania													6%	0%	-6%	23%	0%	-23%	17%	0%	-17%	18%	0%	-18%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Romania																11%	0%	-11%	2%	0%	-2%	7%	0%	-7%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Romania													6%	0%	-6%	23%	0%	-23%	17%	0%	-17%	18%	0%	-18%
Market Integration																								
Bi-directionality Balance																								
Ruse (BG) / Giurgiu (RO)				20%	100%	80%				20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%	20%	100%	80%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	93.6	155.6	117.1	50.9	82.9	65.0
	Supply Maximization	390.6	482.5	428.7	156.7	227.5	192.3
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	17.2	18.5	18.2	5.5	5.1	7.3
	2 Weeks	9.3	56.0	67.8	13.6	4.2	20.8
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	88.0	71.4	112.2	85.6	69.4	109.1
	Fuel Switch savings	0.0	0.2	0.0	0.0	0.2	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	90.0	35.7	193.8	123.9	155.6	93.6	155.6	93.6
Supply Maximization	389.2	0.0	533.7	0.1	482.5	390.6	241.2	195.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	18.5	17.2	18.5	17.2	11.4	9.3	18.5	17.2
2 Weeks	67.8	9.3	67.8	9.3	71.8	56.0	67.8	9.3
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	112.2	71.4	112.2	71.4	112.2	71.4	112.2	71.4
Fuel Switch savings	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	35.8	10.1	123.5	71.8	82.9	50.9	82.9	50.9
Supply Maximization	203.9	0.0	273.8	0.0	227.5	156.7	113.7	78.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	7.3	5.1	7.3	5.1	3.6	2.5	7.3	5.1
2 Weeks	20.8	4.2	20.8	4.2	20.8	4.2	20.8	4.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	109.1	69.4	109.1	69.4	109.1	69.4	109.1	69.4
Fuel Switch savings	0.2	0.0	0.2	0.0	0.2	0.0	0.2	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environme
by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the prom

TYNDP Code	Type of infrastructure	Surface of impact
*		

Potential impact	Mitigation measures	i
Natura 2000 Protected Areas	NA	NA
Protected Areas under the Protected Areas Act	NA	NA
Natural resources	NA	NA
Cultural heritage and archaeological sites	NA	NA

Environmental Impact explained [Promoter]

In December 2018, the Feasibility study for the Balkan gas hub was completed. Within the study an analysis was conducted, and all necess
order to facilitate the preparation of a preliminary environmental impact assessment. The data gathered in the analysis is for all the
infrastructure of the Balkan gas hub. At the next stage of project implementation and depending on the specific infrastructure, the a
Environmental Protection Act, the Biological Diversity Act, etc. will be carried out.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Other project benefits identified within the conduct of the Feasibility study for the Balkan gas hub completed at the end of 2018, besides the infrastructural development in the region, is that the project envisages the set up and development of liquid, competitive and transparent natural gas exchange.
Thus, the establishment of the Balkan gas hub will facilitate the wholesale trade of natural gas among the market participants in South-eastern Europe. In practice, this will enable gas demand and supply to meet on the market by providing a platform for physical and/or financial transactions. The latter will create a prerequisite for the development and functioning of competitive markets.

- Liquidity - the establishment of a virtual hub will boost the liquidity of the natural gas market;
- Transparency - transparent trade is necessary pre-condition for the development of the gas hub. The price of the product shall be transparent, and all market players should have equal access to information;
- Reliable supply mechanism - Another important prerequisite for a successful gas market is the reliable supply mechanism;
- Standartization - Standartization (standard characteristics and terms of trade contracts) and turning gas into a tradable good is essential for the ability of the hub to "combine" transactions so that they may ensure net positions.

F. Useful Links

Bulgartransgaz Project Link
https://www.bulgartransgaz.bg/en/pages/pcis-118.html
Bulgartransgaz National Development Plan
https://www.bulgartransgaz.bg/en/pages/desetgodishni-planove-za-razvitie-na-mrejite-na-bulgartransg-142.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_17

Reasons for grouping [ENTSOG]

The project group is composed by projects to upgrade the existing interconnections between HR-SI at IP Rogatec and between AT-SI at IP Murfeld and allow higher gas flows across AT-SI-HR. The group includes a new interconnection pipeline between HR and SI (TRA-N-86) as well as the enabler projects TRA-N-94, TRA-N-1057, TRA-N-361, TRA-N-389 and TRA-N-390.

Objective of the project(s) in the group [Promoter]

Main objectives of the project group are: (1) Removing bottlenecks; (2) Allowing the bi-directional gas flow along the route HR-SI-AT; (3) Increasing the security of supply for Austria, Slovenia, Croatia and Hungary; (4) Improving N-1 for both Slovenia and Croatia; (5) Increase of the capacity along the route to provide enhanced access to Baumgarten and access of the gas from the LNG Krk toward Baumgarten as the most important trading hub in the region.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0086	Interconnection Croatia/Slovenia (Lučko - Zabok - Rogatec)	Plinacro Ltd	HR	Advanced	6.26.1.1	2021	2021	NA
TRA-N-0094	CS Kidričevo, 2nd phase of upgrade	Plinovodi d.o.o.	SI	Less-Advanced	6.26.1.2	2022	2022	Rescheduled
TRA-N-0389	Upgrade of Murfeld/Ceršak interconnection (M1/3 Interconnection Ceršak)	Plinovodi d.o.o.	SI	Less-Advanced	6.26.1.5	2022	2022	Rescheduled
TRA-N-0390	Upgrade of Rogatec interconnection (M1A/1 Interconnection Rogatec)	Plinovodi d.o.o.	SI	Less-Advanced	6.26.6	2022	2022	Rescheduled
TRA-N-1057	Compressor stations 2 and 3 at the Croatian gas tranmission system	Plinacro Ltd	HR	Advanced	6.26.1.3	2022	2022	Rescheduled
TRA-N-0361	GCA 2015/08: Entry/Exit Murfeld	Gas Connect Austria GmbH	AT	Advanced	6.26.1.4	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0086	700	69	-
TRA-N-0094	-	-	30
TRA-N-0361	-	-	-
TRA-N-0389	800	0	-
TRA-N-0390	800	4	-
TRA-N-1057	-	-	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0086	Plinacro Ltd	Rogatec	2021	162	162
TRA-N-0361	Gas Connect Austria GmbH	Murfeld (AT) / Ceršak (SI)	2022	166.5	105.2
TRA-N-0389	Plinovodi d.o.o.	Murfeld (AT) / Ceršak (SI)	2022	78.7	162
TRA-N-0390	Plinovodi d.o.o.	Rogatec	2022	162	162

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-86	TRA-N-94	TRA-N-1057	TRA-N-361	TRA-N-389	TRA-N-390
CAPEX [mln. EUR]	324.85	76.05*	80.40**	50.00	100.00	6.00**	12.40**
Range CAPEX		0%	10%	0%	25%	10%	10%
OPEX [mln. EUR/y]	13.45	1.37*	3.97**	2.00	6.00	0.03**	0.08**

Description of costs and range [Promoter]

> Project TRA-N-94 CS Kidričevo:

Description of CAPEX: the compressor station CS Kidričevo (civil works, equipment and other costs) represents 100% of the cost.
Description of OPEX: 67% of costs represent the cost of own consumption of gas (for the operation of the compressor station – CS Kidričevo), 32% of costs represent operation and maintenance cost, and 1% are labor costs (extension of existing compressor station).

> Project TRA-N-389 Upgrade of Murfeld/Ceršak IP:

Description of CAPEX: the pipeline (construction, connections and other costs) represents 89% of CAPEX and BMRS Ceršak (civil works, equipment and other costs) represents 11% of the cost.
Description of OPEX: 100% of costs represent operation and maintenance cost. There are no additional cost of own consumption of gas and labor cost – upgrade of existing interconnection Rogatec.

> Project TRA-N-390 Upgrade of Rogatec IP:

Description of CAPEX: the pipeline (construction, connections and other costs) represents 54% of CAPEX and BMRS Rogatec (civil works, equipment and other costs) represents 46% of the cost.
Description of OPEX: 100% of costs represent operation and maintenance cost. There are no additional cost of own consumption of gas and labor cost – upgrade of existing interconnection Ceršak.

> Project TRA-N-86 Interconnection Croatia/Slovenia:

Description of CAPEX: 100% of the CAPEX of the Gas pipeline Croatia/Slovenia (Lučko-Zabok-Rogatec) represents costs of designing and engineering, civil works, assembly and installation works, material and equipment.
Description of OPEX: 100% of the cost represents operation and maintenance cost. There are no additional costs of own consumption (fuel gas) and labour cost.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **increases diversification of entry points** (being a precondition for competition and arbitrage). The increase in the capacities in Austria, Croatia and Slovenia allows for a further diversification of entry points, leading to a lower level of HHI (lower LICD indicator).
The projects group also allow the concerned countries to **further share their potential dependence** from Russian gas with Croatia mostly benefitting from such convergence and reducing its dependency from Russian gas.

> **Security of Supply:**

The projects group **fully mitigates the risk of demand curtailment** for Croatia for all disruption cases and scenarios.
It also **significantly improves the remaining flexibility** for Croatia and Slovenia.
The project group **partially mitigates risk of demand curtailment in case of Ukrainian disruption** in Hungary, Serbia and Bosnia Herzegovina.
Additionally, the project group allows also for **full mitigation of risk of demand curtailment** in many European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The **bidirectionality is improved** with the creation of capacity between Croatia, Slovenia and Austria.
The project brings benefits in monetised terms as a **reduction of cost of gas supply** by around 5.4 Mln EUR/y (on average) in the reference situation and low infrastructure level. Such decrease can be mainly linked to a reduction in the marginal prices which is triggered by lower transportation costs due to the utilisation also of this new route. This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits while, on the contrary, in case of lower tariffs the benefits are higher. Additional benefits compared to the reference situation (and up to 13.4 Mln EUR/y in Distributed Generation scenario) can be observed in case of LNG cheaper than other sources.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project group will enable LNG for Krk island to reach Central (Baumgarten gas hub) and South East Europe and help gas diversification and reduction of gas prices which will enable new development of gas fired power plants. That will impact on reduction of CO2 emissions. The project group realisation will also enable reduction of emissions other than CO2 such as reduction of SO2, NOx emissions and other particulate matter.
Group will enable fuel switch savings of maximal 5.3 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings of 1.3 Mln EUR/y in Sustainable Transition and advanced infrastructure level scenario.
It will also enable CO2 savings benefits of maximal 32.9 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings of 8.7 Mln EUR/y in Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025									2030									2040								
	(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to RU (%)																											
Croatia							24%	13%	-11%				27%	21%	-6%				27%	22%	-5%	48%	36%	-12%	31%	17%	-14%
Czechia																			27%	23%	-3%						
Hungary																			27%	24%	-3%	48%	44%	-4%			
Slovakia																			27%	23%	-4%						
LNG and Interconnection Capacity Diversification (LICD)																											
Austria				3333	2501	-832	3333	2500	-833	3333	2501	-833	3333	2500	-833	3345	2531	-814	3333	2500	-833	3333	2500	-833	3333	2500	-833
Croatia							5124	5000	-124				5156	5020	-135	5101	5000	-101									
Slovenia				5031	3351	-1680	5024	3347	-1677	5051	3362	-1689	5001	3334	-1667	5000	3333	-1667	5022	3346	-1676	5055	3364	-1691	5000	3333	-1667

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Croatia	9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Curtailment Rate Peak Day (%)																								
Croatia	13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	0%	-33%	36%	0%	-36%
Remaining Flexibility 2-Week Cold Spell (%)																								
Croatia	0%	55%	55%	0%	67%	67%	0%	34%	34%	0%	38%	38%	6%	96%	90%	0%	43%	43%	0%	23%	23%	0%	20%	20%
Denmark																						89%	91%	1%
Italy																			69%	69%	1%			
Slovenia	66%	100%	34%	69%	100%	31%	61%	100%	39%	92%	100%	8%				57%	100%	43%	52%	98%	46%	98%	100%	2%
Remaining Flexibility Peak day (%)																								
Croatia	0%	44%	44%	0%	49%	49%	0%	23%	23%	0%	25%	25%	0%	78%	78%	0%	31%	31%	0%	12%	12%	0%	8%	8%
Hungary	83%	93%	10%	92%	100%	8%																		
Italy	39%	40%	1%	41%	41%	1%																		
Slovenia	48%	100%	52%	50%	100%	50%	43%	95%	51%	68%	100%	32%				29%	100%	71%	26%	46%	20%			
Single Largest Infrastructure Disruption (SLID)-Croatia																								
Croatia													41%	32%	-10%									
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%															
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Single Largest Infrastructure Disruption (SLID)-Slovenia																								
Slovenia	51%	40%	-11%	51%	38%	-12%	52%	50%	-2%							55%	48%	-7%	57%	54%	-3%			
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				19%	0%	-19%	30%	0%	-30%	33%	0%	-33%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina	10%	5%	-5%	6%	4%	-2%																		
Bulgaria	10%	6%	-4%																					
Croatia	13%	0%	-13%	10%	0%	-10%	28%	6%	-22%	28%	0%	-28%	1%	0%	-1%	22%	0%	-22%	33%	8%	-25%	36%	0%	-36%
Hungary	9%	0%	-8%	5%	0%	-5%																		
Serbia	10%	4%	-6%	6%	4%	-2%																		

Row Labels	2025									2030									2040								
	(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Market Integration																											
Bi-directionality Balance																											
Murfeld (AT) / Ceršak (SI)							0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%
Rogatec	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

ADVANCED Infrastructure Level

Row Labels	2025									2030									2040								
	(blank)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
LNG and Interconnection Capacity Diversification (LICD)																											
Austria				2500	2001	-499	2500	2000	-500	2500	2000	-500	2500	2000	-500	2507	2020	-487	2500	2000	-500	2500	2000	-500	2500	2000	-500
Croatia																						2113	2000	-113			
Slovenia				3351	2511	-840	3347	2509	-839	3362	2517	-844	3334	2500	-834	3333	2500	-833	3346	2508	-838	3364	2519	-845	3333	2500	-833
Security of Supply																											
Remaining Flexibility 2-Week Cold Spell (%)																											
Italy																									89%	89%	1%
Remaining Flexibility Peak day (%)																											
Italy																									62%	63%	1%
Market Integration																											
Bi-directionality Balance																											
Murfeld (AT) / Ceršak (SI)							0%	100%	100%				0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%
Rogatec	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%	0%	100%	100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	5.2	3.9	7.2	3.1	4.9	3.4
	Supply Maximization	18.9	5.7	15.6	7.3	7.4	6.5
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.4	3.8	2.8	0.0	0.0	0.0
	2 Weeks	2.3	23.2	17.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	21.9	26.5	32.9	8.7	10.5	13.6
	Fuel Switch savings	2.7	3.0	5.3	2.7	1.3	2.5

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.5	0.1	35.9	17.9	6.8	3.3	7.2	3.9
Supply Maximization	4.5	0.0	50.5	4.1	19.3	5.3	9.5	2.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.8	2.4	3.8	2.4	2.6	1.6	3.8	2.4
2 Weeks	23.2	2.3	23.2	2.3	27.1	17.3	23.2	2.3
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	32.9	21.9	32.9	21.9	33.5	22.2	32.9	21.9
Fuel Switch savings	5.3	2.7	5.3	2.7	5.5	2.7	5.3	2.7

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.4	0.0	12.5	7.6	4.9	2.9	4.9	3.1
Supply Maximization	0.7	0.0	22.6	0.0	7.1	6.1	3.7	3.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	13.6	8.7	13.6	8.7	13.9	8.8	13.6	8.7
Fuel Switch savings	2.7	1.3	2.7	1.3	2.5	0.9	2.7	1.3

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0086	Transmission gas pipeline	DN 700 (28"), length 69 km	No

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-N-0086 **During construction period the potential impacts on the environment are likely for: air quality, noise, geomorphology, habitats, cultural heritage**	For the project TRA-N-0086, EIA procedures have been carried out and Decisions on acceptability have been issued by the Croatian line Ministry. The Ministry Decisions on acceptability includes prescribed relevant environmental protection measures for reducing the potential impacts to the lowest level. EIA procedures were carried out in accordance with Croatian national legislation that is aligned with EU requirements.	Included in project CAPEX	Not expected

Environmental Impact explained [Promoter]

> Hungary

Major influences of the project TRA-N-86 on the economic and environmental dimensions are to be considered during the construction period (disturbance, traffic disturbance where secondary roads are cut, and impacts due to the dust, noise, transport machinery, and other machineries). The impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents. The proposed Environmental mitigation measures include measures prescribed by national law and other regulations, protection measures in accidental situations, plans and technical solutions for environmental protection as well as other protective measures. Mitigation measures for reducing the possible impacts to the lowest possible level are proposed in the EIA procedures.

> Slovenia

The planned transmission pipeline crosses protected areas of nature (protected areas and Nature 2000 areas), so SEA and EIA will have to be implemented in the transmission pipeline planning process. The conclusion of the environmental impact assessment shall be an environmental protection consent, in which all the necessary mitigation measures, to be taken into account in the implementation phase, shall be defined.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The Group provides security of supply and improves N-1 criteria for both Croatia and Slovenia. It will increase the capacity of interconnection between Croatia and Slovenia up to 5 bcm/y, in both directions, that provides enhanced access to gas hub Baumgarten. Considering all existing and potentially new supply routes in the surrounding region this Group enables significant transit potential in both directions. Implementation of this Group will enable supply of Slovenian and Austrian gas markets and other gas markets in CEE with the gas from planned LNG terminal Krk. Other expected benefits of this Group are:

- Reducing energy prices for the end users (potential reduction of marginal gas prices in Croatia, Slovenia and Austria)
- Providing additional gas transmission and transit of gas to the neighbouring SEE countries
- Facilitating market integration

Regarding the HHI and N-1 standard, the project will crucial contributed to improve the HHI and N-1 standard.

Herfindahl–Hirschman Index (HHI) is a commonly accepted measure of market concentration. The markets in which the HHI is between 750 and 1,800 points are considered moderately concentrated, markets in which the HHI is between 1,800 and 5,000 points are considered highly concentrated and markets in which the HHI is in excess of 5,000 points to be very highly concentrated. HHI index for Slovenia is without the projects, included in this group 6,573. Taking into account the projects in group the HHI index for Slovenia decreases from 6,573 to 4,299.

The robustness of gas network to withstand the disruption of the largest infrastructure at national level represent N-1 standard. For Slovenia, the N-1 standard for gas year 2021 is 65 %. With the project as defined in this document, the N-1 standard in year 2022 will increase to 352.8 %.

F. Useful Links

Plinovodi National Development Plan 2019-2028 link :
http://www.plinovodi.si/media/4763/plinovodi-tyndp-2019-2028_eng.pdf
Plinovodi PCI 6.26 link :
http://www.plinovodi.si/media/4766/pci-information-leaflet-626.pdf
Plinacro Project link :
http://www.plinacro.hr/default.aspx?id=913
Gas Connect Austria National Development Plan 2018-2017:
https://www.gasconnect.at/en/network-information/network-development/network-development-plan/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_18

Reasons for grouping [ENTSOG]

The project group represents an interconnection between Bosnia-Herzegovina and Croatia at IP Slobodnica- Bosanski Brod / Zenica and includes the two sides of the investment.

Objective of the project(s) in the group [Promoter]

Due to Bosnia and Herzegovina (BA) dependence to a single route and source of gas supply, the existing gas pipeline system does not provide sufficient level of security of supply to existing consumers and does not allow future gas market development. Group implementation aims at providing new gas supply route for BA, with a possibility of diversification of supply sources. Group aims at enhancing SoS for BA and at enabling natural gas supply to Oil Refinery Brod and other industrial and residential consumers along this route. Also, project group aims at contributing to the diversification of entry/exit points of Croatian gas transmission system with neighbouring countries. Group is planned as bidirectional.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0066	Interconnection Croatia -Bosnia and Herzegovina (Slobodnica- Bosanski Brod)	Plinacro Ltd	HR	Advanced	NA	2020	2020	Delayed
TRA-N-0224	Gaspipeline Brod - Zenica	BH Gas d.o.o.	BA	Less-Advanced	NA	2023	2023	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0066	700	6	-
TRA-N-0224	500	140	0

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0066	Plinacro Ltd	Slobodnica- Bosanski Brod-Zenica	2020	162	162
TRA-N-0224	BH Gas d.o.o.	Slobodnica- Bosanski Brod-Zenica	2023	44	35

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-224	TRA-N-66
CAPEX [mln. EUR]	94	85.00	9
Range CAPEX		5%	0%
OPEX [mln. EUR/y]	1.01	1.00	0.01

The promoters did not indicate intention to apply for the 4th PCI selection process for project TRA-N-66. In line with the defined guidelines, only costs for projects whose promoters declared their intention to apply to the 4th PCI process during the TYNDP 2018 project data collection are published.

Description of costs and range [Promoter]

> TRA-N-0066 Interconnection Croatia-Bosnia and Herzegovina (Slobodnica-Bosanski Brod)

100% of the CAPEX of the Interconnection Croatia-Bosnia and Herzegovina (Slobodnica-Bosanski Brod)_refers to the costs of designing and engineering, civil works, assembly and installation works, material and equipment.
100% of the OPEX refers to the operation and maintenance cost. There are no additional costs of own consumption (fuel gas) and labour cost.
CAPEX and OPEX represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018).

> TRA-N-224 Gaspipeline Brod - Zenica

Estimated CAPEX in the amount of 85 Mil EUR includes construction of the 140 km transmission pipeline (DN 500/75 bar). Data source: Pre-Feasibility Study February 2006. CAPEX range is estimated as 5% because of the age and maturity of available data. Once the Feasibility Study and Preliminary Design will be developed, CAPEX data will be more accurate.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **increases diversification of entry points** (being a precondition for competition and arbitrage). The increase in the capacities in Bosnia Herzegovina and Croatia allows for a further diversification of entry points, leading to a lower level of HHI (lower LICD indicator).
The projects group also allow Croatia to benefit from a moderate **decrease in its dependence** from main sources as Russia and LNG.

> **Security of Supply:**

Allowing Croatia and Bosnia Herzegovina to share the risk of demand curtailment, the projects group **partially mitigates the risk of demand curtailment** in Croatia for all disruption cases and scenarios.
The interconnection significantly mitigates the risk of demand curtailment in Croatia **in case of disruption of its largest infrastructure** (Rogatec). The project has also a positive but limited impact in reducing the risk of demand curtailment for Slovenia in case of disruption of tis largest infrastructure (Murfeld (AT) / Ceršak (SI)). Additionally, the project group allows for **full mitigation of risk of demand curtailment** in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod (UA) - Velké Kapušany (SK)) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.
In case of 2-weeks cold spell, the project **slightly improves the remaining flexibility** in Croatia and Slovenia.

> **Market Integration:**

The development of further interconnection with the rest of Eastern countries allows Croatia and Bosnia Herzegovina to benefit from a decrease in its marginal prices. This reduction is triggered by transmission tariffs savings by creating a new and direct route between Croatia and Bosnia Herzegovina that allows the countries to reduce the use of more expensive routes (based on the reference tariffs used). This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route. In case of higher tariffs, the sensitivity analysis tables show in fact no benefits while, on the contrary, in case of lower tariffs the benefits are higher. In monetary terms this can be translated in a **decrease of the overall cost of gas** by 0.2 Mln EUR/y (on average) in low infrastructure level and by 3 Mln EUR/y (on average) in advanced infrastructure level.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project group will enable gasification of considerable part of Bosnia and Herzegovina and development of gas fired power plants.
Beside for residential and industrial sector, the group will enable gas usage in BA power generation sector where most of electricity is produced from coal. Around 40% of energy consumed in industry are from coal or oil products while around 20% of energy consumed in households and commercial sector are also from coal or oil products (of which more than half is coal) (IEA 2018). Firewood is also significant heating fuel in households and in a commercial sector. BA is a country with very low energy efficiency, and the usage of natural gas in the industry sector will enhance energy efficiency and result in consuming smaller amounts of energy for the same technology process.
The group will enable fuel switch savings in the maximal amount of 3.7 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings in the amount of 1.0 Mln EUR in Sustainable Transition scenario and advanced infrastructure level. It will also enable CO2 savings in the maximal amount of 3.7 Mln EUR/y in Global Climate scenario and low infrastructure level and minimal savings in the amount of 5.7 Mln EUR/y in Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Croatia	5%	0%	-5%																					
Dependence to RU (%)																								
Croatia	31%	29%	-2%	24%	13%	-11%																		
LNG and Interconnection Capacity Diversification (LICD)																								
Bosnia Herzegovina	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Croatia	5156	3518	-1637	5124	3400	-1725	5156	3570	-1585	5156	3457	-1699	5101	3388	-1713	5156	3503	-1653	5156	3649	-1506	5156	3563	-1592
Supply Source Access (SSA)																								
Croatia													3	4	1	3	4	1						
Hungary													3	4	1	3	4	1						
Romania													1	2	1	1	2	1						

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Croatia	9%	6%	-3%	2%	0%	-2%	24%	22%	-2%	23%	20%	-2%				19%	16%	-2%	30%	28%	-2%	33%	32%	-2%
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	12%	-2%	10%	8%	-2%	28%	27%	-1%	28%	27%	-1%	1%	0%	-1%	22%	21%	-1%	33%	32%	-1%	36%	36%	-1%
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	6%	-3%	2%	0%	-2%	24%	21%	-3%	23%	19%	-3%				19%	15%	-3%	30%	26%	-3%	33%	30%	-3%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	11%	-2%	10%	8%	-2%	28%	26%	-3%	28%	25%	-3%	1%	0%	-1%	22%	19%	-2%	33%	30%	-3%	36%	34%	-2%
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	6%	-3%	2%	0%	-2%	24%	21%	-3%	23%	19%	-3%				19%	15%	-3%	30%	26%	-3%	33%	30%	-3%
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	11%	-2%	10%	8%	-2%	28%	26%	-3%	28%	25%	-3%	1%	0%	-1%	22%	19%	-2%	33%	30%	-3%	36%	34%	-2%
Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	6%	-3%	2%	0%	-2%	24%	21%	-3%	23%	19%	-3%				19%	15%	-3%	30%	26%	-3%	33%	30%	-3%
Curtailment Rate Peak Day (%)																								
Croatia	13%	11%	-2%	10%	8%	-2%	28%	26%	-3%	28%	25%	-3%	1%	0%	-1%	22%	19%	-2%	33%	30%	-3%	36%	34%	-2%
Remaining Flexibility 2-Week Cold Spell (%)																								
Bosnia Herzegovina													49%	100%	51%									
Croatia				0%	1%	1%							6%	10%	3%									
Slovenia				69%	73%	4%																		
Single Largest Infrastructure Disruption (SLID)-Bosnia Herzegovina																								
Bosnia Herzegovina													100%	0%	-100%									
Single Largest Infrastructure Disruption (SLID)-Croatia																								
Croatia	33%	2%	-30%	34%	2%	-32%	30%	3%	-27%	29%	3%	-27%	41%	1%	-40%	33%	2%	-30%	28%	3%	-25%	26%	2%	-23%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Single Largest Infrastructure Disruption (SLID)-Slovenia																								
Croatia													29%	26%	-2%									
Slovenia										46%	44%	-2%										52%	50%	-2%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia	9%	6%	-3%	2%	1%	-2%	24%	21%	-3%	23%	19%	-3%				19%	15%	-3%	30%	26%	-3%	33%	30%	-3%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Croatia	13%	11%	-2%	10%	8%	-2%	28%	26%	-3%	28%	25%	-3%	1%	0%	-1%	22%	19%	-2%	33%	30%	-3%	36%	34%	-2%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Bosnia Herzegovina	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000	10000	5000	-5000
Croatia	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500	2500	2000	-500
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Bosnia Herzegovina	60%	100%	40%	60%	100%	40%	49%	100%	51%	49%	100%	51%	49%	100%	51%	39%	100%	61%	39%	100%	61%	39%	100%	61%
Remaining Flexibility Peak day (%)																								
Bosnia Herzegovina	35%	100%	65%	35%	100%	65%	25%	100%	75%	25%	100%	75%	25%	100%	75%	17%	100%	83%	17%	100%	83%	17%	100%	83%
Single Largest Infrastructure Disruption (SLID)-Bosnia Herzegovina																								
Bosnia Herzegovina	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference						
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	0.3	0.1	3.0	2.9	3.0
Supply Maximization	1.4	0.5	0.9	3.0	3.0	3.0
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	2.1	2.1	2.1	0.4	0.4	0.4
2 Weeks	0.1	2.3	2.3	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	18.0	22.2	26.4	5.7	7.0	8.3
Fuel Switch savings	2.7	3.2	3.7	2.7	1.0	1.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.4	0.0	0.4	0.0	0.3	0.0
Supply Maximization	0.2	0.0	4.2	0.0	1.6	0.6	0.7	0.3
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.1	2.1	2.1	2.1	0.1	0.1	2.1	2.1
2 Weeks	2.3	0.1	2.3	0.1	2.3	2.3	2.3	0.1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	26.4	18.0	26.4	18.0	28.4	19.5	26.4	18.0
Fuel Switch savings	3.7	2.7	3.7	2.7	4.2	2.7	3.7	2.7

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.5	4.5	3.3	3.2	3.0	2.9
Supply Maximization	0.0	0.0	4.5	0.0	3.3	3.3	1.5	1.5
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.4	0.4	0.4	0.4	0.0	0.0	0.4	0.4
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	8.3	5.7	8.3	5.7	9.0	6.2	8.3	5.7
Fuel Switch savings	2.7	1.0	2.7	1.0	1.3	0.9	2.7	1.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-66	Transmission gas pipeline	DN 700, length 6 km	No
TRA-N-224	Transmission gas pipeline	Length of the Zenica–Brod pipeline with branches to Maglaj, Zepce, Zavidovici, Doboj and Modrica is 140 km.	Potential sensitive area will be identified during EIA procedure and development of Preliminary Design.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Potential environmental impact will be identified during EIA procedure and development of Preliminary Design.	Mitigation measures will be proposed through the EIA procedure, all in line with national legislation and EU requirements.	The environmental protection and mitigation measures costs will be assessed and prescribed in EIA procedure.	Related costs will be assessed in EIA procedure.

Environmental Impact explained [Promoter]

At this development stage of TRA-N-224 project potential environmental impact has not been identified, it will be developed during EIA procedure and Preliminary Design phase. In a normal operation gas pipeline is a closed technological system that has no impact on the environment. In case of controlled discharge of certain section by application of legal and technical regulations the impact of natural gas on the environment is minimal.

Major influences of the project on the environmental dimensions is to be felt during the construction period (disturbance, traffic disturbance where secondary roads are cut, and impacts due to the dust, noise, transport machinery, and other machineries). The impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents. The proposed environmental protection measures include measures prescribed by national law and other regulations, protection measures in accidental situations, plans and technical solutions for environmental protection as well as other protective measures. Protection measures for reducing the possible impacts to the lowest possible level are proposed in the EIA procedures.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The implementation of the projects within this group will have significant positive impact on integration of the Croatian and BA gas markets. The construction of the group pipelines will enhance security of supply (BA current N-1 = 0) and makes additional volumes of gas available to the market. The group will create potential for using gas for power generation in BA. Natural gas consumption means using clean, environmentally friendly source of energy, because of its low-carbon intensity in comparison to other fossil fuels. Therefore, use of gas for heating and power generation lead to reduction of CO_2, SO_2, NO_x and PM emissions. Great benefits are expected in reducing environmental pollution in urban areas. Additionally, lower usage of firewood in the energy consumption sectors (residential and industrial) means significant contribution to forest protection in BA.
Having in mind that Oil Refinery Brod is currently one of the largest air polluter in BA and cross-border in Croatia, the group will significantly improve the situation with air pollution in both countries.
Other benefits include market enhancement, increased economic activity and employment growth, savings related to lower costs of gas purchase (when potential less expensive supply sources become available) and increased bargaining power in negotiation with the current gas supplier, increased market sustainability and integration in regional energy market.

F. Useful Links

PLINACRO National Development Plan:
http://www.plinacro.hr/UserDocsImages/dokumenti/Desetogodi%C5%A1nji%20plan%20razvoja%20PTS%202018-2027.pdf , (NDP 2018-2027, page 64)

BH-Gas: Framework Energy Strategy of Bosnia and Herzegovina until 2035
http://www.mvteo.gov.ba/data/Home/Dokumenti/Energetika/Framework_Energy_Strategy_of_Bosnia_and_Herzegovina_until_2035_ENG_FINAL....pdf

Project Group EAST_19

Reasons for grouping [ENTSOG]

The project group represents an interconnection between Bosnia-Herzegovina and Croatia at IP Posušje and includes the two sides of the investment.

Objective of the project(s) in the group [Promoter]

Group aims at integrating Bosnia and Herzegovina (BA) with the Croatian gas transmission system and enable BA to supply gas from other markets and at reducing risk of disruption of gas supply to BA, having a single-entry point, and covering current winter demand. Project is planned as bi-directional.
Additionally, the group aims at enabling gas market development in southern Croatia and BA where natural gas is unavailable.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0302	Interconnection Croatia-Bosnia and Herzegovina (South)	Plinacro Ltd	HR	Advanced	NA	2021	2021	NA
TRA-N-0851	Southern Interconnection pipeline BiH/CRO	BH Gas d.o.o.	BA	Less-Advanced	NA	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0302	500	22	-
TRA-N-0851	500	165	0

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0302	Plinacro Ltd	Posušje	2021	81	81
TRA-N-0851	BH Gas d.o.o.	Posušje	2023	73	38

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-302	TRA-N-851
CAPEX [mln. EUR]	116.12	16.12*	100.00
Range CAPEX		0%	5%
OPEX [mln. EUR/y]	1.29	0.29*	1.00

Description of costs and range [Promoter]

> TRA-N-0302 Interconnection Croatia-Bosnia and Herzegovina (South)

100% of the CAPEX of the Interconnection Croatia-Bosnia and Herzegovina (South) refers to the costs of designing and engineering, civil works, assembly and installation works, material and equipment.
100% of the OPEX refers to the operation and maintenance cost. There are no additional costs of own consumption (fuel gas) and labour cost.
CAPEX and OPEX represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018).

> TRA-N-0851 Southern Interconnection pipeline BiH/CRO

Estimated CAPEX includes investments in the construction of the pipeline (114 km of the main route and 48 km of branch to Mostar) and aboveground facilities, land acquisition, project documentation and permits. BH-Gas data source: Pre-Feasibility Study COWI-IPF, 2013 and CBA Mott Macdonalds-Connecta, 2018. CAPEX range is estimated as 5% because of the age and maturity of available data. Once the Feasibility Study and Preliminary Design will be developed, CAPEX data will be more accurate.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The realisation of the interconnection between Croatia and Bosnia Herzegovina allows for **full mitigation of risk of demand curtailment** in Bosnia Herzegovina in case of disruption of its main infrastructure (Zvornik) in all demand scenarios and **improves remaining flexibility**.

The project group allows also for **full mitigation of risk of demand curtailment** in many European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The realisation of the project group EAST_19, will enable gasification of the southern parts of Croatia and Bosnia and Herzegovina and development of gas market in both countries.
Beside for residential and industrial sector, the group will enable gas usage in BA power generation sector where most of electricity is produced from coal. Around 40% of energy consumed in industry are from coal or oil products while around 20% of energy consumed in households and commercial sector are also from coal or oil products (of which more than half is coal) (IEA 2018). Firewood is also significant heating fuel in households and in a commercial sector. BA is a country with very low energy efficiency, and the usage of natural gas in the industry sector will enhance energy efficiency and result in consuming smaller amounts of energy for the same technology process.
Group will enable fuel switch savings in the maximal amount of 2.5 Mln EUR/y in the Global Climate scenario and low infrastructure level and minimal savings in the amount of 0.5 Mln EUR/y in the Sustainable Transition scenario and advanced infrastructure level. It will also enable CO2 savings in the maximal amount of 17.8 Mln EUR/y in the Global Climate scenario and low infrastructure level and minimal savings in the amount of 3 Mln EUR/y in the Distributed Generation scenario and advanced infrastructure level.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Single Largest Infrastructure Disruption (SLID)-Bosnia Herzegovina																								
Bosnia Herzegovina	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Bosnia Herzegovina	60%	100%	40%	60%	100%	40%	49%	100%	51%	49%	100%	51%	49%	100%	51%	39%	100%	61%	39%	100%	61%	39%	100%	61%
Remaining Flexibility Peak day (%)																								
Bosnia Herzegovina	35%	100%	65%	35%	100%	65%	25%	100%	75%	25%	100%	75%	25%	100%	75%	17%	100%	83%	17%	100%	83%	17%	100%	83%
Single Largest Infrastructure Disruption (SLID)-Bosnia Herzegovina																								
Bosnia Herzegovina	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.4	1.5	1.3	0.4	0.4	0.4
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	12.2	14.8	17.8	3.0	3.6	4.3
	Fuel Switch savings	1.8	2.2	2.5	1.8	0.5	0.6

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.5	0.4	1.5	0.4	0.0	0.0	1.5	0.4
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	17.8	12.2	17.8	12.2	18.4	12.6	17.8	12.2
Fuel Switch savings	2.5	1.8	2.5	1.8	2.7	1.8	2.5	1.8

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	1.1	0.3	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.4	0.4	0.4	0.4	0.0	0.0	0.4	0.4
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	4.3	3.0	4.3	3.0	4.5	3.1	4.3	3.0
Fuel Switch savings	1.8	0.5	1.8	0.5	0.7	0.4	1.8	0.5

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0302	Transmission gas pipeline	DN 500, length 22 km	NO
TRA-N-851	Transmission gas pipeline	The South Interconnection of BiH and Croatia project is located mainly on the territory of BiH in the length of 165 km. The project falls within the administrative boundaries of the following cantons: Herzegovina-Neretva, West Herzegovina, Canton 10 and Central Bosnia Canton.	Potential sensitive area will be identified during EIA procedure and development of Preliminary Design.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
During construction period the potential impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, cultural heritage	For the project TRA-N-0302, EIA procedure has been carried out and a Decision on acceptability has been issued by the Croatian line Ministry. The Decision on acceptability issued by the Ministry includes prescribed relevant environmental protection measures for reducing the potential impacts to the lowest level. EIA procedures were carried out in accordance with the Croatian national legislation, that is, they have been aligned with the EU requirements.	Included in project CAPEX	Not expected
Major potentially environmental impact of the project occurs during the construction period (disturbance, impacts due to the dust, noise from transport and machineries). Impacts on the environment to be considered during EIA procedure are for: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents.	Mitigation measures to mitigate possible impacts to the lowest possible level will be proposed through the EIA procedure, all in line with national legislation and EU requirements. Mitigation measures during the construction phase, MM during operation, MM in case of accident, MM after termination of use and socio-economic MM will include responsibilities of design company, contractor, engineer, operator and potential other parties.	The environmental protection and mitigation measures costs will be assessed in EIA procedure	Related costs will be assessed in EIA procedure.

Environmental Impact explained [Promoter]

Major influences of the project TRA-N-0302 on the economic and environmental dimensions are to be felt during the construction period (disturbance, traffic disturbance where secondary roads are cut, and impacts due to the dust, noise, transport machinery, and other machineries). The impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents. The proposed environmental protection measures include measures prescribed by national law and other regulations, protection measures in accidental situations, plans and technical solutions for environmental protection as well as other protective measures. Protection measures for reducing the possible impacts to the lowest possible level are proposed in the EIA procedures.

The preliminary EIA, which was conducted for project TRA-N-0851 during the Pre-FS Report, considered potential impacts along the two potential pipeline routes. Most of the potential physical, biological and economic residual effects that could arise during construction and operation of the pipeline were considered to be reversible in the short- to medium-term. It was assessed that in no situation there was a high probability for the occurrence of a permanent or long-term residual effect that could not be technically or economically compensated. In conclusion, route Zagvozd-Posušje-N.Travnik with the main branch to Mostar was selected as more acceptable and was recommended for further development in the next stages of the project

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The implementation of the projects within this group will have significant positive impact on the integration of the Croatian and BA gas markets. The construction of the pipelines from this group will enhance security of supply for BA (current N-1 = 0) and provide additional volumes of gas available to the market. Group will create a potential for using gas for power generation in BA. Natural gas consumption means using clean, environmentally friendly source of energy, because it is of low-carbon intensity compared to other fossil fuels. Therefore, use of gas for heating and power generation lead to reduction of environmental pollution i.e. reduction of CO_2, SO_2, NO_x and other particulate matter emissions. Thus, project will improve the situation with air pollution in BA that significantly increases during the winter season and especially in urban areas. Additionally, lower usage of firewood in the energy consumption sectors (residential and industrial) means significant contribution to forest protection in BA. The main economic benefits from the implementation of the project are the savings made on avoiding interruptions in gas supply when the existing connection is cut (because of the age and poor condition) and savings from the avoidance of gas disruptions on the route via Ukraine, from Russia. Other benefits include market enhancement, increased economic activity and employment growth, savings related to lower costs of gas purchase (potential less expensive supply sources become available) and increased bargaining power in negotiation with the current gas supplier.
Additionally, project expands the gas market for the planned Ionian-Adriatic Pipeline providing diversification of cross-border entry/exit points between Croatia and neighbouring countries, effect not considered in the LICD indicator that disregard import entry points.

F. Useful Links

PLINACRO:
http://www.plinacro.hr/UserDocsImages/dokumenti/Desetogodi%C5%A1nji%20plan%20razvoja%20PTS%202018-2027.pdf (NDP 2018-2027, page 64)

BH-Gas Framework Energy Strategy of Bosnia and Herzegovina until 2035:
http://www.mvteo.gov.ba/data/Home/Dokumenti/Energetika/Framework_Energy_Strategy_of_Bosnia_and_Herzegovina_until_2035_ENG_FINAL....pdf

BH-Gas Conclusion of Government of Federation of BiH on Stategic importance of the South Interconnection of BiH and Croatia Gaspipeline Project, route Zagvozd (CRO) – Posušje (BiH) – Novi Travnik with branch to Mostar:
http://www.fbihvlada.gov.ba/bosanski/sjednica_v2.php?sjed_id=642&col=sjed_saopcenje

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group EAST_20

Reasons for grouping [ENTSOG]

The project group represents an interconnection between Greece and North Macedonia* at IP Stojakovo village (MK) / Pontoiraklia (GR) and includes the two sides of the investment.

* map will be modified accordingly in view of Final TYNDP 2018 publication

Objective of the project(s) in the group [Promoter]

The group consists of one gas pipeline connecting the gas transmission systems of Greece and North Macedonia aiming at providing to the latter the supply capacity needed for the expansion of the gasification of the country and access to diversified sources of supply through the Gas Transmission System of Greece.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0980	Interconnection Macedonia-Greece	MER JSC Skopje	MK	Less-Advanced	NA	2020	2020	NA
TRA-N-0967	Nea-Messimvria to FYRoM pipeline	DESFA S.A.	GR	Less-Advanced	NA	2021	2021	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0967	700	50	-
TRA-N-0980	-	-	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0967	DESFA S.A.	Stojakovo village (MK) / Pontoiraklia (GR)	2021	-	76.5
TRA-N-0980	MER JSC Skopje	Stojakovo village (MK) / Pontoiraklia (GR)	2020	76.5	-

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[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-967	TRA-N-980
CAPEX [mln. EUR]	N/A	48.70	-
Range CAPEX		25%	0%
OPEX [mln. EUR/y]	N/A	0.88	-

The promoters did not indicate intention to apply for the 4th PCI selection process for project TRA-N-980. In line with the defined guidelines, only costs for projects whose promoters declared their intention to apply to the 4th PCI process during the TYNDP 2018 project data collection are published.

Description of costs and range [Promoter]

The Capex for project TRA-N-0967, representing the part of the pipeline that will be built by DESFA on the Greek territory, has been estimated in the framework of a feasibility study concluded in January 2019. It has been based on a routing survey and on the in-house database of DESFA for all elements of procurement, construction and services, not including internal cost. Same for the cost of the Border Metering Station.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The interconnection between Greece and North Macedonia allows this second to benefit from a **decrease in its dependence** from Russian gas.
The project **increases the number of sources** North Macedonia has access to. Thanks to the realisation of this interconnection, North Macedonia can benefit from a decrease of LNG price for at least 20% of its demand.

> **Security of Supply:**

The interconnection between Greece and North Macedonia **fully mitigates the risk of demand curtailment** for North Macedonia from 2025 onward for all disruption in case of Sustainable Transition. In such scenario and without the project, North Macedonia presents in fact risk for its demand to be curtailed in climatic stress conditions.
The interconnection **significantly mitigates the risk of demand curtailment** in North Macedonia in case of disruption of its largest infrastructure (Kyustendil /Zidilovo) and in case of Ukrainian route disruption.
Additionally, in Sustainable Transition and always under Ukrainian route disruption, the interconnection between Greece and Macedonia allows also for **full mitigation of risk of demand curtailment** in Bulgaria, Bosnia Herzegovina, Hungary, Serbia and Slovenia.

> **Market Integration:**

The project allows North Macedonia to benefit from a decrease in its marginal price. The possibility also for North Macedonia to benefit for such situation indicates that the realisation of the new interconnection **removes potential bottlenecks** between North Macedonia and other countries. Such benefit is reflected in monetised terms as **reduction of cost of gas** by around 0,7 Mln EUR/y (on average). Such a decrease in marginal prices can be mainly linked to a reduction in the transportation costs due to the utilisation also of this new route. This is confirmed by the sensitivity on tariffs that shows high variation in the size of benefits depending on the level of tariffs (higher or lower compared to the reference one) considered for this new route. In case of higher tariffs, the sensitivity analysis tables show in fact lower benefits while, on the contrary, in case of lower tariffs the benefits are higher.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

North Macedonia relies to a large extent to solid fuels for space heating and power generation. This results to high levels of pollution especially during winter. The existing pipeline through Bulgaria, has a maximum capacity of 800 mcm which cannot cover the forecasted demand of the country when the national gas transmission system, presently under construction will be completed. Natural gas is expected to mainly replace lignite in power generation and in the space & water heating sector through its use in district heating plants to be installed in most cities in addition to its supply through distribution networks.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
FYROM	22%	17%	-5%	12%	8%	-4%	16%	2%	-14%										6%	0%	-6%			
Supply Source Access (SSA)																								
FYROM	1	2	1	2	3	1	1	2	1	2	3	1	2	3	1	2	3	1	1	2	1	2	3	1
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Belarus Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
FYROM	28%	100%	72%	28%	100%	72%	28%	100%	72%															
Remaining Flexibility Peak day (%)																								
FYROM	0%	100%	100%	0%	100%	100%	0%	100%	100%							86%	100%	14%	67%	100%	33%			
Poland										80%	81%	1%												
Single Largest Infrastructure Disruption (SLID)-FYRomaniaM																								
FYROM	78%	22%	-56%	78%	22%	-56%	71%	29%	-41%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
FYROM	33%	0%	-33%	33%	0%	-33%	33%	0%	-33%															
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina							8%	6%	-2%	6%	4%	-2%				4%	2%	-2%				6%	4%	-2%
Bulgaria	10%	9%	-1%				9%	6%	-3%	7%	5%	-2%				5%	2%	-3%	8%	7%	-1%	6%	4%	-2%
FYROM	59%	0%	-59%	59%	0%	-59%	63%	6%	-57%	8%	0%	-8%				6%	0%	-6%	13%	2%	-11%	6%	0%	-6%
Hungary	9%	8%	-1%	5%	4%	-1%																		
Serbia	10%	8%	-2%				8%	6%	-2%	6%	4%	-2%				4%	1%	-3%	8%	6%	-2%	6%	4%	-2%
Slovenia																			8%	6%	-2%			

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Belarus Disruption Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Curtailment Rate Peak Day (%)																								
FYROM	22%	0%	-22%	22%	0%	-22%	29%	0%	-29%															
Remaining Flexibility 2-Week Cold Spell (%)																								
FYROM	28%	100%	72%	28%	100%	72%	28%	100%	72%															
Remaining Flexibility Peak day (%)																								
FYROM	0%	100%	100%	0%	100%	100%	0%	100%	100%							86%	100%	14%	67%	100%	33%			
Single Largest Infrastructure Disruption (SLID)-FYRomaniaM																								
FYROM	78%	22%	-56%	78%	22%	-56%	71%	29%	-41%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%	100%	0%	-100%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
FYROM	33%	0%	-33%	33%	0%	-33%	33%	0%	-33%															
Ukraine Disruption Curtailment Rate Peak Day (%)																								
FYROM	59%	0%	-59%	59%	0%	-59%	63%	0%	-63%							3%	0%	-3%	13%	0%	-13%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	0.8	0.2	1.0	1.1	0.8	0.9
	Supply Maximization	1.3	1.2	1.2	1.2	1.3	1.2
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.3	1.8	1.6	0.1	0.2	0.2
	2 Weeks	0.3	1.3	1.3	0.6	1.3	1.3
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0.0	1.8	2.8	0.0	1.3	2.0
	Fuel Switch savings	0.0	0.4	0.0	0.0	0.3	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.5	0.0	1.2	0.6	1.1	0.2	1.0	0.2
Supply Maximization	0.9	0.0	1.7	0.1	1.4	1.3	0.7	0.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.8	0.3	1.8	0.3	0.4	0.2	1.8	0.3
2 Weeks	1.3	0.3	1.3	0.3	1.3	0.6	1.3	0.3
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	2.8	0.0	2.8	0.0	3.0	0.0	2.8	0.0
Fuel Switch savings	0.4	0.0	0.4	0.0	0.5	0.0	0.4	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.4	0.3	1.2	0.8	1.1	0.8
Supply Maximization	0.7	0.0	1.7	0.0	1.4	1.2	0.7	0.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.2	0.1	0.2	0.1	0.2	0.1	0.2	0.1
2 Weeks	1.3	0.6	1.3	0.6	1.3	0.6	1.3	0.6
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	2.0	0.0	2.0	0.0	2.1	0.0	2.0	0.0
Fuel Switch savings	0.3	0.0	0.3	0.0	0.3	0.0	0.3	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0967	Pipeline and Border Metering Station (BMS)	Potential impact area: 5.600 ha Building restriction zone: 224 ha	Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
No impact is expected in the project area during operation of the pipeline and the BMS. The usual impact regarding noise, traffic, disruption of agricultural works is expected during construction.	The usual mitigation measures for pipeline construction will be adopted (top soil reinstatement, irrigation systems connection, cover of trucks to avoid dust, collection and disposal or recycling of earth, fuel, lubricants, contaminated water etc. in approved areas). Moreover the Right of Way zone will be reduced in the short sections in forest areas.	Not yet estimated	Not yet estimated

Environmental Impact explained [Promoter]

The environmental impact is examined, for such pipelines (class A1 projects according to Greek Law) in a 1 km wide zone around the routing. This gives a maximum area of potential impact of 5.600 ha.

A building and tree planting restriction zone of 40 m applies along the pipeline, resulting to an impact zone for such activities of 224 ha.

According to the Preliminary ESIA no environmentally sensitive areas are affected by the pipeline. Five Natura 2000 areas exist in the vicinity of the pipeline routing with their boundaries set at distances from 370 m to more than 2 km from the routing.

No rare flora neither rare endemic species have been identified at the project area. No impact in areas of cultural interest is foreseen.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Additionally, to the benefits already explained in section C, the project will make possible the gasification of North Macedonia. In fact there is a project under execution for the creation of gas transmission and distribution infrastructure covering the whole country. As the existing pipeline presently supplying the regions of Kumanovo and Skopje with Russian gas through Bulgaria has a maximum capacity of 0,8 bcma, a second source of supply is needed if the forecasted demand is to be met.
In case the discussions, already in an advanced stage, between North Macedonia and Kosovo will result to an agreement, the project will also enable the gasification of Kosovo.

F. Useful Links

DESFA: http://www.desfa.gr/en/national-natural-gas-system/transmission

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

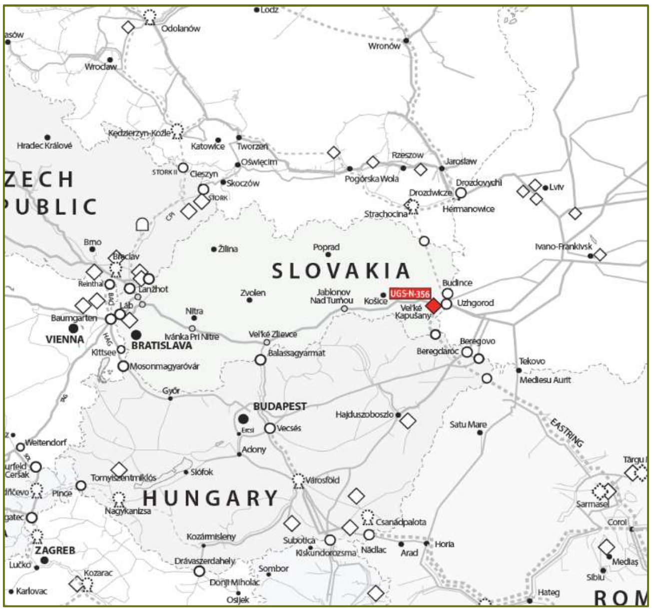
Project Group EAST_23

Reasons for grouping [ENTSOG]

The project group includes the stand-alone UGS project to be developed by NAFTA in Slovakia. The submission includes also the evacuation pipeline connecting the UGS facility to the transmission grid.

Objective of the project(s) in the group [Promoter]

To enhance liquidity at the emerging gas hub Velke Kapusany; facilitate gas trading between CEE countries along N-S and E-W gas corridors; improve gas supply for Ukraine and countries along the NSI East Gas corridor. The storage will also be hydrogen- and P2G-ready.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
UGS-N-0356	Underground Gas Storage Velke Kapusany	Nafta	SK	Advanced	NA	2023	2023	NA

Projects Overview

Technical Information

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0356	3.75	3.75	340

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
UGS-N-0356	NAFTA a.s.	UGS Velke Kapusany	2023	398	398

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	UGS-N-356
CAPEX [mln. EUR]	161.00	161.00
Range CAPEX		25%
OPEX [mln. EUR/y]	3.00	3.00

Description of costs and range [Promoter]

The bulk of CAPEX for the project UGS Veľké Kapušany are the costs of drilling of new wells, workovers of existing wells, construction of the main centre, metering station, gathering station, flownlines and connection pipelines. Other CAPEX items include the feasibility study, engineering, land settlement, project management, expertise and other.
Within the range of CAPEX estimate, we assume the possibility of installation of 30 MW Power to Gas technology with connection to gas storage. In case that the technology will be in operation for just half of the year, it would be able to store more than 126 GWh of energy.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

The project group allows also for **full mitigation of risk of demand curtailment** in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany). In Sustainable Transition, such disruption would have in fact an impact on overall Europe.

Under Ukrainian route disruption and Sustainable Transition demand scenario, the project has **a positive impact on the risk of demand curtailment** in several countries in Europe in the range of 0-2%. In such situation, most of Europe could in fact overall face a curtailed demand. When countries can share the same level of demand curtailment (no infrastructure bottlenecks) the benefits stemming from the realisation of the projects in terms of avoided curtailed demand have an impact on Europe as a whole and there are several possible ways to allocate them at country level. The results show one possible configuration of this allocation.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

As far as Fuel Switching is concerned, the main benefit of renewable energy storage in UGS Veľké Kapušany lies in enabling the use of excess electricity produced by renewables or other low-CO2 sources, to feed electrolysis, the product of which is hydrogen. This mechanism enables the renewable electricity production facilities to run longer and more efficiently, resulting in switching electricity production away from fossil fuels. More flexibility will also enhance the long-term stability of the electrical grid, which will allow for installation of additional renewable energy sources in Slovakia and the neighbouring countries.

In case that the UGS will be able to store only 10 % of H2 coming from RES (in a mixture with natural gas), it would be possible to store 102 GWh. In case that this energy will be converted back to electricity with efficiency of about 50%, we will save more than 18 000 t CO2/year. Depending on the efficiency as well as maximum H2 content, the CO2 savings could be much higher.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2030						2040					
	SUSTAINABLE			DISTRIBUTED			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply												
Remaining Flexibility 2-Week Cold Spell (%)												
Denmark										89%	91%	1%
Remaining Flexibility Peak day (%)												
Italy							35%	36%	1%			
Poland				80%	81%	1%						
Single Largest Infrastructure Disruption (SLID)-Slovakia												
Austria	2%	0%	-2%									
Belgium	2%	0%	-2%				2%	0%	-2%			
France	2%	0%	-2%									
Germany	2%	0%	-2%									
Luxembourg	2%	0%	-2%				2%	0%	-2%			
Slovenia	2%	0%	-2%				2%	0%	-2%			
Sweden	2%	0%	-2%									
Switzerland	2%	0%	-2%									
Ukraine Disruption Curtailment Rate Peak Day (%)												
Bosnia Herzegovina							8%	6%	-2%			
Bulgaria							8%	6%	-2%			
Italy	6%	5%	-1%									
Luxembourg							8%	6%	-2%			
Serbia							8%	6%	-2%			
Slovenia							8%	6%	-2%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	0	0	0	0	0	0
	Supply Maximization	0	0	0	0	0	0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0	3	2	0	0	0
	2 Weeks	0	0	0	0	0	0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0	0	0	0	0	0
	Fuel Switch savings	0	0	0	0	0	0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0	0	0	0	0	0	0	0
Supply Maximization	0	0	0	0	0	0	0	0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3	0	3	0	1	0	3	0
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0	0	0	0	0	0	0	0
Fuel Switch savings	0	0	0	0	0	0	0	0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0	0	2	2	0	0	0	0
Supply Maximization	0	0	2	0	0	0	0	0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0	0	0	0	0	0	0	0
2 Weeks	0	0	0	0	0	0	0	0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	0	0	0	0	0	0	0	0
Fuel Switch savings	0	0	0	0	0	0	0	0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDOP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
UGS-N-0356	UGS – pipes	DN 80 PN 220 835 m , DN 100 PN 220 440 m, DN 150 PN 220 3 210 m, DN 250 PN 220 2 120 m, DN 300 PN 220 1 510 m	CHKO (Protected landscape area) Latorica, SKUEV0006 Latorica, SKCHVU Medzibodrožie
UGS-N-0356	UGS – Gathering station ZUP 1 – ZUP 4 and wells	81 086 m^2	CHKO Latorica (Protected landscape area), SKUEV0006 Latorica, SKCHVU Medzibodrožie

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Very low	To optimize location of pipes on the base detailed survey of fauna and flora	100 000 EUR	0
Very low	To optimize location of gathering station on the base detailed survey of fauna and flora	100 000 EUR	0

Environmental Impact explained [Promoter]

Area of impact is defined in relation with area of SKCHVU Medzibodrožie, which covers the largest range of proposed infrastructure. The project was assessed during EIA process with positive results that were published by the Ministry of Environment of the Slovak Republic (Final Statement No.: 313/2018/mo). The Final Statement expresses its approval for the implementation of the proposed activity. NAFTA a.s. will take all necessary measures described in the Final Statement, which will help to mitigate potential negative impact of infrastructure on environment. However, we are able to declare that in correlation with the Final Statement, negative impacts on the environment of proposed infrastructure are at very low or presumably zero level.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

UGS Veľké Kapušany will also be hydrogen- and power-to-gas-ready.

The project will allow for an expansion of RES not only in Slovakia, but also in other countries – Poland, Hungary, Ukraine, Austria, and Czech Republic. P2G will also lead to better utilization of all segments of existing gas infrastructure in case of possible Russian gas transit re-route away from Ukraine and to a possible re-purpose of gas infrastructure in the future.

F. Useful Links

Underground gas storage Velke Kapusany project page:
https://www.nafta.sk/en/underground-gas-storage-velke-kapusany
EIA Enviroportal:
http://enviroportal.sk/sk/eia/detail/pzzp-velke-kapusany

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

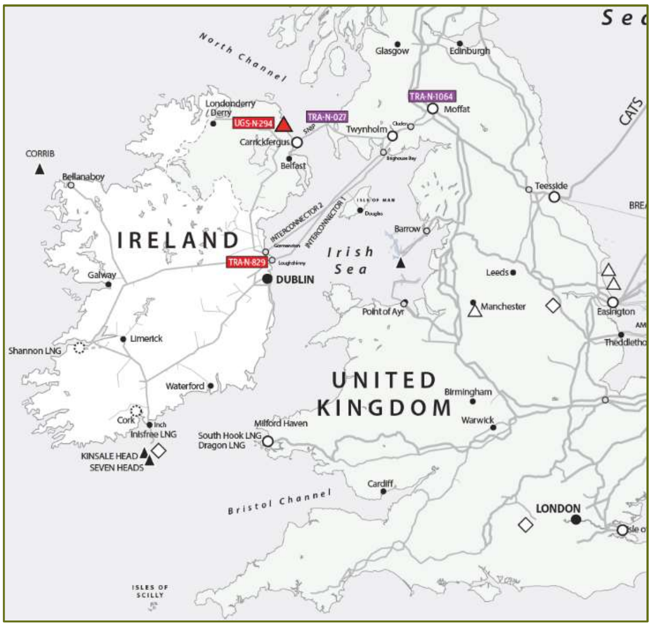
Project Group WEST_01

Reasons for grouping [ENTSOG]

The project group is composed by projects to insure the reverse flow at Moffat IP for the direction IE>UK (TRA-N-829 and TRA-N-1064) and from Northern Ireland to Scotland on SNIP pipeline (TRA-N-27) as well as UGS Islandmagee project (UGS-N-294). The transmission projects are considered enhancers of the UGS, allowing for possible cross-border flows between UK and Ireland.

Objective of the project(s) in the group [Promoter]

The primary objective of the project groups to construct an underground gas storage facility at Islandmagee, delivering new storage capacity in Northern Ireland. The PRF SNIP project, TRA-N-0027, is an enabling project to bring gas back to GB from the storage facility. PRF at Moffat would enable bi-directional flow of gas (IE/UK), enabling IE gas sources to supply to the UK.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0027	Physical reverse flow from NI to GB and IE via SNIP pipeline	Premier Transmission	UK	Less-Advanced	5.1.2	2021	2021	On time
TRA-N-0829	PCI 5.1.1 Physical Reverse Flow at Moffat interconnection point IE/UK	Gas Networks Ireland	IE	Advanced	5.1.1	2021	2021	Rescheduled
TRA-N-1064	Moffat Physical Reverse Flow	National Grid Gas plc	UK	Less-Advanced	5.1.1	2020	2020	On time
UGS-N-0294	Islandmagee Gas Storage Facility	Infrastrata	UK	Advanced	5.1.3	2022	2022	Rescheduled

Projects Overview

Technical information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0027	600	-	10
TRA-N-0829	750	194	29
TRA-N-1064	-	-	-

TYNDP Project Code	Injection Capacity Increment [mcm/d]	Withdrawal Capacity Increment [mcm/d]	WGV Increment [mcm]
UGS-N-0294	12	22	420

Capacity increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0027	Premier Transmission Ltd	Twynholm	2021	-	131
TRA-N-0829	Gas Networks Ireland	Moffat (IE)	2021	-	176.2
TRA-N-1064	National Grid Gas plc	Moffat	2020	176.2	-
UGS-N-0294	Islandmagee Storage Ltd	Islandmagee	2022	132	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-829	TRA-N-1064	TRA-N-27	UGS-N-294
CAPEX [mln. EUR]	640	220	10	60	350
Range CAPEX		25%	33%	25%	20%
OPEX [mln. EUR/y]	12.5	1.9	0.1	2.5	8.0

Description of costs and range [Promoter]

The CAPEX required for the creation of the Phase 1 of the project which comprise the creation of 2 underground caverns beneath Larne Lough and the construction of the Above Ground Facilities on Islandmagee is estimated at approximately £119.5 million.
Twynholm PRF Costs are estimates at this stage of the project.
Costs for Moffat PRF represent those submitted by Gas Networks Ireland (GNI) as part of the TYNDP project submission in February 2018. GNI have since completed feasibility studies on PCI 5.1.1, following which the costs have been further refined, however these updated costs have not been considered.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The United Kingdom sees the **diversification of its entry points** (LICD indicator) slightly improving thanks to the realisation of the reverse flow from Ireland. The modest impact on the LICD indicator is due to the size of the additional capacity brought by the reverse flow compared to the existing capacities at the other entry points

> **Security of Supply:**

The projects group increases the **remaining flexibility** in the United Kingdom by 3% in all scenarios in 2-week cold spell situation.

> **Market integration:**

The **bidirectionality** is improved by 51% (from 0%). The projects group creates new entry from Ireland to United Kingdom. Depending on the considered demand scenarios and infrastructure level, the projects allow to **reduce the cost of gas supply** in Europe by around 1.2 Mln EUR/y in the reference supply price scenario. The positive impact on the cost of gas supply is higher in case of Russian supply minimisation configuration (i.e. Russia more expensive than the other sources) since the projects group allows for more access to an alternative supply.

Fuel Switch benefits explained [Promoter]

The project would facilitate consumers in switching from oil as primary energy source to less carbon-intensive gas.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
LNG and Interconnection Capacity Diversification (LICD)																											
United Kingdoom				7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7004	6543	-461	7187	6748	-439	7187	6748	-439
Security of Supply																											
Remaining Flexibility 2-Week Cold Spell (%)																											
Denmark																									89%	91%	1%
United Kingdom	52%	55%	3%	43%	46%	3%	48%	52%	3%	41%	45%	3%	36%	39%	3%	63%	67%	4%	61%	65%	4%	43%	47%	4%	27%	30%	3%
Market Integration																											
Bi-directionality Balance																											
Moffat							0%	51%	51%				0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%

ADVANCED Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
LNG and Interconnection Capacity Diversification (LICD)																											
United Kingdoom				7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7004	6543	-461	7187	6748	-439	7187	6748	-439
Security of Supply																											
Remaining Flexibility 2-Week Cold Spell (%)																											
United Kingdom	52%	55%	3%	45%	48%	3%	50%	54%	3%	43%	47%	3%	37%	41%	3%	65%	69%	4%	63%	67%	4%	46%	49%	4%	28%	31%	3%
Market Integration																											
Bi-directionality Balance																											
Moffat							0%	51%	51%				0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.8	1.7	1.3	0.5	0.5	0.5
Supply Maximization	1.2	2.4	1.5	1.3	1.5	1.1
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	10.1	5.0	5.4	10.1	5.0	5.4
Fuel Switch savings	0.6	0.4	0.8	0.6	0.4	0.8

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	1.7	0.7	5.6	4.7	1.5	0.5	1.7	0.8
Supply Maximization	2.4	0.4	6.3	4.3	2.3	1.0	1.2	0.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	10.1	5.0	10.1	5.0	10.8	4.6	10.1	5.0
Fuel Switch savings	0.8	0.4	0.8	0.4	0.9	0.4	0.8	0.4

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.9	0.5	4.9	4.4	0.4	0.3	0.5	0.5
Supply Maximization	1.6	0.0	5.5	0.0	1.5	1.2	0.8	0.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	10.1	5.0	10.1	5.0	10.8	4.6	10.1	5.0
Fuel Switch savings	0.8	0.4	0.8	0.4	0.9	0.4	0.8	0.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0829	Tranmission	Agricultural / Adjacent to Existing Tranmisssion AGI and National Roadway network	No. Closest designated area is 1.3 km from proposed location.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

Where exact details were unknown the Environmental Appraisal adopted conservative, worst case, assumptions in line with the precautionary principle and has demonstrated that all residual impacts are within acceptable limits. Islandmagee Storage Ltd are committed to the polluter pays principle and have agreed with Regulators to develop and implement appropriate real time monitoring regimes to ensure that any impacts are identified and addressed promptly by the operators. The Islandmagee Storage Project has obtained planning permission from DOE under F/2000/0092/F for terrestrial works elements of the proposal. Consent to Discharge of Effluent (14.11.2014) and Licence to Abstract Water (14.11.2014), have been issued. However, both require a Marine Licence to be in place before abstraction or discharge can commence. It is important to note that whereas a draft marine licence was issued (on 10th July 2014), there was no final marine licence agreed or issued by the Department.

GNI have carried out an envoirnmental impact assessment on the proposed Transmission Infrastructure as part of the Feasibility Studies. The nature and magnitude of any impact has been assessed, and mitigation measures were identified for further consideration at the FEED stage of the project. Specific costs related to mitigation measures would be subject to the outcome of planning consents, only available at FEED stage.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

F. Useful Links

Promoters Project link:
https://www.infrastrataplc.com/projects/islandmagee-energy/
http://www.mutual-energy.com/other-projects/scotland-to-northern-ireland-pipeline-snip-project/
http://gmo-ni.com/assets/documents/Transparency/NI-Gas-Capacity-Statement/Final-NIGCS-18-19-to-2027-28-3.12.18.pdf
GNI Network Development Plan:
https://www.gasnetworks.ie/corporate/gas-regulation/system-operator/publications/GNI-Network-Development-Plan-2017.pdf
GNI PCI Project link:
http://www.gasnetworks.ie/en-IE/About-Us/Our-network/Projects/Projects-of-common-interest/PCI-511-Physical-reverse-flow-at-Moffat-interconnection-point-IrelandUnited-Kingdom/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

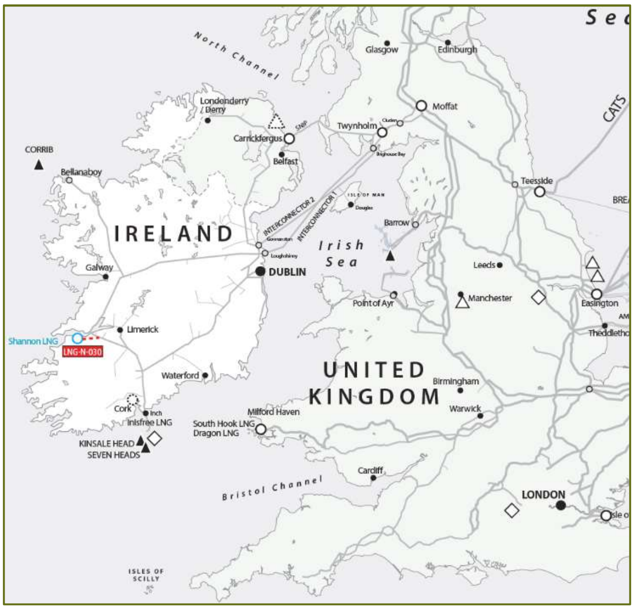
Project Group WEST_02

Reasons for grouping [ENTSOG]

The project group is composed by one single LNG project to be developed in Ireland. It includes also the evacuation pipeline connecting the LNG facility to the transmission grid.
Group WEST_03 considers Shannon LNG terminal with reverse flow at Moffat IP.

Objective of the project(s) in the group [Promoter]

The project aims at providing major benefits to Ireland increasing Ireland's security and diversity of supply and ends Ireland's energy isolation, reducing cost of gas and energy, advancing a low carbon energy environment, providing potential for storage and providing significant employment in a peripheral rural area.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
LNG-N-0030	Shannon LNG Terminal and Connecting Pipeline	Shannon LNG	IE	Advanced	5.3	2022	2022	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0030	2.8	200000	265000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0030	Shannon LNG	Shannon LNG	2022	-	86

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-30
CAPEX [mln. EUR]	450	450**
Range CAPEX		15%
OPEX [mln. EUR/y]	22.5	22.5**

Description of costs and range [Promoter]

The capex figure covers purchase of land, widening of access road, building marine jetty, site development and civil works, onshore equipment, 26 km pipeline to connect to the grid, Feed and pre-feed costs, electrical connection etc.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **improves the diversification of capacities** in entry in Ireland (LICD indicator) with the creation of a new entry point. The LICD indicator for Ireland is halved.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Ireland from 2025 onward in all demand scenarios and in peak day and 2-week cold spell. Belgium shows a slight improvement in remaining flexibility from 2030. In fact, the realisation of the LNG terminal potentially limits the flows from the United Kingdom to Ireland that can be redirected to Belgium. The same effect is observed in other demand scenarios and also in case of Ukraine or Belarus disruption where other European countries can benefit from a lower utilisation of the interconnection between Ireland and the United Kingdom.
The project group **reduces the potential demand curtailment** by around 25% from 2025 in case of disruption of the single largest infrastructure (Moffat). The uncovered demand still remains significant and above 50%.

> **Market integration:**

The project allows for a **reduction of the cost of gas supply** in all scenarios and infrastructure levels of around 4.7 Mln EUR/y for the reference supply price configuration thanks to the connection to LNG. Those benefits are null only in case of high tariffs sensitivity. In fact, in case tariffs related to the LNG terminal in Ireland are doubled, the assessment shows that Ireland can import gas from the alternative routes through the United Kingdom.

Fuel Switch benefits explained [Promoter]

The Shannon LNG Terminal (LNG-N-30) facilitates a switch by oil, coal and peat power plants to cleaner gas.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Ireland	10000	5487	-4513	10000	5385	-4615	10000	5612	-4388	10000	5375	-4625	10000	5294	-4706	10000	5149	-4851	10000	5440	-4560	10000	5174	-4826
Security of Supply																								
Belarus Disruption Curtailment Rate Peak Day (%)																								
Belgium																			2%	0%	-2%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Ireland	50%	83%	33%	50%	83%	33%	40%	73%	33%	52%	85%	33%	64%	100%	36%	52%	85%	33%	33%	66%	33%	51%	84%	33%
United Kingdoom	43%	45%	2%	48%	50%	2%	41%	43%	2%	36%	37%	2%	63%	65%	2%	61%	63%	2%	43%	46%	2%	27%	28%	2%
Remaining Flexibility Peak day (%)																								
Belgium							37%	42%	6%	53%	59%	6%							13%	19%	6%	41%	46%	6%
France							13%	15%	2%	28%	29%	1%							4%	6%	2%	33%	35%	2%
Germany	90%	91%	2%	96%	97%	1%	35%	38%	3%	89%	90%	2%							39%	43%	4%			
Ireland	15%	40%	25%	15%	40%	25%	8%	33%	25%	16%	41%	25%	26%	53%	27%	16%	42%	25%	2%	27%	25%	16%	41%	25%
Italy							32%	34%	2%										35%	37%	2%			
Netherlands	56%	58%	2%	69%	72%	3%	17%	20%	3%	60%	64%	3%	99%	100%	1%				7%	9%	3%	97%	100%	3%
United Kingdoom	17%	19%	1%	20%	21%	1%	11%	12%	1%	9%	10%	1%	34%	36%	2%	31%	33%	2%	4%	6%	2%	5%	7%	1%
Single Largest Infrastructure Disruption (SLID)-Ireland																								
Ireland	86%	61%	-25%	86%	61%	-25%	93%	68%	-25%	85%	59%	-25%	83%	56%	-27%	84%	59%	-25%	99%	74%	-25%	85%	59%	-25%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium																			2%	0%	-2%			
Germany							2%	0%	-2%															
Luxembourg																			2%	0%	-2%			
Portugal																			2%	0%	-2%			
Spain																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-United Kingdom																								
Ireland							4%	2%	-2%	8%	6%	-2%							8%	6%	-2%	12%	10%	-2%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bosnia Herzegovina																			8%	6%	-2%			
Bulgaria																			8%	6%	-2%			
Czechia																			6%	4%	-2%			
Germany																			6%	5%	-1%			
Italy							6%	4%	-2%															
Luxembourg																			8%	6%	-2%			
Serbia																			8%	6%	-2%			
Slovakia							6%	4%	-2%															
Slovenia																			8%	6%	-2%			

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Ireland	10000	5487	-4513	10000	5385	-4615	10000	5612	-4388	10000	5375	-4625	10000	5294	-4706	10000	5149	-4851	10000	5440	-4560	10000	5174	-4826
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
France																			1%	0%	-1%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Ireland	50%	83%	33%	50%	83%	33%	40%	73%	33%	52%	85%	33%	64%	100%	36%	52%	85%	33%	33%	66%	33%	51%	84%	33%
United Kingdoom	46%	48%	2%	52%	54%	2%	45%	47%	2%	39%	41%	2%	67%	69%	2%	65%	67%	2%	47%	49%	2%	30%	31%	2%
Remaining Flexibility Peak day (%)																								
Belgium							41%	47%	6%	53%	59%	6%							19%	25%	6%	41%	46%	6%
France							14%	16%	2%	30%	30%	1%							7%	8%	2%	35%	37%	2%
Germany	95%	97%	2%				63%	65%	2%	95%	96%	2%							66%	67%	2%			
Ireland	15%	40%	25%	15%	40%	25%	8%	33%	25%	16%	41%	25%	26%	53%	27%	16%	42%	25%	2%	27%	25%	16%	41%	25%
Italy																			48%	50%	1%			
Netherlands	58%	60%	2%	72%	74%	3%	19%	22%	3%	63%	67%	3%	99%	100%	1%				10%	12%	3%	97%	100%	3%
Spain																			10%	11%	1%			
United Kingdoom	17%	19%	1%	20%	21%	1%	12%	13%	1%	9%	10%	1%	34%	36%	2%	31%	33%	2%	6%	7%	2%	5%	7%	1%
Single Largest Infrastructure Disruption (SLID)-Ireland																								
Ireland	86%	61%	-25%	86%	61%	-25%	93%	68%	-25%	85%	59%	-25%	83%	56%	-27%	84%	59%	-25%	99%	74%	-25%	85%	59%	-25%
Single Largest Infrastructure Disruption (SLID)-Spain																								
Ireland																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-United Kingdom																								
Belgium							2%	0%	-2%															
Ireland							4%	2%	-2%	8%	6%	-2%							8%	6%	-2%	12%	10%	-2%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	4.5	5.0	4.5	3.5	5.0	4.5
	Supply Maximization	4.5	5.0	4.5	4.5	5.1	4.5
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.6	4.7	3.6	2.6	3.2	2.6
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	3.7	5.3	5.3	3.7	5.3	5.3
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	27.5	24.3	5.0	4.5	5.0	4.5
Supply Maximization	0.0	0.0	27.5	18.4	5.0	4.5	2.5	2.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.7	2.6	4.7	2.6	2.2	0.0	4.7	2.6
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	5.3	3.7	5.3	3.7	5.3	3.7	5.3	3.7
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	22.7	12.8	5.0	3.5	5.0	3.5
Supply Maximization	0.0	0.0	27.6	0.0	5.1	4.5	2.5	2.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.2	2.6	3.2	2.6	0.7	0.0	3.2	2.6
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	5.3	3.7	5.3	3.7	5.3	3.7	5.3	3.7
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmen
by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the prom

TYNDP Code	Type of infrastructure	Surface of impact	
LNG-N-0030	LNG Terminal	Open agricultural land	

Potential impact	Mitigation measures	Related costs includ CAPEX and

Environmental Impact explained [Promoter]

An extensive analysis of all environmental aspects was carried out before the project was submitted for planning permission.

E. Other Benefits

Missing benefits are all benefits of a project **which may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

In addition to security and diversity of supply and competition, the project is located is in a peripheral rural area of Ireland and will provide long-term employment and be a catalyst in bringing further industry and employment to the region.
Shannon LNG has calculated an improvement in Ireland's N-1 standard of 80% (in 2030) resulting from LNG project.
For TYNDP18 Shannon LNG promoter submitted for modelling an exit capacity of 86 GWh/d for operational year 1 of the LNG terminal. In case the capacity for operational year 3 (equal to 110 GWh/d) would be considered, the project group would reduce the potential demand curtailment by around 32% from 2025 and in case of disruption of the single largest infrastructure (Moffat).

F. Useful Links

Shannon LNG Project link:
http://www.shannonlng.ie/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

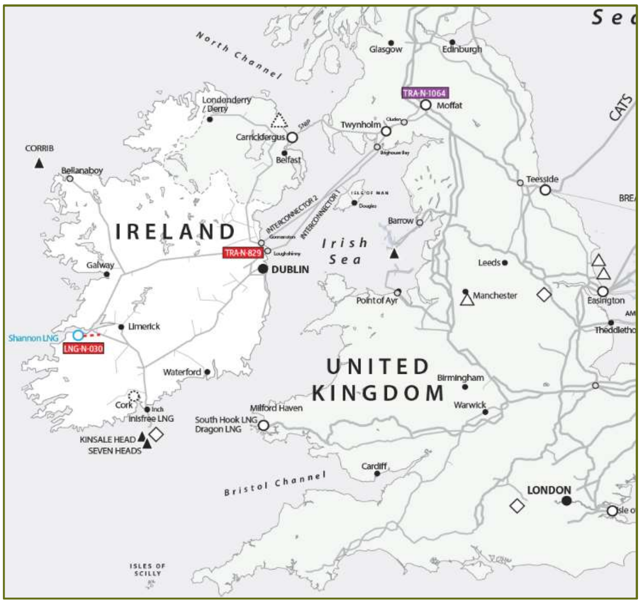
Project Group WEST_03

Reasons for grouping [ENTSOG]

The project group is composed by projects to insure the reverse flow at Moffat IP for the direction IE>UK (TRA-N-829 and TRA-N-1064) as well as the Shannon LNG terminal in Ireland. The transmission projects are considered enhancers for the LNG, allowing for possible cross-border flows between UK and Ireland.

Objective of the project(s) in the group [Promoter]

Physical Reverse Flow at Moffat (PCI 5.1.1) aims at enabling the bi-directional flow of gas (IE/UK), enabling for the first time IE gas sources to supply to the UK, providing an outlet for IE gas sources. Shannon LNG aims at increasing Ireland's security and diversity of supply, reducing cost of gas to Irish consumers, reducing CO2 and providing significant local employment.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-1064	Moffat Physical Reverse Flow	National Grid Gas plc	UK	Less-Advanced	5.1.1	2020	2020	On time
TRA-N-0829	PCI 5.1.1 Physical Reverse Flow at Moffat interconnection point (IE/UK)	Gas Networks Ireland	IE	Advanced	5.1.1	2021	2021	Rescheduled
LNG-N-0030	Shannon LNG Terminal and Connecting Pipeline	Shannon LNG	IE	Advanced	5.3	2022	2022	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0829	750	194	29
TRA-N-1064	-	-	-

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0030	2.8	200000	265000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-1064	National Grid Gas plc	Moffat	2020	176.2	-
TRA-N-0829	Gas Networks Ireland	Moffat (IE)	2021	-	176.2
LNG-N-0030	Shannon LNG	Shannon LNG	2022	-	86

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-829	TRA-N-1064	LNG-N-30
CAPEX [mln. EUR]	680	220	10	450**
Range CAPEX		25%	33%	15%
OPEX [mln. EUR/y]	24.50	1.90	0.10	22.50

Description of costs and range [Promoter]

Costs for the transmission projects represent those submitted by Gas Networks Ireland (GNI) as part of the TYNDP project submission in February 2018. GNI have since completed feasibility studies on PCI 5.1.1, following which the costs have been further refined. These updated costs have not been considered in the ENTSOG CBA, as their development followed after TYNDP 2018 data freeze.

Shannon LNG (LNG-N-30) The capex figure covers purchase of land, widening of access road, building marine jetty, site development and civil works, onshore equipment, 26 km pipeline to connect to the grid, Feed and pre-feed costs, electrical connection etc

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **increases the diversification of entry points** (LICD indicator) in Ireland and in the United Kingdom. The construction of the LNG terminal in Ireland creates a new entry while the United Kingdom sees the LICD indicator slightly improving thanks to the realisation of the reverse flow from Ireland. The modest impact on the LICD indicator in the United Kingdom is due to the size of the additional capacity brought by the reverse flow compared to the still higher capacities existing at the other entry points.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Ireland from 2025 in all scenarios and in peak day and 2-week cold spell. Thanks to the project realisation Ireland becomes more resilient to climatic stress. Belgium shows a slight improvement in remaining flexibility from 2030. In fact, the realisation of the LNG terminal potentially limits the flows from the United Kingdom to Ireland that can be redirected to Belgium. The same effect is observed in other demand scenarios and also in case of Ukraine or Belarus disruption where other European countries can benefit from a lower utilisation of the interconnection between Ireland and the United Kingdom.
The project group **reduces the potential demand curtailment** by around 25% from 2025 in case of disruption of the single largest infrastructure (Moffat). The uncovered demand still remains significant and above 50%.

> **Market integration:**

The **bidirectionality is improved** by 51% from 0%. The project group creates new entry from Ireland to United Kingdom.
Depending on the considered demand scenarios and infrastructure level, the projects allow to **reduce the cost of gas supply** in Europe by around 4.5 Mln EUR/y (on average). In terms of monetised benefits group WEST_03 does not show significantly differences compared to group WEST_02.

Fuel Switch benefits explained [Promoter]

The project would underpin gas supplies facilitating UK and Irish domestic and commercial consumers in switching from oil as primary energy source to less carbon-intensive gas.
The Shannon LNG Terminal (LNG-N-30) facilitates a switch by oil, coal and peat power plants to cleaner gas.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Ireland	10000	5487	-4513	10000	5385	-4615	10000	5612	-4388	10000	5375	-4625	10000	5294	-4706	10000	5149	-4851	10000	5440	-4560	10000	5174	-4826
United Kingdoom	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7004	6543	-461	7187	6748	-439	7187	6748	-439
Security of Supply																								
Belarus Disruption Curtailment Rate Peak Day (%)																								
Belgium																			2%	0%	-2%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Ireland	50%	83%	33%	50%	83%	33%	40%	73%	33%	52%	85%	33%	64%	100%	36%	52%	85%	33%	33%	66%	33%	51%	84%	33%
United Kingdoom	43%	45%	2%	48%	50%	2%	41%	43%	2%	36%	37%	2%	63%	65%	2%	61%	63%	2%	43%	46%	2%	27%	28%	2%
Remaining Flexibility Peak day (%)																								
Belgium							37%	42%	6%	53%	59%	6%							13%	19%	6%	41%	46%	6%
France							13%	15%	2%	28%	29%	1%							4%	6%	2%	33%	35%	2%
Germany	90%	91%	2%	96%	97%	1%	35%	38%	3%	89%	90%	2%							39%	43%	4%			
Ireland	15%	40%	25%	15%	40%	25%	8%	33%	25%	16%	41%	25%	26%	53%	27%	16%	42%	25%	2%	27%	25%	16%	41%	25%
Italy							32%	34%	2%										35%	37%	2%			
Netherlands	56%	58%	2%	69%	72%	3%	17%	20%	3%	60%	64%	3%	99%	100%	1%				7%	9%	3%	97%	100%	3%
Poland										80%	81%	1%												
United Kingdoom	17%	19%	1%	20%	21%	1%	11%	12%	1%	9%	10%	1%	34%	36%	2%	31%	33%	2%	4%	6%	2%	5%	7%	1%
Single Largest Infrastructure Disruption (SLID)-Ireland																								
Ireland	86%	61%	-25%	86%	61%	-25%	93%	68%	-25%	85%	59%	-25%	83%	56%	-27%	84%	59%	-25%	99%	74%	-25%	85%	59%	-25%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium																			2%	0%	-2%			
Germany							2%	0%	-2%															
Luxembourg																			2%	0%	-2%			
Portugal																			2%	0%	-2%			
Spain																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-United Kingdoom																								
Ireland							4%	2%	-2%	8%	6%	-2%							8%	6%	-2%	12%	10%	-2%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria																			6%	4%	-2%			
Bosnia Herzegovina																			8%	6%	-2%			
Bulgaria																			8%	6%	-2%			
Czechia																			6%	4%	-2%			
Germany																			6%	5%	-1%			
Italy							6%	4%	-2%															
Luxembourg																			8%	6%	-2%			
Serbia																			8%	6%	-2%			
Slovakia							6%	4%	-2%															
Slovenia																			8%	6%	-2%			
Market Integration																								
Bi-directionality Balance																								
Moffat				0%	51%	51%				0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Ireland	10000	5487	-4513	10000	5385	-4615	10000	5612	-4388	10000	5375	-4625	10000	5294	-4706	10000	5149	-4851	10000	5440	-4560	10000	5174	-4826
United Kingdoom	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7187	6748	-439	7004	6543	-461	7187	6748	-439	7187	6748	-439
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
France																			1%	0%	-1%			
Remaining Flexibility 2-Week Cold Spell (%)																								
Ireland	50%	83%	33%	50%	83%	33%	40%	73%	33%	52%	85%	33%	64%	100%	36%	52%	85%	33%	33%	66%	33%	51%	84%	33%
United Kingdoom	46%	48%	2%	52%	54%	2%	45%	47%	2%	39%	41%	2%	67%	69%	2%	65%	67%	2%	47%	49%	2%	30%	31%	2%
Remaining Flexibility Peak day (%)																								
Belgium							41%	47%	6%	53%	59%	6%							19%	25%	6%	41%	46%	6%
France							14%	16%	2%	30%	30%	1%							7%	8%	2%	35%	37%	2%
Germany	95%	97%	2%				63%	65%	2%	95%	96%	2%							66%	67%	2%			
Ireland	15%	40%	25%	15%	40%	25%	8%	33%	25%	16%	41%	25%	26%	53%	27%	16%	42%	25%	2%	27%	25%	16%	41%	25%
Italy																			48%	50%	1%			
Netherlands	58%	60%	2%	72%	74%	3%	19%	22%	3%	63%	67%	3%	99%	100%	1%				10%	12%	3%	97%	100%	3%
Spain																			10%	11%	1%			
United Kingdoom	17%	19%	1%	20%	21%	1%	12%	13%	1%	9%	10%	1%	34%	36%	2%	31%	33%	2%	6%	7%	2%	5%	7%	1%
Single Largest Infrastructure Disruption (SLID)-Ireland																								
Ireland	86%	61%	-25%	86%	61%	-25%	93%	68%	-25%	85%	59%	-25%	83%	56%	-27%	84%	59%	-25%	99%	74%	-25%	85%	59%	-25%
Single Largest Infrastructure Disruption (SLID)-Spain																								
Ireland																			2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-United Kingdom																								
Belgium							2%	0%	-2%															
Ireland							4%	2%	-2%	8%	6%	-2%							8%	6%	-2%	12%	10%	-2%
Market Integration																								
Bi-directionality Balance																								
Moffat				0%	51%	51%				0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%	0%	51%	51%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	4.4	4.8	4.4	3.4	4.8	4.4
	Supply Maximization	4.4	4.8	4.4	4.4	4.9	4.4
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.5	4.4	3.5	2.5	3.1	2.5
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	14.1	10.6	11.1	14.1	10.6	11.1
	Fuel Switch savings	0.6	0.4	0.8	0.6	0.4	0.8

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	26.4	24.0	5.0	4.5	4.8	4.4
Supply Maximization	0.0	0.0	26.4	17.6	5.0	4.5	2.4	2.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	4.4	2.5	4.4	2.5	2.2	0.0	4.4	2.5
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	14.1	10.6	14.1	10.6	14.5	9.9	14.1	10.6
Fuel Switch savings	0.8	0.4	0.8	0.4	0.9	0.4	0.8	0.4

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	26.4	22.4	5.0	3.5	4.8	3.4
Supply Maximization	0.0	0.0	26.4	0.0	5.1	4.5	2.4	2.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.1	2.5	3.1	2.5	0.7	0.0	3.1	2.5
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	14.1	10.6	14.1	10.6	14.5	9.9	14.1	10.6
Fuel Switch savings	0.8	0.4	0.8	0.4	0.9	0.4	0.8	0.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0829	Tranmission	Agricultural / Adjacent to Existing Tranmisssion AGI and National Roadway network	No. Closest designated area is 1.3 km from proposed location.
LNG-N-0030	LNG Terminal	Open agricultural land	

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

GNI have carried out an environmental impact assessment on the proposed Transmission Infrastructure as part of the Feasibility Studies. The nature and magnitude of any impact has been assessed, and mitigation measures were identified for further consideration at the FEED stage of the project. Specific costs related to mitigation measures would be subject to the outcome of planning consents, only available at FEED stage.

Shannon LNG (LNG-N-30): An extensive analysis of all environmental aspects was carried out before the project was submitted for planning permission.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Moffat Physical Reserve Flow

The promotors believe the group of projects will bring significant benefits to Ireland and neighbouring jurisdictions.
Further to the quantified and monetised benefits outlined in Sections C, D and E, the promotors believe that additional benefits for SLID indicator could be considered:

> Single Largest Infrastructure (SLID) indicator considers disruption at Moffat entry point, as no additional projects impacting capacity at this entry point were submitted to TYNDP18. As stated in section D: 'The project group **reduces the potential demand curtailment** by around 25% from 2025 in case of disruption of the single largest infrastructure (Moffat). The uncovered demand still remains significant and above 50%'.

> Additionally, UK National Risk Assessment on security of supply 2018 (2017/1938) considers completion on mitigation works in Scotland, and therefore from 2020 the single largest infrastructure will represent less than half the actual capacity of the Moffat Entry Point. Hence the SLID indicator is anticipated to be significantly lower than presented in Section D. (For more information, please refer to Section H. Useful links)

Shannon LNG

In addition to security and diversity of supply and competition benefits, the project which is located in a peripheral rural area of Ireland and will provide long-term employment and be a catalyst in bringing further industry and employment to the region.
Shannon LNG has calculated an improvement in Ireland's N-1 standard of 80% (in 2030) resulting from LNG project.
For TYNDP18 Shannon LNG promoter submitted for modelling an exit capacity of 86 GWh/d for operational year 1 of the LNG terminal. In case the capacity for operational year 3 (equal to 110 GWh/d) would be considered, the project group would reduce the potential demand curtailment by around 32% from 2025 and in case of disruption of the single largest infrastructure (Moffat).

F. Useful Links

GNI National Development Plan 2017:
https://www.gasnetworks.ie/corporate/gas-regulation/system-operator/publications/GNI-Network-Development-Plan-2017.pdf
GNI Physical reverse flow at Moffat Project Link:
http://www.gasnetworks.ie/en-IE/About-Us/Our-network/Projects/Projects-of-common-interest/PCI-511-Physical-reverse-flow-at-Moffat-interconnection-point-IrelandUnited-Kingdom/
Shannon LNG Project link:
http://www.shannonlng.ie/
UK National Risk Assessment on Security of Gas Supply:
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/774288/national-risk-assessment-security-gas-supply.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_04

Reasons for grouping [ENTSOG]

The project group represents the first phase of the 3rd interconnection between Portugal and Spain and includes the two sides of the investment. This phase is assessed separately from the 2nd phase in order to evaluate the incremental impact of each phase.

Objective of the project(s) in the group [Promoter]

From a European perspective, the 3rd IP Portugal-Spain project aims at contributing to integrate the European systems and, therefore, an internal gas market development. This project linked and supplemented with the full development of the Iberian-French Corridor, aims at ensuring that no Member State is isolated from the European network, as well as, reinforce the security of supply in any system, increasing the solidarity between countries in all of Europe.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0168	Interconnection ES-PT (3rd IP) - 1st phase	Enagás Transporte, S.A.U.	ES	Less-Advanced	5.4.1	2024	2024	Rescheduled
TRA-N-0283	3rd IP between Portugal and Spain (pipeline Celorico-Spanish border)	REN - Gasodutos, S.A.	PT	Advanced	5.4.1	2024	2024	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0168	700	86	4
TRA-N-0283	700	162	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0168	Enagás Transporte, S.A.U.	VIP IBERICO	2024	70	70
TRA-N-0283	REN Gasodutos, S.A.	VIP IBERICO	2024	85	70

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-168	TRA-N-283
CAPEX [mln. EUR]	189.8	74.8	115.0
Range CAPEX		0%	15%
OPEX [mln. EUR/y]	3.23	1.40	1.83

Description of costs and range [Promoter]

The first phase of the 3rd Interconnection Portugal – Spain is a pipeline with 162 km from the existing junction station JCT 13200-Celorico da Beira, in Guarda, developing to the North to Vale de Frades (in the Portuguese/Spanish border) and into Spain, to Zamora, with a length of 86 km, and reinforcements in the compressor station of Zamora.

In Portugal, the pipeline will have five intermediate junction stations and a Custody Transfer Station (CTS) in Vale de Frades. The project cost's calculation consider the basic engineering design studies and the historical cost data available in REN Gasodutos (Portuguese Promoter). Also based on historical values and based on the procurement procedures, a 15% range is usually considered in order to account for the uncertainty associated to price changes of the materials, equipment's and civil works. Portuguese Regulator (ERSE) validated the cost presented in National TYNDP and it is lower than the reference costs presented in ACER Unit Investment Costs Report. The calculation of OPEX values took in consideration the operational historical data of REN Gasodutos, promoter that operates the Portuguese NG network since 1997, and which is part of the Juran - Gas Transmission Benchmark Initiative (GTBI), since 2012.

In Spain, a standard cost methodology is in force in Spain to provide an incentive to the efficient investment in transmission assets, and which are used for the calculation of the costs added to the Regulatory Asset Base (RAB). The above information is further explained in the Royal-Decree 326/2008.
The standard unit investment values in Spain have been calculated by the CNMC, at the Ministry's request. For the calculation of these values, historical costs and projections have been taken into account. The CNMC has all the information relative to their calculation, including the inputs related to all historical investments in Spain, and the methodology applied, which was developed by the CNMC itself. The final values represent the expected average cost of the infrastructures to be developed in the future, whose technical design and operating conditions are adapted to the standards used in the Spanish national gas system. These values are unique for the entire national territory.
On Enagás' side, the costs reported for this project were determined through a bottom-up methodology (i.e. based on own estimates), which were in line with (very close, but not identical, to) the standard unit costs approved by the Ministry.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group slightly **improves diversification of entry points** (LICD indicator) in Portugal and Spain increasing capacity at the existing interconnection between the two countries. In Advanced infrastructure level the project **reduces the dependence from LNG** in Portugal by 4% (on average) in 2025 and 2030.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Portugal from 2025 in all scenarios in peak day situation. Thanks to the project realisation, Portugal becomes more resilient to climatic stress. In the Advanced infrastructure level Portugal improves the remaining flexibility in 2-weeks cold spell while France and Spain see their remaining flexibility slightly improving in 2040.
In case of disruption of the single largest infrastructure (SLID) in Portugal that is, thanks to the project realisation, the interconnection between Spain and Portugal (VIP IBERICO), **the potential demand curtailment** of Portugal is halved. The uncovered demand remains higher than 10% in most of the scenarios even after the project realisation.
In case of disruption of Algerian supply, in the Advanced infrastructure level, the project group **slightly mitigates the risk of demand curtailment** in Spain. In Advanced, Portugal improves the capacity of the network through a new compressor station in Carregado. This new compressor station improves the send out capacity from the Sines LNG Terminal. Therefore, in Advanced infrastructure level Portugal is able to send gas to Spain to help to mitigate slightly the risk of demand curtailment. The project allows further cooperation among Spain and Portugal.

> **Market integration:**

The **bidirectionality is improved** by 49% (from 43% to 92%). The project group creates more capacity from Portugal to Spain balancing both sides of the interconnection.

Fuel Switch benefits explained [Promoter]

Under the new European energy policy framework to facilitate a clean energy transition, natural gas can meet growing power-generation needs, as reducing greenhouse gas emissions levels against other carbon intensity fossil fuels as oil and coal by more environmentally friendly energy sources.
In this context, the Project Group Fuel Switch benefits related to CO_2 savings are associated with the decarbonisation targets for 2030 and beyond (up to 2050), as defined by the European Climate and Energy package and detailed in the National Climate and Energy Plans, for both Portugal and Spain. Specifically, the Project Group allows operational integration between the UGS facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems and increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation. It also allows a higher rate for oil and coal replacement in the industrial sector.
The fuel Switch benefits and CO_2 savings include:

1. In the Electricity sector, the shutdown of the existing coal power plants, (15 units in Spain and 2 units in Portugal) 11.700 MW in total. The coal phase-out has an impact on the gas demand due to the partial substitution of coal with gas, according to the data collection process for the TYNDP 2018, as has been simulated for 2025 and 2030;
2. In the Industrial sector, there has been a trend for switching the replacement other fossil fuels (more expensive and more pollutant) with natural gas has been a trend in the past that is expected to continue in the coming years;
3. In the Residential and Commercial sector, there are also benefits from switching to NG, as opposed to continue the consumption of diesel, propane or butane (household bottles). Since 2000's, residential and commercial gas demand has been driven by fuel switching beginning in the main cities and then evolving progressively on smaller towns. This trend will continue in the coming years as shown by the EUROSTAT 2016 data for Portugal and Spain;
4. In the Transportation sector, some fuel switching from diesel to compressed NGV has been accomplished already, while a future increase is expected in this sector addressing logistic services, and public transportation in cities.

Depending on the scenario and the assessment year main benefits from Fuel switching and CO_2 emission savings will mainly come either from the electricity or the industrial sector. Project Group will facilitate a clean energy transition and will increase the VIP capacity and the Security of Supply for Portugal and Spain under some supply stress scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5162	5004	-158				5162	5000	-162	5104	5000	-104												
Spain	7129	6518	-611	6886	6250	-636	7046	6426	-620	6870	6233	-637	6416	5745	-671	6918	6285	-633	7270	6675	-595	7069	6451	-618
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Portugal	36%	61%	25%	47%	74%	27%	28%	50%	23%	34%	57%	24%	88%	100%	12%	49%	75%	26%	44%	69%	25%	50%	76%	26%
Remaining Flexibility Peak day (%)																								
Portugal	23%	45%	22%	24%	46%	22%	9%	28%	19%	12%	32%	20%	63%	92%	29%	39%	63%	24%				40%	64%	24%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	19%	-18%	37%	19%	-19%	44%	28%	-16%	42%	25%	-16%	17%	0%	-17%	26%	6%	-20%	31%	11%	-20%	26%	6%	-20%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	92%	49%	43%	92%	49%	43%	92%	49%	43%	92%	49%	43%	92%	49%

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Portugal	33%	28%	-5%	22%	18%	-4%	29%	24%	-5%	19%	15%	-4%												
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5213	5000	-213				5174	5000	-174	5104	5000	-104												
Spain	6050	5585	-465	5802	5327	-476	5964	5495	-469	5787	5311	-476	5365	4875	-489	5834	5360	-475	6200	5743	-457	5987	5519	-468
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Spain																			6%	5%	-1%			
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Spain																			14%	13%	-1%	3%	2%	-1%
Remaining Flexibility 2-Week Cold Spell (%)																								
France																			60%	61%	1%			
Portugal	69%	94%	25%	83%	100%	17%	58%	81%	23%	65%	88%	24%				83%	100%	17%	77%	100%	23%	84%	100%	16%
Spain				69%	70%	1%										41%	42%	1%	21%	22%	1%	39%	40%	1%
Remaining Flexibility Peak day (%)																								
Portugal	52%	74%	22%	53%	75%	22%	34%	54%	19%	38%	58%	20%				71%	95%	24%	65%	88%	23%	72%	95%	24%
Spain													66%	68%	3%							25%	25%	1%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	16%	-22%	37%	15%	-22%	44%	25%	-19%	42%	22%	-20%	17%	0%	-17%	26%	3%	-24%	31%	7%	-23%	26%	2%	-24%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	92%	49%	43%	92%	49%	43%	92%	49%	43%	92%	49%	43%	92%	49%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	1.8	1.8	1.8	2.4	2.1	2.1
2 Weeks	0.0	0.0	0.0	0.0	5.3	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	7.1	6.3	5.4	6.5	5.8	4.9
Fuel Switch savings	1.1	3.1	2.4	1.1	2.9	2.2

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.8	1.8	1.8	1.8	0.0	0.0	1.8	1.8
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	7.1	5.4	7.1	5.4	7.1	5.4	7.1	5.4
Fuel Switch savings	3.1	1.1	3.1	1.1	3.1	1.1	3.1	1.1

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	2.4	2.1	2.4	2.1	0.3	0.0	2.4	2.1
2 Weeks	5.3	0.0	5.3	0.0	5.3	0.0	5.3	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	6.5	4.9	6.5	4.9	6.5	4.9	6.5	4.9
Fuel Switch savings	2.9	1.1	2.9	1.1	2.9	0.9	2.9	1.1

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0168	Pipeline	86.000-meter length x DN 700 Width of right of way: 4 m Width of construction right of way: 22 m	No information available
TRA-N-0168	Compressor station	Project to be developed in existing Zamora CS	No environmentally sensitive area affected
TRA-N-0283	Pipeline	162.000-meter length x DN 700 Width of right of way: 10 m Width of construction right of way: 20 m	700 meters of Alto Douro Vinhateiro (ADV) and its Special Protected Zone (ZEP), and some crossings (parts 8 and 9) of Rede Natura 2000 (PTCON0021) – Rio Sabor and Maçãs, Special Protected Zone (ZEP) (PTZPE0037) - Rio Sabor and Maçãs, and Important Bird Area (IBA) (PT004) - Rio Sabor and Maçãs, as well as Rede Natura 2000 (PTCON0023). Consequently, on the 5th of February 2018, the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
No information available	No information available	No information available	No information available
No information available	No information available	No information available	No information available
Impacts referred in previous column and detailed in the EIA published by Portuguese Environmental Authority (APA)	Mitigation measures foreseen in the Environmental Impact Assessment (EIA)	Yes, but not relevant (included in the 15% margin for CAPEX and OPEX)	Included in the 15% margin for CAPEX and OPEX.

Environmental Impact explained [Promoter]

The environmental permitting of the pipeline TRA-N-0283 in Portugal started on the 12th of February of 2016. Unfortunately, on the 5th of February 2018 the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline TRA-N-0283 in Portugal. As a result, it will be necessary to adjust the initial route, maintaining the same point of interconnection with Spain, meaning that the environmental permitting process has to restart.

At this stage, no environmental studies have been performed for the project TRA-N-0168. During the development phase, Enagás will perform the corresponding studies to determine the environmental impact in detail and the associated preventive, corrective and compensatory measures required to guarantee the respect for the affected environment.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Together with Project Group WEST_04, project TRA-N-320 Carregado Compressor Station (enhancer project) will be commissioned in order to increase VIP capacity between Portugal and Spain through the 3rd interconnection, meaning that Portugal would be able to export gas to Spain in an emergency scenario, thus allowing further cooperation between Spain and Portugal.

The project increases the security of supply in the Portuguese gas system and guarantees the fulfilment of the N-1 criterion of the Regulation Nº 2017/1938. It facilitates the integration of the Portuguese market at Iberian and European level, improving competition and providing shippers with access to alternative balancing gas. Portuguese NG system has higher diversification indexes (HHI) measured both on capacity and on supply sources, than most of the European countries.

This Project Group will contribute to the implementation of the internal energy market and it will also: increase NG market liquidity between Portuguese and Spanish systems, by providing new infrastructure access alternatives to market players in the Iberian Peninsula; reinforce the security of supply in case of failure in any one of the two gas systems, given the total reversibility of the new interconnection; allow operational integration between the underground storage facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems; increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation.

The Project Group provides a significant increase in the interconnection capacity between Portugal and Spain, firm and bidirectional. The contribution of this project to the potential market integration of the Portuguese and Spanish markets is however not fully captured by ENTSOG's modelling. The capacity provided by Project Group, would nonetheless be fundamental for the market integration of the Portuguese and Spanish markets, playing an enabling role, in case of an eventual market merger between the two countries.

F. Useful Links

Enagas project link:
https://www.enagas.es/enagas/en/MarcoRegulatorio/Proyectos_Interes_Comun
REN Project link:
http://www.ren.pt/en-GB/o_que_fazemos/projetos_interesse_2017

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_05

Reasons for grouping [ENTSOG]

The project group represents first and second phase of the 3rd interconnection between Spain and Portugal. The Compressor Station project (TRA-N-320) is considered an enhancer of the interconnection. The group includes the two sides of the investment.

Objective of the project(s) in the group [Promoter]

From a European perspective, the 3rd IP Portugal-Spain project aims at contributing to integrate the European systems and, therefore, an internal gas market development. This project linked and supplemented with the full development of the Iberian-French Corridor, aims at ensuring that no Member State is isolated from the European network, as well as, reinforce the security of supply in any system, increasing the solidarity between countries in all of Europe.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0168	Interconnection ES-PT (3rd IP) - 1st phase	Enagás Transporte, S.A.U	ES	Less-Advanced	5.4.1	2024	2024	Rescheduled
TRA-N-0283	3rd IP between Portugal and Spain (pipeline Celorico-Spanish border)	REN - Gasodutos, S.A.	PT	Advanced	5.4.1	2024	2024	Rescheduled
TRA-N-0284	3rd IP between Portugal and Spain (Compressor Station)	REN - Gasodutos, S.A.	PT	Less-Advanced	5.4.2.	2028	2028	Rescheduled
TRA-N-0285	3rd IP between Portugal and Spain (pipeline Cantanhede-Mangualde)	REN - Gasodutos, S.A.	PT	Less-Advanced	5.4.2.	2028	2028	Rescheduled
TRA-N-0729	Interconnection ES-PT (3rd IP) - 2nd phase	Enagás Transporte, S.A.U	ES	Less-Advanced	5.4.2.	2028	2028	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0168	700	86	4
TRA-N-0283	700	162	-
TRA-N-0284	-	-	12
TRA-N-0285	500	67	-
TRA-N-0729	800	307	-
TRA-N-0729	750	90	-
TRA-N-0729	750	30	-
TRA-N-0729	750	28	-
TRA-N-0729	600	170	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0168	Enagás Transporte, S.A.U	VIP IBERICO	2024	70	70
TRA-N-0283	REN Gasodutos, S.A.	VIP IBERICO	2024	85	70
TRA-N-0284	REN Gasodutos, S.A.	VIP IBERICO	2028	22	27
TRA-N-0285	REN Gasodutos, S.A.	VIP IBERICO	2028	32	29
TRA-N-0729	Enagás Transporte, S.A.U	VIP IBERICO	2028	72	72

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-168	TRA-N-283	TRA-N-729	TRA-N-285	TRA-N-284
CAPEX [mln. EUR]	771.3	74.8	115.0	510.5	49.0	22.0
Range CAPEX		0%	15%	0%	15%	15%
OPEX [mln. EUR/y]	13.46	1.40	1.83	8.80	0.77	0.66

Description of costs and range [Promoter]

The first phase of the 3rd Interconnection Portugal – Spain is a pipeline with 162 km from the existing junction station JCT 13200-Celorico da Beira, in Guarda, developing to the North to Vale de Frades (in the Portuguese/Spanish border) and into Spain, to Zamora, with a length of 86 km and reinforcements in the compressor station of Zamora.
The second phase of the 3rd Interconnection Portugal – Spain consists of several reinforcements both in Portugal and Spain:

1. PT – a new compressor station in Cantanhede (TRA-N-284) and a duplication of a pipeline with 67 km from Cantanhade to Mangualde (TRA-N-285);
2. ES – the new infrastructures (TRA-N-727) includes: Guitiriz – Lugo pipeline (28 Km); Lugo - Villafranca del Bierzo pipeline (90 Km); Villafranca del Bierzo – Castropodame pipeline (30 Km); Castropodame – Zamora pipeline (170 Km); and Zamora - La Barbolla – Adradas pipeline (307 Km).

In Portugal, the pipeline TRA-N-283 will have five intermediate junction stations and a Custody Transfer Station (CTS) in Vale de Frades. The project cost's calculation consider the basic engineering design studies (first phase), the pre-feasibility studies (second phase) and the historical cost data available in REN Gasodutos (Portuguese Promoter). Also based on historical values and based on the procurement procedures, a 15% range is usually considered in order to account for the uncertainty associated to price changes of the materials, equipment's and civil works. Portuguese Regulator (ERSE) has validated the costs presented in the National TYNDPs and they are lower than the reference costs presented in ACER Unit Investment Costs Report. The calculation of OPEX values took in consideration the operational historical data of REN Gasodutos, promoter that operates the Portuguese NG network since 1997, and which is part of the Juran - Gas Transmission Benchmark Initiative (GTBI), since 2012. Cost estimates for projects TRA-N-284 and TRA-N-285 follow the same procedure.

In Spain, a standard cost methodology is in force in Spain to provide an incentive to the efficient investment in transmission assets, and which are used for the calculation of the costs added to the Regulatory Asset Base (RAB). The above information is further explained in the Royal-Decree 326/2008.
The standard unit investment values in Spain have been calculated by the CNMC, at the Ministry's request. For the calculation of these values, historical costs and projections have been taken into account. The CNMC has all the information relative to their calculation, including the inputs related to all historical investments in Spain, and the methodology applied, which was developed by the CNMC itself. The final values represent the expected average cost of the infrastructures to be developed in the future, whose technical design and operating conditions are adapted to the standards used in the Spanish national gas system. These values are unique for the entire national territory.
On Enagás' side, the costs reported for this project were determined through a bottom-up methodology (i.e. based on own estimates), which were in line with (very close, but not identical, to) the standard unit costs approved by the Ministry.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group slightly **improves diversification of entry points** (LICD indicator) in Portugal and Spain increasing capacity at the existing interconnection between the two countries. In Advanced infrastructure level the project **reduces the dependence from LNG** in Portugal by 4% (on average) in 2025 and 2030.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Portugal from 2025 in all scenarios in peak day situation. Thanks to the project realisation, Portugal becomes more resilient to climatic stress. In the Advanced infrastructure level Portugal improves the remaining flexibility in 2-weeks cold spell while France and Spain see their remaining flexibility slightly improving in 2040.
In case of disruption of the single largest infrastructure (SLID) in Portugal that is, thanks to the project realisation, the interconnection between Spain and Portugal (VIP IBERICO), **the potential demand curtailment** of Portugal is halved. The uncovered demand remains higher than 10% in most of the scenarios even after the project realisation.
In case of disruption of Algerian supply, in the Advanced infrastructure level, the project group **slightly mitigates the risk of demand curtailment** in Spain. In Advanced, Portugal improves the capacity of the network through a new compressor station in Carregado. This new compressor station improves the send out capacity from the Sines LNG Terminal. Therefore, in Advanced infrastructure level Portugal is able to send gas to Spain to help to mitigate slightly the risk of demand curtailment. The project allows further cooperation among Spain and Portugal. The projects allow further cooperation among Spain and Portugal.

> **Market integration:**

The **bidirectionality is improved** by 49% (from 43% to 92%). The project group creates more capacity from Portugal to Spain balancing both sides of the interconnection.

Fuel Switch benefits explained [Promoter]

Under the new European energy policy framework to facilitate a clean energy transition, natural gas can meet growing power-generation needs, as reducing greenhouse gas emissions levels against other carbon intensity fossil fuels as oil and coal by more environmentally friendly energy sources.
In this context, the Project Group Fuel Switch benefits and benefits related to CO_2 savings are associated with the decarbonisation targets for 2030 and beyond (up to 2050), as defined by the European Climate and Energy package and detailed in the National Climate and Energy Plans, for both Portugal and Spain. Specifically, the Project Group allows operational integration between the UGS facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems and increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation. It also allows a higher rate for oil and coal replacement in the industrial sector."
The fuel Switch benefits and CO_2 savings include:

1. In the Electricity sector, the shutdown of the existing coal power plants, (15 units in Spain and 2 units in Portugal), 11.700 MW in total. The coal phase-out has an impact on the gas demand due to the partial substitution of coal with gas, according to the data collection process for the TYNDP 2018, as has been simulated for 2025 and 2030;
2. In the Industrial sector, there has been a trend for switching the replacement other fossil fuels (more expensive and more pollutant) with natural gas has been a trend in the past that is expected to continue in the coming years;
3. In the Residential and Commercial sector, there are also benefits from switching to NG, as opposed to continue the consumption of diesel, propane or butane (household bottles). Since 2000's, residential and commercial gas demand has been driven by fuel switching beginning in the main cities and then evolving progressively on smaller towns. This trend will continue in the coming years as shown by the EUROSTAT 2016 data for Portugal and Spain;
4. In the Transportation sector, some fuel switching from diesel to compressed NGV has been accomplished already while a future increase is expected in this sector addressing logistic services, and public transportation in cities.

Depending on the scenario and the assessment year main benefits from Fuel switching and CO_2 emission savings will mainly come either from the electricity or the industrial sector. Project Group will facilitate a clean energy transition and will increase the VIP capacity and the Security of Supply for Portugal and Spain under some supply stress scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5162	5004	-158				5162	5000	-162	5104	5000	-104												
Spain	7129	6518	-611	6886	6250	-636	7046	6025	-1022	6870	5827	-1043	6416	5339	-1077	6918	5881	-1038	7270	6282	-988	7069	6050	-1019
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Portugal	36%	61%	25%	47%	74%	27%	28%	73%	45%	34%	80%	47%	88%	100%	12%	49%	100%	50%	44%	94%	50%	50%	100%	50%
Remaining Flexibility Peak day (%)																								
Poland										80%	81%	1%												
Portugal	23%	45%	22%	24%	46%	22%	9%	47%	38%	12%	51%	39%	63%	100%	37%	39%	87%	47%				40%	87%	47%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	19%	-18%	37%	19%	-19%	44%	28%	-16%	42%	25%	-16%	17%	0%	-17%	26%	6%	-20%	31%	11%	-20%	26%	6%	-20%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Portugal	33%	28%	-5%	22%	18%	-4%	29%	24%	-5%	19%	15%	-4%												
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5213	5000	-213				5174	5000	-174	5104	5000	-104												
Spain	6050	5585	-465	5802	5327	-476	5964	5189	-776	5787	5004	-783	5365	4575	-790	5834	5053	-781	6200	5438	-762	5987	5213	-774
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Spain																			6%	5%	-1%			
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Spain																			14%	13%	-1%	3%	2%	-1%
Remaining Flexibility 2-Week Cold Spell (%)																								
France																			60%	61%	1%			
Portugal	69%	94%	25%	83%	100%	17%	58%	100%	42%	65%	100%	35%				83%	100%	17%	77%	100%	23%	84%	100%	16%
Spain				69%	70%	1%										41%	42%	1%	21%	22%	1%	39%	40%	1%
Remaining Flexibility Peak day (%)																								
Portugal	52%	74%	22%	53%	75%	22%	34%	73%	38%	38%	77%	39%				71%	100%	29%	65%	100%	35%	72%	100%	28%
Spain													66%	68%	3%							25%	25%	1%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	16%	-22%	37%	15%	-22%	44%	6%	-38%	42%	3%	-39%	17%	0%	-17%	26%	0%	-26%	31%	0%	-31%	26%	0%	-26%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.8	1.8	1.8	3.1	3.1	2.8
	2 Weeks	0.0	0.0	0.0	0.0	5.3	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	11.0	9.6	8.1	10.2	8.8	7.3
	Fuel Switch savings	1.9	5.5	4.2	1.9	5.1	3.9

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.8	1.8	1.8	1.8	0.1	0.1	1.8	1.8
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	11.0	8.1	11.0	8.1	11.0	6.6	11.0	8.1
Fuel Switch savings	5.5	1.9	5.5	1.9	5.5	1.5	5.5	1.9

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.1	2.8	3.1	2.8	0.5	0.1	3.1	2.8
2 Weeks	5.3	0.0	5.3	0.0	6.5	0.0	5.3	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	10.2	7.3	10.2	7.3	10.3	6.1	10.2	7.3
Fuel Switch savings	5.1	1.9	5.1	1.9	5.1	1.4	5.1	1.9

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0168	Pipeline	86.000 m length x DN 700 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0168	Compressor station	Project to be developed in existing Zamora CS	No environmentally sensitive area affected
TRA-N-0283	Pipeline	162.000 meter length x DN 700 Width of right of way: 10 m Width of construction right of way: 20 m	> 700 meters of Alto Douro Vinhateiro (ADV) and its Special Protected Zone (ZEP), and some crossings (parts 8 and 9) of Rede Natura 2000 (PTCON0021) > Rio Sabor and Maçãs, Special Protected Zone (ZEP) (PTZPE0037) - Rio Sabor and Maçãs, and Important Bird Area (IBA) (PT004) - Rio Sabor and Maçãs > Rede Natura 2000 (PTCON0023) > Consequently, on the 5th of February 2018, the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline.
TRA-N-0284	Compressor station	NA	NA
TRA-N-0285	Pipeline	67.000 m length x DN500 Width of right of way: 10 m (partially already exists, duplication line) Width of construction right of way: 20 m (partially already exists)	NA
TRA-N-0729	Pipeline	307.000 m length x DN 800 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	90.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	30.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	28.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	170.000 m length x DN 600 Width of construction right of way: 20 m. Width of right of way: 4 m	NA

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Impacts referred in previous column for Project TRA-N-283 and detailed in the EIA published by Portuguese Environmental Authority (APA)	Mitigation measures foreseen in the Environmental Impact Assessment (EIA)	Yes, but not relevant (included in the 15% margin for CAPEX and OPEX)	Included in the 15% margin for CAPEX and OPEX.

Environmental Impact explained [Promoter]

The environmental permitting of the pipeline TRA-N-0283 (first phase of the project) in Portugal started on the 12th of February of 2016. Unfortunately, on the 5th of February 2018 the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline TRA-N-0283 in Portugal. As a result, it will be necessary to adjust the initial route, maintaining the same point of interconnection with Spain, meaning that the environmental permitting process has to restart.

At this stage, no environmental studies have been performed for the second phase of the Project (project TRA-N-0729, TRA-N-0284 and TRA-N-0285). During the development phase, Enagás and REN Gasodutos will perform the corresponding studies to determine the environmental impact in detail and the associated preventive, corrective and compensatory measures required to guarantee the respect for the affected environment.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Together with Project Group WEST_04, project TRA-N-320 Carregado Compressor Station (enhancer project) will be commissioned in order to increase VIP capacity between Portugal and Spain through the 3rd interconnection, meaning that Portugal would be able to export gas to Spain in an emergency scenario, thus allowing further cooperation between Spain and Portugal.

Project Group increases the security of supply in the Portuguese gas system and guarantees the fulfilment of the N-1 criterion of the Regulation Nº 2017/1938. It also facilitates the integration of the Portuguese market at Iberian and European level, improving competition and providing shippers with access to alternative balancing gas. Portuguese NG system has higher diversification indexes (HHI) measured both on capacity and on supply sources, than most of the European countries.

This Project Group will contribute to the implementation of the internal energy market and it will also increase NG market liquidity between Portugal and Spain systems, by providing new infrastructure access alternatives to market players in the Iberian Peninsula; reinforce the security of supply in case of failure in any one of the two gas systems, given the total reversibility of the new interconnection; allow operational integration between the underground storage facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems; and increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation.

The Project Group provides a significant increase in the interconnection capacity between Portugal and Spain, firm and bidirectional. The contribution of this project to the potential market integration of the Portuguese and Spanish markets is however not captured by the modest results of the project in ENTSOG's modelling. The capacity provided by Project Group, would nonetheless be fundamental for the market integration of the Portuguese and Spanish markets, playing an enabling role, in case of an eventual market merger between the two countries.

F. Useful Links

Enagas Project link:
https://www.enagas.es/enagas/en/MarcoRegulatorio/Proyectos_Interes_Comun

REN Project link:
https://www.ren.pt/en-GB/o_que_fazemos/projetos_interesse_2017

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_05

Reasons for grouping [ENTSOG]

The project group represents first and second phase of the 3rd interconnection between Spain and Portugal. The Compressor Station project (TRA-N-320) is considered an enhancer of the interconnection. The group includes the two sides of the investment.

Objective of the project(s) in the group [Promoter]

From a European perspective, the 3rd IP Portugal-Spain project aims at contributing to integrate the European systems and, therefore, an internal gas market development. This project linked and supplemented with the full development of the Iberian-French Corridor, aims at ensuring that no Member State is isolated from the European network, as well as, reinforce the security of supply in any system, increasing the solidarity between countries in all of Europe.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0168	Interconnection ES-PT (3rd IP) - 1st phase	Enagás Transporte, S.A.U	ES	Less-Advanced	5.4.1	2024	2024	Rescheduled
TRA-N-0283	3rd IP between Portugal and Spain (pipeline Celorico-Spanish border)	REN - Gasodutos, S.A.	PT	Advanced	5.4.1	2024	2024	Rescheduled
TRA-N-0284	3rd IP between Portugal and Spain (Compressor Station)	REN - Gasodutos, S.A.	PT	Less-Advanced	5.4.2.	2028	2028	Rescheduled
TRA-N-0285	3rd IP between Portugal and Spain (pipeline Cantanhede-Mangualde)	REN - Gasodutos, S.A.	PT	Less-Advanced	5.4.2.	2028	2028	Rescheduled
TRA-N-0729	Interconnection ES-PT (3rd IP) - 2nd phase	Enagás Transporte, S.A.U	ES	Less-Advanced	5.4.2.	2028	2028	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0168	700	86	4
TRA-N-0283	700	162	-
TRA-N-0284	-	-	12
TRA-N-0285	500	67	-
TRA-N-0729	800	307	-
TRA-N-0729	750	90	-
TRA-N-0729	750	30	-
TRA-N-0729	750	28	-
TRA-N-0729	600	170	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0168	Enagás Transporte, S.A.U	VIP IBERICO	2024	70	70
TRA-N-0283	REN Gasodutos, S.A.	VIP IBERICO	2024	85	70
TRA-N-0284	REN Gasodutos, S.A.	VIP IBERICO	2028	22	27
TRA-N-0285	REN Gasodutos, S.A.	VIP IBERICO	2028	32	29
TRA-N-0729	Enagás Transporte, S.A.U	VIP IBERICO	2028	72	72

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-168	TRA-N-283	TRA-N-729	TRA-N-285	TRA-N-284
CAPEX [mln. EUR]	771.3	74.8	115.0	510.5	49.0	22.0
Range CAPEX		0%	15%	0%	15%	15%
OPEX [mln. EUR/y]	13.46	1.40	1.83	8.80	0.77	0.66

Description of costs and range [Promoter]

The first phase of the 3rd Interconnection Portugal – Spain is a pipeline with 162 km from the existing junction station JCT 13200-Celorico da Beira, in Guarda, developing to the North to Vale de Frades (in the Portuguese/Spanish border) and into Spain, to Zamora, with a length of 86 km and reinforcements in the compressor station of Zamora.
The second phase of the 3rd Interconnection Portugal – Spain consists of several reinforcements both in Portugal and Spain:

1. PT – a new compressor station in Cantanhede (TRA-N-284) and a duplication of a pipeline with 67 km from Cantanhade to Mangualde (TRA-N-285);
2. ES – the new infrastructures (TRA-N-727) includes: Guitiriz – Lugo pipeline (28 Km); Lugo - Villafranca del Bierzo pipeline (90 Km); Villafranca del Bierzo – Castropodame pipeline (30 Km); Castropodame – Zamora pipeline (170 Km); and Zamora - La Barbolla – Adradas pipeline (307 Km).

In Portugal, the pipeline TRA-N-283 will have five intermediate junction stations and a Custody Transfer Station (CTS) in Vale de Frades. The project cost's calculation consider the basic engineering design studies (first phase), the pre-feasibility studies (second phase) and the historical cost data available in REN Gasodutos (Portuguese Promoter). Also based on historical values and based on the procurement procedures, a 15% range is usually considered in order to account for the uncertainty associated to price changes of the materials, equipment's and civil works. Portuguese Regulator (ERSE) has validated the costs presented in the National TYNDPs and they are lower than the reference costs presented in ACER Unit Investment Costs Report. The calculation of OPEX values took in consideration the operational historical data of REN Gasodutos, promoter that operates the Portuguese NG network since 1997, and which is part of the Juran - Gas Transmission Benchmark Initiative (GTBI), since 2012. Cost estimates for projects TRA-N-284 and TRA-N-285 follow the same procedure.

In Spain, a standard cost methodology is in force in Spain to provide an incentive to the efficient investment in transmission assets, and which are used for the calculation of the costs added to the Regulatory Asset Base (RAB). The above information is further explained in the Royal-Decree 326/2008.
The standard unit investment values in Spain have been calculated by the CNMC, at the Ministry's request. For the calculation of these values, historical costs and projections have been taken into account. The CNMC has all the information relative to their calculation, including the inputs related to all historical investments in Spain, and the methodology applied, which was developed by the CNMC itself. The final values represent the expected average cost of the infrastructures to be developed in the future, whose technical design and operating conditions are adapted to the standards used in the Spanish national gas system. These values are unique for the entire national territory.
On Enagás' side, the costs reported for this project were determined through a bottom-up methodology (i.e. based on own estimates), which were in line with (very close, but not identical, to) the standard unit costs approved by the Ministry.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group slightly **improves diversification of entry points** (LICD indicator) in Portugal and Spain increasing capacity at the existing interconnection between the two countries. In Advanced infrastructure level the project **reduces the dependence from LNG** in Portugal by 4% (on average) in 2025 and 2030.

> **Security of Supply:**

The project group **increases the remaining flexibility** in Portugal from 2025 in all scenarios in peak day situation. Thanks to the project realisation, Portugal becomes more resilient to climatic stress. In the Advanced infrastructure level Portugal improves the remaining flexibility in 2-weeks cold spell while France and Spain see their remaining flexibility slightly improving in 2040.
In case of disruption of the single largest infrastructure (SLID) in Portugal that is, thanks to the project realisation, the interconnection between Spain and Portugal (VIP IBERICO), **the potential demand curtailment** of Portugal is halved. The uncovered demand remains higher than 10% in most of the scenarios even after the project realisation.
In case of disruption of Algerian supply, in the Advanced infrastructure level, the project group **slightly mitigates the risk of demand curtailment** in Spain. In Advanced, Portugal improves the capacity of the network through a new compressor station in Carregado. This new compressor station improves the send out capacity from the Sines LNG Terminal. Therefore, in Advanced infrastructure level Portugal is able to send gas to Spain to help to mitigate slightly the risk of demand curtailment. The project allows further cooperation among Spain and Portugal. The projects allow further cooperation among Spain and Portugal.

> **Market integration:**

The **bidirectionality is improved** by 49% (from 43% to 92%). The project group creates more capacity from Portugal to Spain balancing both sides of the interconnection.

Fuel Switch benefits explained [Promoter]

Under the new European energy policy framework to facilitate a clean energy transition, natural gas can meet growing power-generation needs, as reducing greenhouse gas emissions levels against other carbon intensity fossil fuels as oil and coal by more environmentally friendly energy sources.
In this context, the Project Group Fuel Switch benefits and benefits related to CO_2 savings are associated with the decarbonisation targets for 2030 and beyond (up to 2050), as defined by the European Climate and Energy package and detailed in the National Climate and Energy Plans, for both Portugal and Spain. Specifically, the Project Group allows operational integration between the UGS facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems and increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation. It also allows a higher rate for oil and coal replacement in the industrial sector."
The fuel Switch benefits and CO_2 savings include:

1. In the Electricity sector, the shutdown of the existing coal power plants, (15 units in Spain and 2 units in Portugal), 11.700 MW in total. The coal phase-out has an impact on the gas demand due to the partial substitution of coal with gas, according to the data collection process for the TYNDP 2018, as has been simulated for 2025 and 2030;
2. In the Industrial sector, there has been a trend for switching the replacement other fossil fuels (more expensive and more pollutant) with natural gas has been a trend in the past that is expected to continue in the coming years;
3. In the Residential and Commercial sector, there are also benefits from switching to NG, as opposed to continue the consumption of diesel, propane or butane (household bottles). Since 2000's, residential and commercial gas demand has been driven by fuel switching beginning in the main cities and then evolving progressively on smaller towns. This trend will continue in the coming years as shown by the EUROSTAT 2016 data for Portugal and Spain;
4. In the Transportation sector, some fuel switching from diesel to compressed NGV has been accomplished already while a future increase is expected in this sector addressing logistic services, and public transportation in cities.

Depending on the scenario and the assessment year main benefits from Fuel switching and CO_2 emission savings will mainly come either from the electricity or the industrial sector. Project Group will facilitate a clean energy transition and will increase the VIP capacity and the Security of Supply for Portugal and Spain under some supply stress scenarios.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5162	5004	-158				5162	5000	-162	5104	5000	-104												
Spain	7129	6518	-611	6886	6250	-636	7046	6025	-1022	6870	5827	-1043	6416	5339	-1077	6918	5881	-1038	7270	6282	-988	7069	6050	-1019
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Portugal	36%	61%	25%	47%	74%	27%	28%	73%	45%	34%	80%	47%	88%	100%	12%	49%	100%	50%	44%	94%	50%	50%	100%	50%
Remaining Flexibility Peak day (%)																								
Poland										80%	81%	1%												
Portugal	23%	45%	22%	24%	46%	22%	9%	47%	38%	12%	51%	39%	63%	100%	37%	39%	87%	47%				40%	87%	47%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	19%	-18%	37%	19%	-19%	44%	28%	-16%	42%	25%	-16%	17%	0%	-17%	26%	6%	-20%	31%	11%	-20%	26%	6%	-20%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%

ADVANCED Infrastructure Level

	2025			2030												2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Portugal	33%	28%	-5%	22%	18%	-4%	29%	24%	-5%	19%	15%	-4%												
LNG and Interconnection Capacity Diversification (LICD)																								
Portugal	5213	5000	-213				5174	5000	-174	5104	5000	-104												
Spain	6050	5585	-465	5802	5327	-476	5964	5189	-776	5787	5004	-783	5365	4575	-790	5834	5053	-781	6200	5438	-762	5987	5213	-774
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Spain																			6%	5%	-1%			
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Spain																			14%	13%	-1%	3%	2%	-1%
Remaining Flexibility 2-Week Cold Spell (%)																								
France																			60%	61%	1%			
Portugal	69%	94%	25%	83%	100%	17%	58%	100%	42%	65%	100%	35%				83%	100%	17%	77%	100%	23%	84%	100%	16%
Spain				69%	70%	1%										41%	42%	1%	21%	22%	1%	39%	40%	1%
Remaining Flexibility Peak day (%)																								
Portugal	52%	74%	22%	53%	75%	22%	34%	73%	38%	38%	77%	39%				71%	100%	29%	65%	100%	35%	72%	100%	28%
Spain													66%	68%	3%							25%	25%	1%
Single Largest Infrastructure Disruption (SLID)-Portugal																								
Portugal	38%	16%	-22%	37%	15%	-22%	44%	6%	-38%	42%	3%	-39%	17%	0%	-17%	26%	0%	-26%	31%	0%	-31%	26%	0%	-26%
Market Integration																								
Bi-directionality Balance																								
VIP IBERICO				43%	92%	49%				43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%	43%	100%	57%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	0.0	0.0	0.0	0.0	0.0	0.0
	Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	1.8	1.8	1.8	3.1	3.1	2.8
	2 Weeks	0.0	0.0	0.0	0.0	5.3	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	11.0	9.6	8.1	10.2	8.8	7.3
	Fuel Switch savings	1.9	5.5	4.2	1.9	5.1	3.9

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	1.8	1.8	1.8	1.8	0.1	0.1	1.8	1.8
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	11.0	8.1	11.0	8.1	11.0	6.6	11.0	8.1
Fuel Switch savings	5.5	1.9	5.5	1.9	5.5	1.5	5.5	1.9

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.1	2.8	3.1	2.8	0.5	0.1	3.1	2.8
2 Weeks	5.3	0.0	5.3	0.0	6.5	0.0	5.3	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	10.2	7.3	10.2	7.3	10.3	6.1	10.2	7.3
Fuel Switch savings	5.1	1.9	5.1	1.9	5.1	1.4	5.1	1.9

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0168	Pipeline	86.000 m length x DN 700 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0168	Compressor station	Project to be developed in existing Zamora CS	No environmentally sensitive area affected
TRA-N-0283	Pipeline	162.000 meter length x DN 700 Width of right of way: 10 m Width of construction right of way: 20 m	> 700 meters of Alto Douro Vinhateiro (ADV) and its Special Protected Zone (ZEP), and some crossings (parts 8 and 9) of Rede Natura 2000 (PTCON0021) > Rio Sabor and Maçãs, Special Protected Zone (ZEP) (PTZPE0037) - Rio Sabor and Maçãs, and Important Bird Area (IBA) (PT004) - Rio Sabor and Maçãs > Rede Natura 2000 (PTCON0023) > Consequently, on the 5th of February 2018, the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline.
TRA-N-0284	Compressor station	NA	NA
TRA-N-0285	Pipeline	67.000 m length x DN500 Width of right of way: 10 m (partially already exists, duplication line) Width of construction right of way: 20 m (partially already exists)	NA
TRA-N-0729	Pipeline	307.000 m length x DN 800 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	90.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	30.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	28.000 m length x DN 750 Width of construction right of way: 22 m. Width of right of way: 4 m	NA
TRA-N-0729	Pipeline	170.000 m length x DN 600 Width of construction right of way: 20 m. Width of right of way: 4 m	NA

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Impacts referred in previous column for Project TRA-N-283 and detailed in the EIA published by Portuguese Environmental Authority (APA)	Mitigation measures foreseen in the Environmental Impact Assessment (EIA)	Yes, but not relevant (included in the 15% margin for CAPEX and OPEX)	Included in the 15% margin for CAPEX and OPEX.

Environmental Impact explained [Promoter]

The environmental permitting of the pipeline TRA-N-0283 (first phase of the project) in Portugal started on the 12th of February of 2016. Unfortunately, on the 5th of February 2018 the Portuguese Environmental Authority (APA) issued the Environmental Impact Declaration (EID) with an unfavourable decision regarding the route proposed for the pipeline TRA-N-0283 in Portugal. As a result, it will be necessary to adjust the initial route, maintaining the same point of interconnection with Spain, meaning that the environmental permitting process has to restart.

At this stage, no environmental studies have been performed for the second phase of the Project (project TRA-N-0729, TRA-N-0284 and TRA-N-0285). During the development phase, Enagás and REN Gasodutos will perform the corresponding studies to determine the environmental impact in detail and the associated preventive, corrective and compensatory measures required to guarantee the respect for the affected environment.

E. Other Benefits

Missing benefits are all benefits of a project which **may be not captured** by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

Together with Project Group WEST_04, project TRA-N-320 Carregado Compressor Station (enhancer project) will be commissioned in order to increase VIP capacity between Portugal and Spain through the 3rd interconnection, meaning that Portugal would be able to export gas to Spain in an emergency scenario, thus allowing further cooperation between Spain and Portugal.

Project Group increases the security of supply in the Portuguese gas system and guarantees the fulfilment of the N-1 criterion of the Regulation Nº 2017/1938. It also facilitates the integration of the Portuguese market at Iberian and European level, improving competition and providing shippers with access to alternative balancing gas. Portuguese NG system has higher diversification indexes (HHI) measured both on capacity and on supply sources, than most of the European countries.

This Project Group will contribute to the implementation of the internal energy market and it will also increase NG market liquidity between Portugal and Spain systems, by providing new infrastructure access alternatives to market players in the Iberian Peninsula; reinforce the security of supply in case of failure in any one of the two gas systems, given the total reversibility of the new interconnection; allow operational integration between the underground storage facilities of Carriço (Portugal) and Yela (Spain), by increasing storage capacity accessibility between both gas systems; and increase the flexibility and support of gas infrastructure to gas fired power generation in both countries, as opposed to coal-fired power generation.

The Project Group provides a significant increase in the interconnection capacity between Portugal and Spain, firm and bidirectional. The contribution of this project to the potential market integration of the Portuguese and Spanish markets is however not captured by the modest results of the project in ENTSOG's modelling. The capacity provided by Project Group, would nonetheless be fundamental for the market integration of the Portuguese and Spanish markets, playing an enabling role, in case of an eventual market merger between the two countries.

F. Useful Links

Enagas Project link:
https://www.enagas.es/enagas/en/MarcoRegulatorio/Proyectos_Interes_Comun

REN Project link:
https://www.ren.pt/en-GB/o_que_fazemos/projetos_interesse_2017

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_06

Reasons for grouping [ENTSOG]

The project group represents the third interconnection between France and Spain on the eastern part of the Pyrenees. It includes the two sides of the investment.

Objective of the project(s) in the group [Promoter]

STEP will create firm capacities on the Spanish side, and non-firm capacities on the French side.

STEP project aims at contributing to achieve the pillars of the internal energy market: sustainability, security of supply, competition and market integration. The existing interconnection capacity between France and Spain as a percentage of total demand is much lower than the European average, and there is a sustained price differential between Spain and NW Europe. There is therefore potential for improving the situation for the Iberian Peninsula particularly but also for the French and European markets, and STEP aims at contributing to achieving this.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-161	South Transit East Pyrenees (STEP) - ENAGAS	Enagás Transporte, S.A.U.	ES	Advanced	5.5.1	2022	2022	Rescheduled
TRA-N-252	South Transit East Pyrenees (STEP) - TEREGA	TEREGA	FR	Advanced	5.5.1	2022	2022	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-161	900	79	-
TRA-N-161	900	28	-
TRA-N-161	-	-	36
TRA-N-252	900	120	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-161	Enagás Transporte, S.A.U.	VIP PIRINEOS	2022	110[2]	120[3]
TRA-N-252	TEREGA	VIP PIRINEOS	2022	0[4]	0[5]

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

[2] Plus 70 GWh/d non-firm entry capacity in Spain.

[3] Plus 110 GWh/d non-firm exit capacity in Spain.

[4] Plus 230 GWh/d non-firm entry capacity in France.

[5] Plus 180 GWh/d non-firm exit capacity in France.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[6]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-161	TRA-N-252
CAPEX [mln. EUR]	442	152	290
Range CAPEX		0%	0%
OPEX [mln. EUR/y]	7.25	4.25	3

Description of costs and range [Promoter]

Teréga: Teréga uses a method which has been in the past audited and approved by the French regulator for energy networks (Commission de Régulation de l'Energie – CRE). During the conceptual studies, this method allows Teréga to obtain a provisional budget of +/- 10%. Teréga also implements a number of measures to improve the precision of its cost estimates, such as a budgetary structure or a cross-projects database allowing for comparisons.

Enagás: A standard cost methodology is in force in Spain to provide an incentive to the efficient investment in transmission assets, and which are used for the calculation of the costs added to the Regulatory Asset Base (RAB). This information is further explained in the Royal-Decree 326/2008.

The standard unit investment values in Spain have been calculated by the CNMC, at the Ministry's request. For the calculation of these values, historical costs and projections have been considered. The CNMC has all the information relative to their calculation, including the inputs related to all historical investments in Spain, and the methodology applied, which was developed by the CNMC itself. The final values represent the expected average cost of the infrastructures to be developed in the future, whose technical design and operating conditions are adapted to the standards used in the Spanish national gas system. These values are unique for the entire national territory.

On Enagás' side, the costs reported for this project were determined through a bottom-up methodology (i.e. based on own estimates), which were in line with (very close, but not identical, to) the standard unit costs approved by the Ministry.

[6] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

Reason for NOT modelling the project group

The capacity increment of project TRA-N-161 has not been matched on the other side of the interconnector by project TRA-N-252 (firm capacity increment submission is 0). As a consequence, after the application of the lesser-of rule, the resulted firm capacity increment of the interconnector is 0 so the project group has not been modelled by ENTSOG as part of the PS-CBA modelling process.

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-161	Pipeline	79.000 meter length x DN 900 Width of construction right of way: 24 m Width of right of way: 4 m	> Special area of conservation (SAC) Riu Fluviá > Special area of conservation (SAC) Rieras de Xucla I Riudelleques > Special area of conservation (SAC) Riberas del Baix Ter > Special area of conservation (SAC) Estany de Sils- Riera de Santa Coloma > Special area of conservation (SAC) Riu i Estanys de Torderá > Special area of conservation (SAC) Riu Llémena
TRA-N-161	Pipeline	28.000 meter length x DN900 Width of construction right of way: 24 m Width of right of way: 4 m	> Special area of conservation (SAC) Riu Llobregat d'Empordà > Special area of conservation (SAC) and Special protection area (SPA) Alta Garrotxa-Massís de les Salines
TRA-N-161	Compressor station	10.000 m^2	No environmentally sensitive area affected
TRA-N-252	Pipeline	Approximate area of study area 3000 km^2 Approximate length of the project: 120,000 m Width of construction track: 26 m Width of the service band: 10 m	In the study area, all the existing regulatory environmental protection perimeters have been identified (Natura 2000, ZNIEFF, RAMSAR, APPB, EBC, ZPS , Natural Parks ...). On the passage option that will be selected, a 12-month biodiversity inventory will be carried out to identify all species of fauna and flora present.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA–N-161 (Martorell-Figueras Pipeline, North Section): Impact on riparian vegetation during construction phase in various rivers in approximately 450 meters length	Horizontal directional drilling in Riu Fluvia Specific restoration and revegetation project Environmental monitoring program	NA	
TRA–N–161 (Martorell-Figueras Pipeline, North Section): Impact on 450 meters length of mixed green oak-pine forest during construction phase.	Specific restoration and revegetation project Environmental monitoring program	NA	
TRA–N–161 (Martorell-Figueras Pipeline, North Section): Potential impact, during construction phase, on species related to rivers like Amphibians, Reptiles and Fish species (specifically Mountain Barbel and European Pond Terrapin) and Mammals like otters and greater horseshoe bat.	Environmental monitoring program Fauna management program Selecting appropriate time for construction works avoiding breading and growth period including crossing construction works in dry season.	NA	
TRA–N–161 (Figueras-French Border Pipeline, Martorell CS)	NA	NA	
TRA–N–252 (Barbaira-Spanish Border Pipeline)	NA	NA	

Environmental Impact explained [Promoter]

Information provided in previous table about Potential impacts on Environmentally Sensitive Area is only referred to Martorell-Figueras Pipeline, North Section, which has a favorable Environmental Impact Statement (EIS).

Regarding the rest of the projects of TRA-N-161 and TRA-N-252, such as Figueras-French Border Pipeline, Martorell CS and Barbaira-Spanish Border Pipeline, previous studies were performed to identify environmental conditions. These studies will complement the environmental impact assessments based on French and Spanish regulations, as well as European law requirements.

These environmental impact assessments will cover factors as biodiversity, soil, water, air, climate, cultural heritage, landscape impact and the interactions between them. These factors will be inventoried, prioritized, and then taken into account in the studies to specifically define the measures:

> Avoidance - Positioning of the route solutions on strong stakes free areas stakes, choice of adapted waterways crossing technics...
> Reduction - Work sequencing to accommodate protected species breeding periods, development of a mitigation tailored plan to the issues that will be implemented during the construction phase
> Compensation - Respect of a compensation plan developed in consultation with State services, chambers of agriculture, forest managers...

Impacts are then evaluated in detail for infrastructure construction phase, called temporary impacts, and for infrastructure operation phase, called sustainable impacts

Finally, associated costs are evaluated based on the finalized environmental assessment.

Therefore, at this stage, it is not possible to complete the previous table with all the required information

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

STEP provides a number of benefits in line with the specific criteria of TEN-E Regulation and of ACER's recommendations:
Security of supply: STEP would contribute to Security of Supply through:

1) providing additional capacity if the existing VIP Pirineos capacity was unavailable
2) reducing system costs when there is an Algerian pipeline import route disruption and/or Qatari LNG
3) allowing more gas from storage sites in Southern France to flow to Spain irrespective of a north-south congestion within France
4) allowing gas stored in Spanish LNG terminals to reach parts of the French market up to and including any south-north congestion

Competition: STEP would contribute to boosting the development of the French and Spanish hubs by improving their liquidity, currently lagging behind other European zones. This could lead to a higher degree of competition between retailers (the more liquid is a wholesale market, the easier it is for retailers to enter and compete) applying downward pressure on retail margins to the benefit of consumers.
Market integration: ENTSOG's TYNDP 2018 showed that, due to the lack of sufficient interconnection capacity

1) Should LNG prices rise, the Iberian Peninsula would face higher prices than the rest of Europe
2) The Iberian Peninsula does not have access to the same level of price diversification than most of the EU

STEP would contribute to bridging that gap by providing the infrastructure to integrate markets together and reducing physical isolation. This would lead to a reduction in gas prices and in electricity prices through access to cheaper gas sources and improve the liquidity of the Spanish and French market places by increasing flows and thus reducing transaction costs. This would help in reduce the wholesale market price difference.
Sustainability: The reduction in gas prices due to STEP would shift some production of electricity from fuel to gas-fired power plants, leading to a reduction in CO_2 emissions and improving air quality. STEP would also allow avoiding investment costs needed to reinforce and bypass the Perpignan Urban area.
Total benefits of the STEP project have been estimated at 955 Mln EUR on average across scenarios.

F. Useful Links

Terega Project link:
https://www.step.terega.fr/
Enagás Project link:
https://www.enagas.es/enagas/en/MarcoRegulatorio/Proyectos_Interes_Comun

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_08

Reasons for grouping [ENTSOG]

The project group is composed by one project consisting of a bidirectional gas pipeline between Malta and Italy with the purpose to mainly enable gas flows from Italy to Malta and end isolation of Malta. The project is considered a "gasification" project allowing to bring gas in an area not yet (fully) reached by gas.

Objective of the project(s) in the group [Promoter]

"Melita TransGas Pipeline" (MTGP) consists in a strategic gas interconnection project between Malta and Italy, which aims at contributing to the integration of the gas market and improving the security of energy supply. Besides ending Malta's isolation from the European gas network, the MTGP aims at reducing the cost of gas supply, increasing energy security of the Maltese economy and reducing the greenhouse gas emissions related to the current LNG supply through a Floating Storage Unit, which is considered an intermediate solution until the pipeline interconnection is implemented.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0031	Melita TransGas Pipeline	Melita TransGas	MT	Advanced	5.19	2024	2024	Ahead of schedule

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0031	560	159	0

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0031	Melita TransGas Co. Ltd.	Delimara (Malta) to Sicily (Italy) Interconnection	2024	56	56

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-31
CAPEX [mln. EUR]	342	342
Range CAPEX		30%
OPEX [mln. EUR/y]	2	2

Description of costs and range [Promoter]

The current CAPEX and OPEX estimation are given by the Basic Design report completed in June 2017 and will be updated and refined with a higher accuracy (±15%) by end of 2019 as part of the FEED activities currently ongoing.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Gasification Benefits explained [ENTSOG]

> **Competition:**

The project **increases the number of supply source access** Malta has access to. Thanks to the interconnection with Italy Malta can access to the different sources (Algeria, Libya, LNG, Russia and Norway).

> **Security of Supply:**

While not shown in the table in section C.2. the project group **increases the remaining flexibility** mainly of Malta in all scenarios in peak day and 2-week cold spell and slightly also in Italy. Benefits shown in the tables below concerning other countries than Malta and Italy are not linked to the project.

> **Market integration:**

MTG Pipeline will eliminate Malta's isolation from the EU Gas Network and will thus contribute to the **integration of the Internal Energy Market**; the interconnection will contribute to the overall flexibility and interoperability of the system as it will offer future possibility of reverse flows capacity.

Fuel Switch benefits explained [Promoter]

The monetised benefits of the project in terms of Fuel Switch savings, amounts to c.a. 162 Mln EUR/y. The estimation takes into consideration the difference in the fuel bill between the baseline scenario and the project scenario which considers the development of the natural gas pipeline between Malta and Sicily (MTGP). The fuel bill is derived through an estimate of demand which is mainly driven by the power generation sector distinguishing between the local generation mix and demand met through the cable interconnector. In both the baseline and project scenario, the fuel cost has been based on the forecasted fuel prices from TYNDP18 Sustainable Transition Scenario which is considered the most relevant scenario for the purpose of this analysis.
MTGP is also expected to lead to additional economic benefits in terms of reduction in CO_2 emissions, of which monetization has been estimated to c.a. 20.6 Mln EUR/y. This value has been derived through an assessment of the pollutants in both the baseline and project scenario coupled with the shadow price of carbon emissions. The latter variables are also based on TYNDP18 Scenario Report specifically Sustainable Transition Scenario is also considered the most relevant scenario.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
LNG and Interconnection Capacity Diversification (LICD)																								
Italy	3003	2885	-118	3003	2885	-118	3003	2885	-118	3003	2885	-118	3003	2885	-118	3003	2885	-118	3003	2885	-118	3003	2885	-118
Supply Source Access (SSA)																								
Malta	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4

ADVANCED Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Supply Source Access (SSA)																								
Malta	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	20.6	20.6
Fuel Switch savings	162.3	162.3

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

Sensitivity I (Commissioning Year)

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	20.6	20.6
Fuel Switch savings	162.3	162.3

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0031	Onshore pipeline in Italy	7 km	Site of Community Importance Biviere and Macconi di Gela Special Protection Zone(SPZ) “Torre Manfria, Biviere and Piana di Gela
TRA-N-0031	Onshore pipeline in Malta	1 km	Sites of Ecological Importance of the Marsaxlokk Bay Local Plan
TRA-N-0031	Offshore pipeline	151 km	none

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Excavation works during construction (pipeline route, terminal station, block valve stations)	Conservation and correct management of the topsoil and restoration of the topsoil, following completion of the construction activities	Refer to Section below: “Environmental Impact explained”	N/A
Emissions from machinery and vessels during the construction	Implementation of a periodic maintenance and control Plan to minimise the emissions	Refer to Section below: *“Environmental Impact explained*	N/A
Impacts on aquatic habitats, water quality and fluvial morphology due to the execution of construction activities	Minimization of impacts interference with wetlands and water bodies. Implementation of an Environmental Monitoring Plan that also includes the monitoring of water bodies and the impacts on flora and fauna in sensitive areas	Refer to Section below: *“Environmental Impact explained”*	N/A
Temporary impact on land use	Restoration of all temporarily occupied areas to their ante-operam conditions	Refer to Section below: *“Environmental Impact explained”*	N/A
Interference with the natural resources during the construction and commissioning	Selection of the location of the pipeline route and related infrastructure so as to avoid the areas with greater biodiversity or naturalistic value. Management of dust, atmospheric emissions, wastewater and waste in order to minimize the impacts on flora, fauna and ecosystems	Refer to Section below: *“Environmental Impact explained”*	N/A
Visual and landscape impacts due to land use and above ground structures	Minimization of the areas involved Implementation of a vegetation and landscape restoration plan	Refer to Section below: *“Environmental Impact explained”*	N/A
Alteration of the seabed in the areas in which the excavation and pipe laying works will be carried out	Management of the design and construction in order to minimize the interference caused	Refer to Section below: *“Environmental Impact explained”*	N/A
Direct material damage caused by the laying of the offshore pipeline	Detailed investigation of the known monuments, cultural constraints and archaeological sites and, if necessary, modification of the route of the gas pipeline to avoid/minimise interference.	Refer to Section below: *“Environmental Impact explained”*	N/A

Environmental Impact explained [Promoter]

In the table above have been listed the main environmental and socioeconomic impacts that might occur during the construction and operation of the MTG Pipeline.
These impacts were identified and assessed during the Basic Design studies based on the project information currently available, the knowledge of the existing state of the project area and the experience acquired in similar projects implemented in comparable environmental and socioeconomic settings.
Through a careful analysis of the various options for the gas pipeline route, the most significant impacts on the various environmental components were reduced to a minimum, with a view to choosing the one that creates the least interference. The impacts associated with the construction of the gas pipeline and the related infrastructure are mainly temporary and located within the working zones. The main permanent impacts are instead limited to the sites of the above ground terminal stations and block valve stations.
The possible measures for mitigating and managing the identified impacts and the environmental monitoring activities were considered in the current project CAPEX and OPEX estimation but not singularly quantified in terms of cost related.
The extension and significance of the eventual environmental impacts and the potential related costs will be assessed and described in greater depth during the Environmental Impact Study phase, which is currently ongoing.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> MTGP poses a means to **fulfil EU strategic energy policy goals** on diversification of sources, reduced dependency on a single supply source, energy security, energy solidarity between Member States and formation of an Internal Energy Market.

> MTGP aims to achieve **European Council's strategic goal** to "lift isolation from Member States which do not have access to the European gas and electricity networks after 2015 or see its energy security jeopardized by lack of the appropriate connections" (Regulation of the European Parliament and EU Council No. 347). Interconnection with EU gas markets would result in diversification of supply sources and prices (higher price convergence to EU / global markets) as advised in **European Energy Roadmap 2050**.

> MTGP also contributes to **increase security of supply** and sustainability by replacing LNG deliveries through a Floating Storage Unit (FSU) and Regasification plant for fuelling the local power generation plants which is considered as an intermediate solution for gas supply until the pipeline interconnection is in place. MTGP shall provide a more reliable, secure and energy efficient form of transport of fuel with access to an increased number of counterparties, import sources and routes.

> MTGP will allow Malta **to access gas sources and developed hubs** on the continent which are currently not available due to the island's isolation from the EU gas grid. The Project is expected to facilitate **gas price convergence** in Malta to the general EU levels, which are estimated to be lower than LNG prices by i.e. capitalizing on the hubs' liquidity, gas supply instruments and trading / hedging opportunities.

> MTGP will contribute to limit the actual risks of supply due to the stress weather conditions and technical capacity failure of the present LNG supply chain and to increase the capacity for future demand from gas-fired power generation plants in Malta.

> By replacing the LNG deliveries, MTGP will **support objectives of sustainability** by eliminating / reducing emissions stemming from the LNG supply related to liquefaction, shipping transport and operation of the FSU and regasification facility, while generating environmental landscape benefits.

F. Useful Links

The energy & water agency PCI project link:
http://www.energywateragency.gov.mt/pci-5-19-gas-interconnectivity/

Malta National Reform program:
https://mfin.gov.mt/en/Library/Documents/NRP/NRP%202018.pdf

SNAM National Development Plan 2017-2026:
http://pianodecennale.snamretegas.it/static/upload/201/2017-2026-decennale-web_eng.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_09

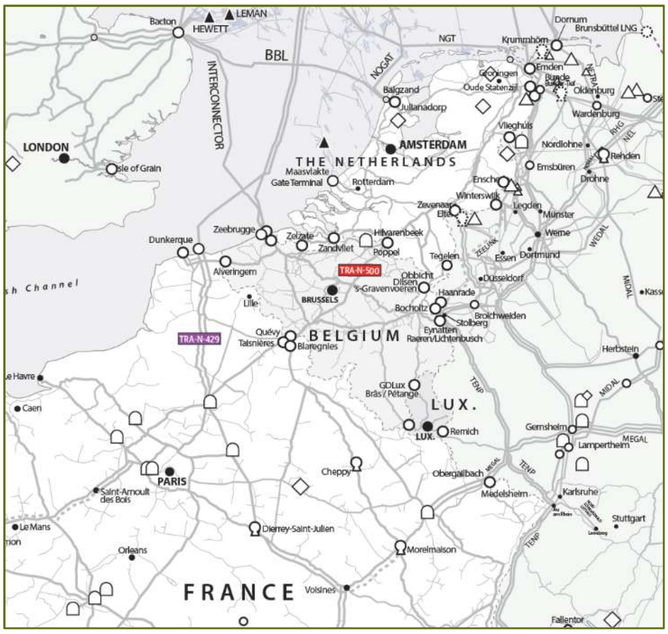
Reasons for grouping [ENTSOG]

The project group includes projects necessary to convert the existing L-gas infrastructure in Belgium and France into H-gas infrastructure so as to ensure flows of H-gas.
Since France and Belgium are using the same infrastructure from the same single supply in the Netherlands, the projects are coordinated and therefore considered together.

Objective of the project(s) in the group [Promoter]

The main objectives of the group of projects is to adapt the transmission network and storage facility:

- to convert L-gas customer to H-gas as scheduled in coordination with DSO, industrial customers and neighbouring countries;
- to avoid any gas curtailment in the L-gas areas;
- to transport new H-gas supplies to newly converted H-gas consumers, so they can benefit from the same competitive and secured supply as H-gas consumers.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0500	L/H Conversion Belgium	Fluxys Belgium	BE	Advanced	5.21	2022	2022	On time
TRA-N-0429	Adaptation L- gas - H-gas	GRTgaz and Storengy	FR	Less-Advanced	5.21	2025	2025	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0429	300	8	-
TRA-N-0429	200	2	-
TRA-N-0500	-	-	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0429	GRTgaz	Blaregnies L (BE) / Taisnières B (FR)	2025	-115	-
TRA-N-0500	Fluxys Belgium	NA	NA	-	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-429	TRA-N-500
CAPEX [mln. EUR]	181	131	50
Range CAPEX		30%	5%
OPEX [mln. EUR/y]	1.5	1.5	0.0

Description of costs and range [Promoter]

The indicative investment cost for the PCI is 181M€ over the period 2017-2029, including 131M€ in France (GRTgaz and Storengy) and 50M€ in Belgium (Fluxys Belgium) as estimated in early 2018 (time of the data collection).
The range of CAPEX reflects the level of maturity reached at the time in each country.
In France, FID has been taken for the pilot phase (42M€) in 2016. Remaining uncertainties on the overall cost will be reduced in 2019 after completion of the pilot phase and design studies for the following stage.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Security of Supply:**

Without the project group realisation, areas in Belgium and France today supplied by low calorific gas will be permanently curtailed due to the decrease of low calorific gas production from 2020 onward. The project group completely **mitigates the risk of demand curtailment** in low calorific gas areas in Belgium and France under permanent disruption of L-gas supplies.
Additionally, in case of disruption of the single largest infrastructure (SLID) in low calorific gas areas, in Belgium and in France, the project removes the **potential demand curtailment** in both areas.

Monetised benefits have been calculated **using two different values of lost load**:

- For SoS benefits, and disruption occurring in case of peak demand (DC and 2W), a 600€/MWh value is used, considering a probability of 1 in 20)
- For annual curtailment, a lesser value is used (147€/MWh) corresponding to the Value of Lost Load for Belgium in the residential sector from ACER study (‘*Study on the estimation of the cost of disruption of gas supply in Europe*’).

Fuel Switch benefits explained [Promoter]

‘Not Applicable but natural gas use maintained’

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																	
	2025						2030									2040		
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																		
Curtailment Rate 2-Week Cold Spell (GWh/d)																		
Belgium L-gas							221.3	0.0	-221.3	215.2	0.0	-215.2	198.6	0.0	-198.6	258.2	0.0	-258.2
France L-gas							30.6	0.0	-30.6	2.2	0.0	-2.2						
Curtailment Rate Peak Day (GWh/d)																		
Belgium L-gas							299.6	0.0	-299.6	293.5	0.0	-293.5	276.9	0.0	-276.9	336.5	0.0	-336.5
France L-gas							149.4	0.0	-149.4	108.8	0.0	-108.8	76.5	0.0	-76.5	51.5	0.0	-51.5
Single Largest Infrastructure Disruption (SLID)-Belgium (GWh/d)																		
Belgium L-gas	368.2	123.2	-245.0	368.2	123.2	-245.0	94.0	0.0	-94.0	94.0	0.0	-94.0	94.0	0.0	-94.0	94.0	0.0	-94.0
France L-gas	127.6	0.0	-127.6	127.6	0.0	-127.6												
Single Largest Infrastructure Disruption (SLID)-France (GWh/d)																		
France L-gas	127.6	0.0	-127.6	127.6	0.0	-127.6												
Yearly Curtailment (Average GWh/d)																		
Belgium L-gas							42.6	0.0	-42.6	36.1	0.0	-36.1	30.1	0.0	-30.1	61.0	0.0	-61.0
France L-gas							43.4	0.0	-43.4	33.5	0.0	-33.5	27.0	0.0	-27.0	47.9	0.0	-47.9

Row Labels	2040 SUSTAINABLE WITHOUT	WITH	DELTA	2040 DISTRIBUTED WITHOUT	WITH	DELTA
Security of Supply						
Curtailment Rate 2-Week Cold Spell (GWh/d)						
Belgium L-gas	280.9	0.0	-280.9	274.8	0.0	-274.8
France L-gas	28.5	0.0	-28.5			
Curtailment Rate Peak Day (GWh/d)						
Belgium L-gas	359.2	0.0	-359.2	353.1	0.0	-353.1
France L-gas	146.5	0.0	-146.5	90.8	0.0	-90.8
Single Largest Infrastructure Disruption (SLID)-Belgium (GWh/d)						
Belgium L-gas	94.0	0.0	-94.0	94.0	0.0	-94.0
France L-gas						
Single Largest Infrastructure Disruption (SLID)-France (GWh/d)						
France L-gas						
Yearly Curtailment (Average GWh/d)						
Belgium L-gas	72.9	0.0	-72.9	66.5	0.0	-66.5
France L-gas	73.5	0.0	-73.5	58.4	0.0	-58.4

ADVANCED Infrastructure Level

Sum of Value	Column Labels																	
	2025						2030									2040		
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																		
Curtailment Rate 2-Week Cold Spell (GWh/d)																		
Belgium L-gas							221.3	0.0	-221.3	215.2	0.0	-215.2	198.6	0.0	-198.6	258.2	0.0	-258.2
France L-gas							30.6	0.0	-30.6	2.2	0.0	-2.2						
Curtailment Rate Peak Day (GWh/d)																		
Belgium L-gas							299.6	0.0	-299.6	293.5	0.0	-293.5	276.9	0.0	-276.9	336.5	0.0	-336.5
France L-gas							149.4	0.0	-149.4	108.8	0.0	-108.8	76.5	0.0	-76.5	51.5	0.0	-51.5
Single Largest Infrastructure Disruption (SLID)-Belgium (GWh/d)																		
Belgium L-gas	368.2	123.2	-245.0	368.2	123.2	-245.0	94.0	0.0	-94.0	94.0	0.0	-94.0	94.0	0.0	-94.0	94.0	0.0	-94.0
France L-gas	127.6	0.0	-127.6	127.6	0.0	-127.6												
Single Largest Infrastructure Disruption (SLID)-France (GWh/d)																		
France L-gas	127.6	0.0	-127.6	127.6	0.0	-127.6												
Yearly Curtailment (Average GWh/d)																		
Belgium L-gas							42.6	0.0	-42.6	36.1	0.0	-36.1	30.1	0.0	-30.1	61.0	0.0	-61.0
France L-gas							43.4	0.0	-43.4	33.5	0.0	-33.5	27.0	0.0	-27.0	47.9	0.0	-47.9

Row Labels	2040 SUSTAINABLE WITHOUT	WITH	DELTA	2040 DISTRIBUTED WITHOUT	WITH	DELTA
Security of Supply						
Curtailment Rate 2-Week Cold Spell (GWh/d)						
Belgium L-gas	280.9	0.0	-280.9	274.8	0.0	-274.8
France L-gas	28.5	0.0	-28.5			
Curtailment Rate Peak Day (GWh/d)						
Belgium L-gas	359.2	0.0	-359.2	353.1	0.0	-353.1
France L-gas	146.5	0.0	-146.5	90.8	0.0	-90.8
Single Largest Infrastructure Disruption (SLID)-Belgium (GWh/d)						
Belgium L-gas	94.0	0.0	-94.0	94.0	0.0	-94.0
France L-gas						
Single Largest Infrastructure Disruption (SLID)-France (GWh/d)						
France L-gas						
Yearly Curtailment (Average GWh/d)						
Belgium L-gas	72.9	0.0	-72.9	66.5	0.0	-66.5
France L-gas	73.5	0.0	-73.5	58.4	0.0	-58.4

For group WEST_09 the values for the curtailed demand indicator are shown in absolute values rather than in percentages as for the other project groups due to the specificities related to the fact that the project group allows conversion from low calorific values consumption areas to high calorific values consumption (i.e. from 100% of demand curtailment to 0% demand curtailment). Absolute values are therefore considered more significant to be shown.

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	Yearly Disruption (MEUR/y)						
	Yearly Curtailment Benefits	4,502	5,367	4,441	4,502	5,367	4,441
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	11	12	10	11	12	10
	2 Weeks	88	100	90	88	100	90
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	0	0	0	0	0	0
	Fuel Switch savings	0	0	0	0	0	0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW/ ADVANCED INFRASTRUCTURE LEVELS

PROJECT BENEFITS	Sensitivity LATER COMMISSIONING YEAR	
	Max	Min
Yearly Disruption (MEUR/y)		
Yearly Curtailment Benefits	6,309	5,142
Mitigation in Disrupted Demand (MEUR/y)		
Peak Day	14	12
2 Weeks	116	102
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	0	0
Fuel Switch savings	0	0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-429	Transport	No impact (under study)	Natura 2000 “Cinq Tailles” at 14km
TRA-N-500	Transport	No impact	Natura 2000 “Valleigebied Kampenhout” at 5km

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

The physical intervention planned within the scope of PCI is limited in size and no significant environmental impact/damage is expected from the realisation of the infrastructural elements for the deployment. Fluxys Belgium and GRTgaz will bear all costs required by the Belgian and French permit process. They will follow guidelines for avoiding, mitigating or compensating negative environmental impacts of the Action “5.21 Adaptation low to high calorific gas in France and Belgium”. Concerning the impacts that could not be avoided or reduced, Fluxys and GRTgaz will implement actions under the supervision of the competent administration to offset these impacts.

Additional information (Environmental Impact) [Promoter]

> Regarding the Netherland’s planning to stop the supply of low calorific gas (L-gas) and regarding the global necessity to reduce carbon footprint which is possible when using natural gas as an alternative for other fossil fuels, adaptations of the Belgian and French Gas Grid and installations are required. Maintaining the use of natural gas avoids an increase of CO_2 emissions with respect to the use of other fossil fuels.

> By converting the L-gas network to H-gas, the current infrastructures will be maintained, instead of being decommissioned. It will avoid building new energy infrastructures, new transmission and distribution capacities and new heating appliances.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

In the last years significant seismic activities in the Groningen area led the Dutch Government to reduce the Groningen production from 54 bcm/year in 2013 to 19.4 bcm/year in 2018/2019.
This has put increased pressure on L/H conversion schedules in Germany, Belgium and France.
Reducing L-gas needs and if possible, accelerating conversion projects has become a priority for concerned Member States.

> **Removing bottlenecks & Ending Energy isolation**

The L-gas area in France and Belgian is physically a gas island with very limited connections to the neighbouring H-gas network. It is supplied from a single source (the Netherlands), with a single route (2 pipelines) and one single UGS. This has been identified for several years as a weak point for the SoS of France and Belgium. With the project, the L-gas area will merge with the H-gas network, which is deeply interconnected, lifting its isolation.

> **Implementation of the internal energy market**

With this project, the L-gas network will be fully integrated into the H-gas network, bringing this area to the same level of security, diversity and flexibility than the north-western H-gas network.
The L-gas area will be supplied from other sources available in Belgium and France, enabling shippers to optimize their supply portfolio, to the benefit of final customers.

> **Providing other benefits: sustainability**

Maintaining the use of natural gas avoids an increase of CO2 emissions (e.g. in BE, in 2025, after the nuclear phase-out, the production of electricity for heating purposes could reach emissions of 440 kg CO2/MWh (energy mix cannot avoid fossil fuels) compared to 185 kg CO2/MWh for the direct use of gas (leaving out the devices efficiency)).
Lastly by intervening into every household and industrial consumer, there is an opportunity to increase the energy efficiency on a large scale, by providing individual advices, installing modern heating devices, or adjusting the heating systems with more effective settings.

F. Useful Links

Fluxys project link:
https://www.fluxys.com/belgium/fr-BE/About%20Fluxys/Investment/InvestmentProgramme/LH_conversion
GRTgaz project link:
http://www.grtgaz.com/grands-projets/le-projet-tulipe/presentation/actualites/projet-tulipe.html
Fluxys Fluxys National Development Plan 2019-2028:
link
GRTgaz National Development Plan 2017-2026:
http://www.grtgaz.com/fileadmin/plaquettes/fr/2017/Plan_decennal_2017-2026.pdf

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group WEST_12

Reasons for grouping [ENTSOG]

The project group is composed by one single project aiming at creating a new pipeline connection between Algeria and Italy via Sardinia.
The project is considered a "gasification" project allowing to bring gas in an area not yet (fully) reached by gas.

Objective of the project(s) in the group [Promoter]

The primary objectives of the project, which offers a new direct gas supply route from Algeria to Italy, via Sardinia, are to: (i) enable the gasification of Sardinia and (ii) enhance security of supply of Italy and of other EU markets, by avoiding transit countries for the supply of Algerian gas to Italy and further to the rest of the EU gas market through reverse flow capability of Italian interconnections.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0012	GALSI Pipeline Project	Edison	IT	Advanced	NA	2019	2019	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0012	660	288	99
TRA-N-0012	812	288	52
TRA-N-0012	1219	285	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0012	Galsi S.p.A.	Koudiet Eddraouch (Galsi) (DZ)	2019	258	-
TRA-N-0012	Galsi S.p.A.	Porto Botte (Galsi)	2019	-	258
TRA-N-0012	Galsi S.p.A.	Piombino (Galsi)	2019	-	226
TRA-N-0012	Galsi S.p.A.	Olbia (Galsi)	2019	258	32

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-12
CAPEX [mln. EUR]	969.98	969.98*
Range CAPEX		15%
OPEX [mln. EUR/y]	17.46	17.46*

Description of costs and range [Promoter]

The figures above are alternative costs provided by ENTSOG, as the actual costs of the project are confidential.
The technical and economic studies completed for the project allow estimation of CAPEX and OPEX with a 15% range.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project enhances the **gasification of** Sardinia island in Italy and remove the area from isolation.

> **Security of Supply:**

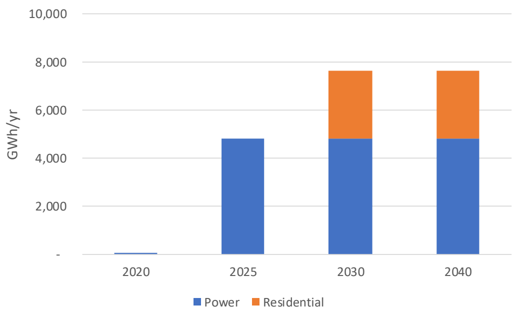
The project **increases the remaining flexibility** of Sardinia island. Therefore, with the project Sardinia get 100% of Remaining Flexibility in all scenarios from 2020 in peak day and 2-week cold spell. Also, in Italy, the project increases the Remaining Flexibility by 1% in the scenarios with higher demand in peak day.

Fuel Switch benefits explained [Promoter]

The Galsi project will enable gasification of Sardinia. As this is only project in the TYNDP 2018 Low and Advanced Infrastructure Scenarios allowing gas supplies to Sardinia, all gasification benefits are attributed to Project Group WEST_12.
According to Italy's National Energy Strategy of 2017, gasification of Sardinia aims to lead to substitution of coal-fired electricity generation and oil consumption for heating. Consequently, the gasification benefits of the island involve:

- Power sector: Reduction of CO2 emission costs due to the switching from coal to natural gas (no fuel cost savings are foreseen, as coal is expected to be cheaper than gas), using a new 400 MW gas-fired power plant
- Residential sector: Reduction of fuel costs and of CO2 emission costs due to the switching from heating oil to natural gas

To calculate the gasification benefits, the gas demand assumptions from ENTSOG's TYNDP18 Final Scenario Report are used. It is expected that in the initial years gas will only be used for electricity generation, with use for heating starting after 2025. The figure below shows the assumed build-up of gas consumption in Sardinia.
Figure 1: Assumed growth of gas demand in Sardinia



Due to the difference in efficiency between using natural gas and coal for electricity generation, the coal energy input at power plants substituted will be higher than the corresponding gas input. The efficiency factors used in the calculations are 35% for coal-fired plants and 58% for gas-fired plants.
To estimate fuel cost and CO2 cost savings, the price assumptions of the Sustainable Transition scenario have been applied. The monetized results are presented in the table below.
Table 1: Monetized benefits for Sardinia gasification

Mil. EUR	2020	2025	2030	2040
Fuel switching (Residential)	-	-	56.90	94.15
CO2 Savings (Power, Residential)	0.50	94.48	166.50	88.88

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																										
	2020			2025			2030												2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Supply Source Access (SSA)																											
Sardinia	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1

ADVANCED Infrastructure Level

Sum of Value	Column Labels																										
	2020			2025			2030												2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Supply Source Access (SSA)																											
Sardinia	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	121.8	121.8
Fuel Switch savings	74.8	74.8

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

Sensitivity I (Commissioning Year)

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	121.8	121.8
Fuel Switch savings	74.8	74.8

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0012	Pipeline	The pipeline was designed in full compliance with current legislation and with the urban plans development and with the aim of minimizing any land restriction on the territory.	It involves a time-limited environmental impact, essentially linked to the phase of construction.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Construction phase: 1. Natural Environment **-** Vegetation / Habitat loss, Fauna Loss / Disturbance 2. Surface Water bodies - Modification of morphology, Impacts on the quality, Impacts on quantity 3. Cultural Heritage - Direct effect, Indirect effect, Negative impacts on scenery and character 4. Noise & Vibrations - Noise from project construction	1. Establishment of a pre-construction biodiversity baseline. Ecologist monitoring of environmental terms, especially in areas of biodiversity interest. Protection of vegetation with trenchless techniques. 2. Water Management Plan to identify and manage any surface or groundwater needs. Waste Management Plan and Materials Management Plan. Pollution Prevention and Response Plan. 3. Appropriate siting of the Project and its facilities temporary or permanent. 4. Avoidance of any impact by the application of best noise reduction techniques to mechanical equipment.	The additional costs have been incorporated in the relevant cost estimations (Capex and Opex).	N/A

Environmental Impact explained [Promoter]

All project environmental studies were concluded.
The peculiarity of the structure is that of being a "hidden" work, because laid completely underground and made with complex construction techniques, which allow the total recovery of the areas crossed to the original situation. The only visible structures are the indicator signs and a few above ground installations.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> Gasification of Sardinia: contributing to a cleaner and more efficient energy mix, and potential gasification Corsica, in conjunction with Project Cyrénée which will connect Corsica to Galsi.

> Ending isolation and enhancing market integration: The Project, by providing a direct physical connection of Sardinia with Algeria, will end the isolation of Sardinia and will allow its integration to the continental EU gas market. Additionally, the Project will also contribute to ending the isolation of Corsica, in conjunction with Project Cyrénée.

> Diversification of counterparts: A new entry point will be added to the Italian gas market, allowing diversification of counterparts in Italy, as it will allow for non-incumbent gas shippers to increase their presence into the Italian market.

> Support development of intermittent renewable energy sources: The project can support the development of intermittent renewable energy sources, through the utilization of the significant solar and wind power potential of Sardinia and potentially of Corsica (in conjunction with Project Cyrénée), by enabling the realization of flexible gas-fired power plants.

> Enhancing Security of Supply: By providing an alternative, direct and more efficient route for the supply of Algerian gas to Italy and further to the rest of the EU gas market through reverse flow capability of Italian interconnections.

F. Useful Links

GALSI Project Link:
http://www.galsi.it/en/advantages

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

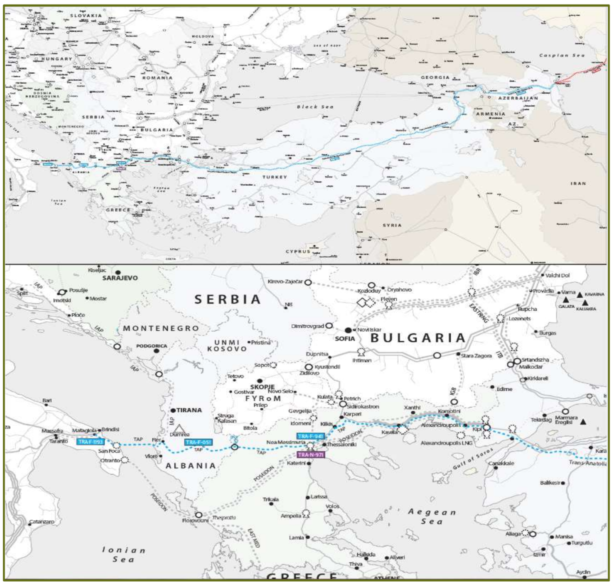
Project Group SGC_01a

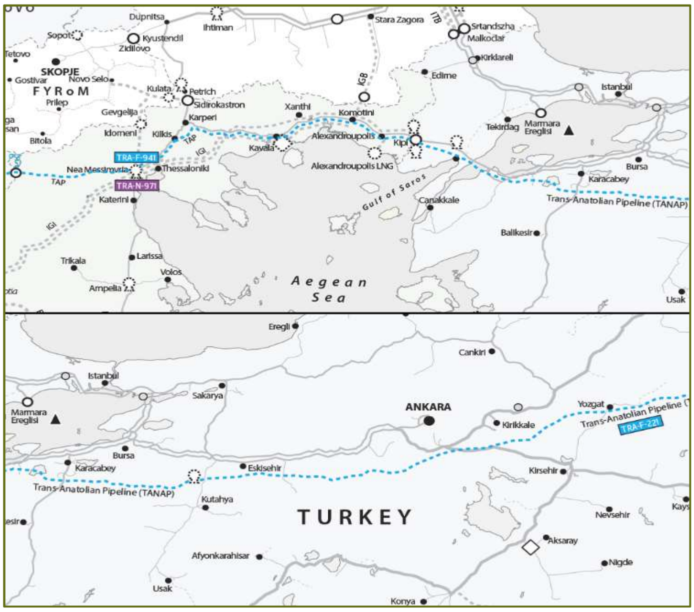
Reasons for grouping [ENTSOG]

The project group includes the projects part of the Southern Gas Corridor, the gas supply chain which aims at bringing gas to Europe from the Caspian region. The corridor starting point is Turkmenistan while the final point in Europe is Melendugno, Italy.

Objective of the project(s) in the group [Promoter]

The Group aim at improving the security and diversification of the internal energy market by bringing new natural gas supplies from the Caspian region (SD field) to South-Eastern Europe and then, via the Italian system, spreading these benefits towards overall Europe. The Group also provides a platform to foster gas to gas competition in European gas market and supports, among others, the establishment of a gas market in Albania.





Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year	Last Comm. Year	Compared to TYNP 2017
TRA-F-1138	South Caucasus Pipeline - (Future) Expansion - SCP-(F)X	SOCAR Midstream Operations LLC	AZ	FID	7.1.1	2018	2018	Rescheduled
TRA-F-0221	TANAP - Trans Anatolian Natural Gas Pipeline Project	Socar	TR	FID	7.1.1	2018	2019	On time
TRA-F-51	Trans Adriatic Pipeline	Trans-Adriatic Pipeline AG	GR	FID	7.1.3	2019	2019	On time
TRA-F-0941	Metering and Regulating station at Nea Messimvria	DESFA S.A.	GR	FID	7.1.3	2019	2019	On time
TRA-F-1193	TAP interconnection	Snam Rete Gas	IT	FID	NA	2019	2019	NA
TRA-N-339	Trans-Caspian (TCP – String 1)	W Stream Caspian Pipeline Company	TM	Advanced	7.1.1	2021	2021	Rescheduled
TRA-N-0971	Compressor station at Nea Messimvria	DESFA S.A.	GR	Less-Advanced	7.1.3	2022	2022	On time

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-51	1200	773	90
TRA-F-51	900	105	-
TRA-F-0221	1442	1347	46
TRA-F-0221	1219	460	46
TRA-F-0941	-	1	-
TRA-F-1193	1400	55	-
TRA-N-339	812	300	175
TRA-N-0971	-	-	27
TRA-F-1138	1067	691	6

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-51	Trans-Adriatic Pipeline AG	Melendugno - IT / TAP	2019	-	291
TRA-F-51	Trans-Adriatic Pipeline AG	Komotini - TAP / IGB	2019	-	142
TRA-F-51	Trans-Adriatic Pipeline AG	Kipi (TR) / Kipi (TAP)	2019	350	-
TRA-F-51	Trans-Adriatic Pipeline AG	Nea Mesimvria	2019	142	142
TRA-F-0221	TANAP TSO	Türkgözü	2018	490	-
TRA-F-0221	TANAP TSO	Kipi (TR) / Kipi (TAP)	2019	-	318
TRA-F-0941	DESFA S.A.	Nea Mesimvria	2019	114	-
TRA-F-1193	Snam Rete Gas S.p.A.	Melendugno - IT / TAP	2019	509	-
TRA-N-339	W- Stream Caspian pipeline Company	TCP / South Caucasus Pipeline	2021	500	-
TRA-N-0971	DESFA S.A.	Nea Mesimvria	2022	-	142
TRA-F-1138	SOCAR Midstream Operations	Türkgözü	2018	-	464

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[1]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-339	TRA-F-1138	TRA-F-221	TRA-F-51	TRA-F-941	TRA-N-971	TRA-F-1193
CAPEX [mln. EUR]	14779.48	1500.00	1047.48*	7477.00	4500.00**	12.00	60.00	183.00
Range CAPEX		30%	10%	10%	0%	10%	10%	10%
OPEX [mln. EUR/y]	360.42	16.00	34.57*	246.74	55.00**	0.22	7.80	0.10

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

Costs represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018) or they are just forecasts, and the actual results may differ from the forecasted amounts. Since 2018, further detailed analysis has been carried out and costs appraisals might have been changed. CAPEX ranges take into account the maturity of the projects and the cost contingencies which could reasonably be anticipated at the moment of TYNDP 2018 data collection.

Clarification on CAPEX of TCP (TRA-N-339): indicated CAPEX of 1500.00 Mln EUR represents costs of both strings of TCP – the first one to serve this project group will cost 750.00 Mln EUR. It will have capacity of 15 bcma. The rest of indicated 1500.00 Mln EUR is for the String 2, to serve SCP/White Stream – SCP_06 (or SCP_08). Indicated OPEX is similarly attributable to both strings with total capacity 30 bcma.

[1] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Italy.

Enabling the connection of Europe to new supply sources from the Caspian region, the group realisation also allows to **significantly reduce the dependence** from the two main supply sources, Russia and LNG, for South-Eastern Europe and Italy. Thanks to the realisation of the southern gas corridor, in Sustainable Transition scenario also Germany and Benelux can benefit from a modest reduction of their dependence from LNG supply. Under the Advanced infrastructure level, even more countries benefit from a supply dependence reduction.

Thanks to the projects group, several countries in those areas can now have **access to an additional supply source**. Also, Italy, being the final delivery point of the Southern Gas Corridor project, is reached by the new source. The fact that the Supply Source Access indicator (SSA) does not show an increase in the number of supply sources for Italy is linked to the standard threshold applied by ENTSOG to all the supply sources.

> **Security of Supply:**

The projects group increases the **remaining flexibility** in Bulgaria, Greece, Hungary and Italy in case of peak demand and 2-weeks cold spell situation. Benefits stemming from the realisation of this group are further spread among different countries due to other projects part of the considered reference grid (e.g. interconnection Greece-Bulgaria).

The projects group contributes to the **mitigation of risk demand curtailment** in South-Eastern countries in case of disruption of the Ukrainian route.

Always in case of Ukrainian disruption and in Sustainable Transition, most of Europe could overall face risk of curtailed demand. The projects group allows to mitigate such risk and has a positive impact on countries such as Italy, Germany and other Western countries.

The project significantly mitigates the risk of demand curtailment in Eastern countries like Bulgaria, Greece and FYROM **in case of disruption of their respective single largest infrastructure**. Additionally, the project group allows for full mitigation of risk of demand curtailment in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition.

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. In the reference situation and under the LOW infrastructure level Europe can access to a new source of gas from the Caspian region. Such benefit increases in the Advanced infrastructure level thanks to the implementation of other projects allowing to connect other countries to the new source (like the Ionian Adriatic Pipeline that is part of group SGC_01b).

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects group allows the replacement of more pollutant fuels (such as coal, heavy oil and diesel/gasoline) with natural gas, which triggers the following positive effects: reduction of both the EU energy bill and CO2 emissions. These positive effects are expected to materialise considering the current fuel mix for power generation, heating and transportation sectors in the countries reached by the projects constituting this group.

In particular, for **Italy** gas plays an important role in the decarbonization process. The most important contribution of gas is envisaged in the power generation sector, where a complete phase-out of coal is expected by 2025 (8 coal power plants of approx. 8 GW will be shut down). Gas will also have a primary role in decarbonizing the transport sector (used in substitution of oil products, with the potential of covering between 20% and 35% of the sector energy demand by 2040, share growing from around 2% today) and the industry sector (especially in the processes where high temperature heat is required). Gas will also have a more limited but important role in the emission reduction of the residential & commercial sector given the gas heat pumps installed for substituting older oil and gas boilers.

For **Greece**, the additional quantities of gas will mainly replace oil in the residential & commercial sector where gas penetration is still progressing. Gas demand in this sector is expected to increase from 8% in 2016 to 17% in 2030. Decarbonisation of the power generation, where the larger part of gas is used, in the power sector is expected to be mainly supported by renewable energy sources (RES). Natural gas will have an important role to play in meeting the intermittency issues thus helping RES penetration.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to LNG (%)all																											
Belgium																7%	4%	-3%				16%	13%	-3%			
Croatia																						16%	13%	-3%			
Czechia										15%	12%	-3%															
France										16%	13%	-2%				7%	5%	-2%									
FYROM				39%	8%	-32%				41%	12%	-29%							13%	0%	-13%	28%	13%	-16%			
Germany										15%	13%	-2%				6%	4%	-3%				16%	13%	-3%			
Greece				38%	7%	-31%				40%	12%	-28%							11%	0%	-11%	27%	11%	-16%			
Ireland																7%	4%	-3%									
Italy				10%	7%	-3%																16%	13%	-3%			
Luxembourg																7%	4%	-3%				16%	13%	-3%			
Netherlands																7%	4%	-3%				16%	13%	-3%			
Poland										15%	12%	-3%															
Slovakia										15%	12%	-3%															
Slovenia				10%	7%	-3%																16%	13%	-3%			
Switzerland																7%	4%	-3%				16%	13%	-3%			
United Kingdom																7%	4%	-3%				16%	13%	-3%			
Dependence to RU (%)																											
Bosnia Herzegovina				36%	21%	-15%	33%	11%	-22%	38%	16%	-22%	30%	1%	-29%	35%	0%	-35%	31%	0%	-31%	49%	6%	-43%	33%	0%	-33%
Bulgaria				36%	21%	-15%	33%	10%	-23%	38%	15%	-23%	30%	0%	-30%	35%	0%	-35%	31%	0%	-31%	49%	5%	-44%	33%	0%	-33%
Croatia				36%	31%	-5%				38%	35%	-3%	30%	27%	-3%				31%	27%	-4%						
Czechia				35%	31%	-4%	32%	28%	-4%				30%	26%	-4%				30%	27%	-4%				33%	31%	-2%
FYROM				36%	22%	-14%	34%	10%	-24%	38%	16%	-22%	30%	0%	-30%	34%	0%	-34%	30%	0%	-30%	48%	6%	-43%	34%	0%	-34%
Greece										10%	0%	-10%															
Hungary				36%	32%	-4%	33%	29%	-4%	37%	35%	-2%	30%	27%	-3%				31%	27%	-4%						
Poland				35%	31%	-4%	32%	28%	-4%	37%	34%	-3%	29%	26%	-3%										33%	30%	-3%
Serbia				36%	21%	-15%	33%	11%	-22%	38%	16%	-22%	30%	1%	-29%	35%	0%	-35%	31%	0%	-31%	49%	5%	-44%	33%	0%	-33%
Slovakia				35%	31%	-4%	33%	28%	-5%				30%	26%	-4%				31%	27%	-4%						
LNG and Interconnection Capacity Diversification (LICD)																											
Italy	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628
Supply Source Access (SSA)																											
Bosnia Herzegovina				3	4	1	4	5	1	3	4	1	4	5	1	3	5	2	4	5	1	3	4	1	4	5	1
Bulgaria				3	4	1	3	5	2	3	4	1	3	5	2	3	5	2	3	5	2	2	3	1	3	5	2
Croatia				3	4	1				2	3	1															
Estonia				2	3	1				2	3	1															
FYROM				1	2	1	1	3	2	1	2	1	1	3	2	1	3	2	1	3	2	1	2	1	1	3	2
Greece							2	3	1				2	3	1	2	3	1	2	3	1				2	3	1
Hungary										2	3	1										2	3	1			
Romania													2	3	1				1	2	1				2	3	1
Serbia				3	4	1	4	5	1	3	4	1	4	5	1	4	5	1	4	5	1	3	4	1	4	5	1
Slovenia																						2	3	1			

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Belarus Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Remaining Flexibility 2-Week Cold Spell (%)																											
Bulgaria				63%	100%	37%	64%	100%	36%	63%	100%	37%	66%	100%	34%				71%	100%	29%	71%	100%	29%	67%	100%	33%
Greece	71%	100%	29%	22%	62%	40%	43%	90%	47%	14%	52%	37%	59%	100%	41%	84%	100%	16%	31%	71%	40%	29%	69%	40%	54%	100%	46%
Italy																						66%	69%	2%	88%	89%	1%
Remaining Flexibility Peak day (%)																											
Bulgaria				49%	88%	39%	49%	88%	39%	35%	74%	40%	40%	77%	36%				42%	79%	37%	45%	81%	36%	42%	78%	36%
Greece	19%	57%	38%	10%	46%	36%	16%	54%	38%	0%	27%	27%	16%	51%	36%	79%	100%	21%	10%	44%	34%	4%	37%	33%	12%	46%	34%
Hungary				81%	83%	2%	91%	92%	2%																		
Italy				37%	39%	2%				26%	32%	6%	47%	50%	3%							29%	35%	6%	61%	62%	1%
Serbia										87%	100%	13%															
Single Largest Infrastructure Disruption (SLID)-Bulgaria																											
Bosnia Herzegovina				12%	0%	-12%	10%	0%	-10%	10%	0%	-10%	10%	0%	-10%				12%	0%	-12%	12%	0%	-12%	12%	0%	-12%
Bulgaria				27%	0%	-27%	27%	0%	-27%	31%	0%	-31%	30%	0%	-30%				24%	0%	-24%	24%	0%	-24%	28%	0%	-28%
Greece										3%	0%	-3%															
Serbia				10%	0%	-10%	10%	0%	-10%	9%	0%	-9%	9%	0%	-9%				10%	0%	-10%	10%	0%	-10%	10%	0%	-10%
Single Largest Infrastructure Disruption (SLID)-Greece																											
FYROM	56%	18%	-38%	38%	6%	-32%	36%	2%	-34%	35%	9%	-26%	54%	20%	-34%	32%	0%	-32%	54%	22%	-32%	60%	28%	-32%	54%	22%	-32%
Greece	57%	20%	-37%	61%	27%	-34%	59%	23%	-35%	60%	36%	-24%	56%	21%	-35%	33%	0%	-33%	56%	23%	-33%	60%	29%	-32%	55%	22%	-33%
Single Largest Infrastructure Disruption (SLID)-Romania																											
Romania				23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	34%	0%	-34%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Single Largest Infrastructure Disruption (SLID)-Serbia																											
Bulgaria				6%	0%	-6%	6%	0%	-6%	12%	0%	-12%	10%	0%	-10%				5%	0%	-5%	5%	0%	-5%	9%	0%	-9%
Greece										3%	0%	-3%															
Serbia										12%	10%	-2%	12%	10%	-2%												
Single Largest Infrastructure Disruption (SLID)-Slovakia																											
Belgium										2%	0%	-2%															
Luxembourg										2%	0%	-2%															
Netherlands										2%	0%	-2%															
Poland																						2%	0%	-2%			
Portugal										2%	0%	-2%															
Slovenia										2%	0%	-2%										2%	0%	-2%			
Sweden										2%	0%	-2%															
Switzerland										2%	0%	-2%										2%	0%	-2%			
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Bosnia Herzegovina				4%	0%	-4%	3%	0%	-3%	2%	0%	-2%							4%	0%	-4%	3%	0%	-3%	4%	0%	-4%
Bulgaria				29%	0%	-29%	29%	0%	-29%	29%	0%	-29%	27%	0%	-27%				29%	0%	-29%	28%	0%	-28%	31%	0%	-31%
FYROM													27%	0%	-27%				28%	0%	-28%	27%	0%	-27%	30%	0%	-30%
Greece				5%	0%	-5%				11%	0%	-11%										1%	0%	-1%			
Romania				15%	12%	-4%	10%	6%	-4%	22%	19%	-4%	29%	27%	-2%							29%	28%	-1%			
Serbia				3%	0%	-3%	1%	0%	-1%	1%	0%	-1%							3%	0%	-3%	2%	0%	-2%	3%	0%	-3%
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Bosnia Herzegovina				12%	10%	-2%	10%	6%	-4%	10%	8%	-2%	10%	6%	-4%				12%	4%	-8%	12%	8%	-4%	12%	6%	-6%
Bulgaria				32%	10%	-22%	32%	6%	-26%	36%	10%	-26%	36%	7%	-29%				36%	5%	-31%	37%	8%	-29%	38%	6%	-32%
Czechia										6%	4%	-2%															
FYROM													34%	8%	-26%				36%	6%	-30%	38%	13%	-25%	38%	6%	-32%
Germany										7%	5%	-2%										7%	6%	-1%			
Greece	10%	0%	-10%	14%	0%	-14%	9%	0%	-9%	25%	4%	-21%	12%	0%	-12%				14%	0%	-14%	20%	2%	-18%	14%	0%	-14%
Hungary				10%	9%	-2%				8%	6%	-2%										8%	7%	-1%			
Italy																						6%	3%	-3%			
Luxembourg										8%	6%	-2%															
Romania				26%	23%	-3%	24%	20%	-3%	32%	29%	-3%	36%	35%	-1%												
Serbia				12%	10%	-2%	10%	6%	-4%	9%	8%	-1%	9%	6%	-3%				10%	4%	-6%	10%	8%	-2%	10%	6%	-4%
Slovenia										8%	6%	-2%															
Switzerland										8%	6%	-2%										8%	6%	-2%			

ADVANCED Infrastructure Level

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to LNG (%)all																											
Bosnia Herzegovina																						5%	2%	-3%			
Croatia																						5%	2%	-3%			
Estonia																						5%	2%	-3%			
Finland																						5%	2%	-3%			
France																						6%	3%	-3%			
FYROM				39%	2%	-37%				41%	8%	-33%							13%	0%	-13%	28%	2%	-26%			
Germany																						5%	3%	-2%			
Greece				38%	2%	-36%				40%	7%	-33%							11%	0%	-11%	27%	2%	-25%			
Hungary																						5%	2%	-3%			
Ireland																						6%	3%	-3%			
Italy										9%	7%	-3%															
Latvia																						5%	2%	-3%			
Lithuania																						5%	2%	-3%			
Serbia																						5%	2%	-3%			
United Kingdom																						6%	3%	-3%			
Dependence to RU (%)																											
Austria				22%	19%	-3%	10%	7%	-3%																		
Belgium				21%	18%	-3%	10%	5%	-5%	20%	12%	-8%															
Bosnia Herzegovina				22%	19%	-3%	10%	7%	-3%																		
Croatia				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
Czechia				22%	19%	-3%	11%	8%	-3%	23%	20%	-3%															
Denmark				22%	19%	-3%	10%	7%	-3%																		
Estonia							10%	7%	-3%																		
Finland				22%	19%	-3%	11%	8%	-3%																		
France				21%	18%	-3%	10%	5%	-5%	20%	14%	-7%															
FYROM				22%	18%	-4%	10%	6%	-4%	21%	16%	-5%															
Germany				22%	19%	-3%	10%	7%	-3%				3%	0%	-3%												
Greece				21%	18%	-3%	10%	4%	-6%	20%	10%	-10%															
Hungary				22%	19%	-3%	10%	7%	-3%				3%	0%	-3%												
Italy				22%	18%	-4%	10%	7%	-3%	22%	20%	-2%	3%	0%	-3%												
Latvia				22%	19%	-3%																					
Lithuania				22%	19%	-3%	11%	8%	-3%																		
Luxembourg				21%	18%	-3%	10%	4%	-6%	21%	13%	-8%															
Netherlands				21%	18%	-3%	10%	7%	-3%																		
Poland				22%	19%	-3%	11%	8%	-3%	23%	21%	-2%															
Serbia				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
Slovakia				22%	19%	-3%	11%	8%	-3%																		
Slovenia				22%	19%	-3%	10%	7%	-3%																		
Sweden				22%	19%	-3%	10%	7%	-3%	21%	18%	-3%															
Switzerland				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
LNG and Interconnection Capacity Diversification (LICD)																											
Italy	3631	3003	-628	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336

Row Labels	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Belarus Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Remaining Flexibility 2-Week Cold Spell (%)																											
Greece	71%	100%	29%	22%	62%	40%	43%	90%	47%	14%	52%	37%	59%	100%	41%	84%	100%	16%	31%	71%	40%	29%	69%	40%	54%	100%	46%
Italy																									89%	89%	1%
Remaining Flexibility Peak day (%)																											
Greece	19%	57%	38%	10%	46%	36%	16%	54%	38%	0%	27%	27%	16%	51%	36%	79%	100%	21%	10%	44%	34%	4%	37%	33%	12%	46%	34%
Italy																						47%	50%	3%	62%	63%	1%
Single Largest Infrastructure Disruption (SLID)-Greece																											
FYROM	56%	18%	-38%																2%	0%	-2%	8%	0%	-8%	2%	0%	-2%
Greece	57%	20%	-37%	6%	0%	-6%				13%	0%	-13%							4%	0%	-4%	10%	0%	-10%	2%	0%	-2%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
FYROM																						2%	0%	-2%			
Greece				5%	0%	-5%				11%	0%	-11%															
Ukraine Disruption Curtailment Rate Peak Day (%)																											
FYROM													12%	0%	-12%				14%	3%	-11%	20%	13%	-7%	14%	0%	-14%
Greece	10%	0%	-10%	14%	0%	-14%	9%	0%	-9%	25%	0%	-25%	10%	0%	-10%				14%	0%	-14%	19%	0%	-19%	12%	0%	-12%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Project benefits (Meur)	Reference					
SCENARIO	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
EU Bill Benefits (MEUR/y)						
Reference	515.3	689.0	574.5	529.8	737.5	611.9
Supply Maximization	1,029.5	1,210.6	1,077.7	1,217.7	1,463.2	1,306.3
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	10.4	13.1	11.9	1.8	3.0	2.6
2 Weeks	3.4	37.4	37.1	1.3	5.7	5.5
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	17.4	26.5	29.0	9.4	15.2	15.8
Fuel Switch savings	9.3	12.8	12.9	9.3	8.2	6.9

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	538.3	349.5	762.6	559.9	784.4	577.5	689.0	515.3
Supply Maximization	1,058.7	171.4	1,285.7	398.7	1,364.7	1,148.1	605.3	514.8
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	13.1	10.4	13.1	10.4	8.1	4.0	13.1	10.4
2 Weeks	37.4	3.4	37.4	3.4	39.2	33.7	37.4	3.4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	29.0	17.4	29.0	17.4	30.0	20.6	29.0	17.4
Fuel Switch savings	12.9	9.3	12.9	9.3	15.7	9.7	12.9	9.3

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	610.7	363.7	827.5	587.7	843.4	596.7	737.5	529.8
Supply Maximization	1,329.8	127.5	1,584.8	0.0	1,667.6	1,376.0	731.6	608.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3.0	1.8	3.0	1.8	1.9	1.2	3.0	1.8
2 Weeks	5.7	1.3	5.7	1.3	6.0	1.5	5.7	1.3
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	15.8	9.4	15.8	9.4	15.6	10.4	15.8	9.4
Fuel Switch savings	9.3	6.9	9.3	6.9	9.7	5.5	9.3	6.9

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-51	Pipeline (onshore and offshore) Above ground installations	765,000 m 48inch diameter pipeline (onshore) 113,000 m 36inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station - 1,500,000 m2.	Whist where ever possible the pipeline route has been selected to avoid environmentally sensitive areas, over the 878km pipeline length, the pipeline intersects protected areas on 37 occasions.
TRA-F-0221	Pipeline	DN 1400 (56”) length: 1347 km DN 1200 (48”) length: 460 km	During the EIA, 67 terrestrial and 27 freshwater sensitive areas were identified, which were not included in the Habitats listed in the 92/43/EEC.
TRA-F-0941	M/R station	N/A	N/A
TRA-N-0971	Compressor station	Design is not yet initiated	
TRA-F-1193	Pipeline	DN 1400 (56”) length: 55 km	Not direct interference with environmental sensitive areas. During the EIA only one Habitat listed in the 92/43/EEC has been identified, it is crossed trenchless (Habitat 6210).
TRA-N-1138	Transmission pipeline and compressor station	93 km	N/A
TRA-N-0339	Pipeline (onshore and offshore) Above ground installations	300 km 32 inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station	The project activities undertaken in Turkmenistan and Azerbaijan will comply with good international practice. The project will be planned, constructed and operated in compliance with the laws of Turkmenistan and Azerbaijan, which require an environmental impact assessment (EIA). In addition to meeting national EIA requirements, the project will be undertaken in accordance with EIA/ESIA requirements of the World Bank Group, EU legislation and other major European finance institutions, and the requirements of relevant regional and international conventions

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-F-51 **Environmental social and cultural heritage impact**	TAP completed comprehensive environmental and social impact assessments (ESIA), following international lender guidelines (including IFC, EIB, EBRD performance requirements and the Equator Principles) and EU regulatory requirements. All ESIA's have been approved by the host country competent authorities and involved significant public stakeholder engagement. During planning and construction phase, TAP's environmental, social and cultural heritage (ESCH) performance management is focused on implementation of a set of prioritised steps, known as a 'mitigation hierarchy'. This is a systematic and dynamic process of assessment, activity planning, management, mitigation and monitoring. TAP has disclosed its ESCH management system (https://www.tap-ag.com/resource-library/reference-documents/project-finance-disclosure) to supplement material already presented to project stakeholders through TAP's extensive engagement programme to the ESIA consultation and disclosure process.	Included in the project costs information	

TRA-F-0221 **For fauna: Interference to breeding activities of the target species triggering the sensitive areas. For flora: Degradation on the habitats of the target flora species.**	Specific mitigation measures were identified and implemented in accordance with the mitigation hierarchy to preserve biodiversity throughout the pipeline right of way: Avoidance: Ecologically sensitive areas were avoided by route changes to the extent technically possible. Freshwater critical habitats were crossed trenchless. Seasonal constraints were identified and strictly applied for the construction activities. Minimisation: The pipeline right of way was narrowed from 36 meters to 30 meters at ecologically sensitive areas and forest habitats. Restoration: The pipeline right of way was reinstated to its original condition. Topsoil was preserved and repositioned following the construction. Collected seeds were replanted and the preserved bulbs were translocated back to pipeline right of way. Trees were planted on the forest sections with a ratio of 1 to 1. Compensation: Residual impacts on sensitive areas were calculated. Associated biodiversity offsets were identified and are being implemented. Trees were planted at forest offset locations with a ratio of 3 to 1.	Included in the project costs information.	Not expected.
TRA-F-0941 **N/A**	N/A	N/A	
TRA-N-0971 **Noise, air pollution, visual impact**	Building, Turbo-compressor enclosure, Chimney height, selection of low NOx emitting units	Not yet estimated	Not yet estimated
TRA-F-1193 **The only habitat included in the EU Habitats Directive (92/43/EEC) is crossed trenchless**	General mitigations, not related to sensitive areas: Olive trees transplanted before works and re-planted after works; Reconstruction of dry stones; Humus preservation; Geomorphologic and vegetation restorations.	Included in the project costs information.	Not expected
TRA-N-0339	Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process.	CAPEX and OPEX not confirmed yet but estimates included in CAPEX and OPEX provided to ENTSOG	Not expected

Environmental Impact explained [Promoter]

The environmental impacts are typical for pipeline and compressor station projects, and they have been minimized by a careful evaluation and choice of the possible routes for the projects' layouts narrowing as much as feasible working strips. Additionally, mitigation measures and environmental restoration works ensure that the realization of the project respect the crossed areas further minimising potential impacts on fauna, flora and biodiversity.

Additional information (Environmental impact) [Promoter]

Considering the substitution of more pollutant fuels across several sectors (e.g. power generation, residential and transportation), these projects have substantial benefits in terms of reduction of air contaminants, such as NOx, SOx, PMx, which are highly dangerous for human health and for the overall environment.

Since the PS-CBA currently captures only CO2 emission reductions, these benefits are not monetised but should be taken into account for a proper evaluation of the projects benefits. Moreover, the projects group allows new competitive gas sources in the European network that can enhance, both environmentally and economically, the support of RES production. In fact, the growth of electricity renewable sources is strictly connected to the availability of flexible back-up solutions. Considering the flexibility, low CO2 impacts and affordable costs of CCGT and cogeneration solutions, they are best placed to deliver the back-up required by renewable sources.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

In case of single large infrastructure unavailability stretching for a period longer than a single day (a realistic case if technical or geopolitical problem cannot be immediately solved), the projects group shows benefits in terms of reduction of demand curtailment. Taking into account a single large infrastructure unavailability longer than a single day and also considering average demand conditions, countries such as Italy, Greece and Bulgaria could experience demand disruptions: the gas from the Caspian region available to the Southern European markets will improves security of supply, enabling diversification of sources. As a reference, in a scenario where the main Italian import infrastructure should be impacted by a 30-day flow interruption, the projects group could mitigate the gas shortage with benefits ranging from €140 Million to €4 Billion, depending on the following conditions: other sources availability, such as North African gas, and reference years taken into account for benefits determination.
An additional benefit may be accounted also in the North European markets: considering the recently commissioned reverse-flow projects, which made available up to 40mcm/d capacity from Italy to France and Germany, the new reserves from Caspian Basin can be used to cope with issues affecting a broader part of Europe, such as L-gas replacement and North-Sea decreasing production. Regarding the benefit related to the availability of competitive gas for North-Western Europe, the assessment triggers the following result: for example, any 0,5 €/MWh price difference (the lower price of the gas made possible by diversification and competition effects materialised because of new gas sources via the Southern Corridor), applied to an annual demand of around 5 bcm (a conservative estimation, considering that L-gas consumption just for France, Germany and Belgium is around 30 bcm/year) would lead to potential benefits of 26 M€/year.
Furthermore, the Group provides diversification of routes and supplies. It will have significant cross-border effect, and certain projects within this Group enable other PCI and non-PCI projects.

F. Useful Links

SCPFX: www.socarmidstream.az
TANAP: www.tanap.com
TAP: https://www.tap-ag.com/the-pipeline/the-big-picture/the-eu-status
DESFA: http://desfa.gr/en/national-natural-gas-system/development-of-the-nngs/development-plan
SNAM: http://www.snam.it/repository-srg/file/it/business-servizi/Processi_Online/Allacciamenti/informazioni/piano-decennale/pd_2018_2027/Piano_decennale_2018-2027.pdf, Pages 63, 109 – 111.
TCP: http://www.w-stream-transcaspian.com/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group SGC_01b

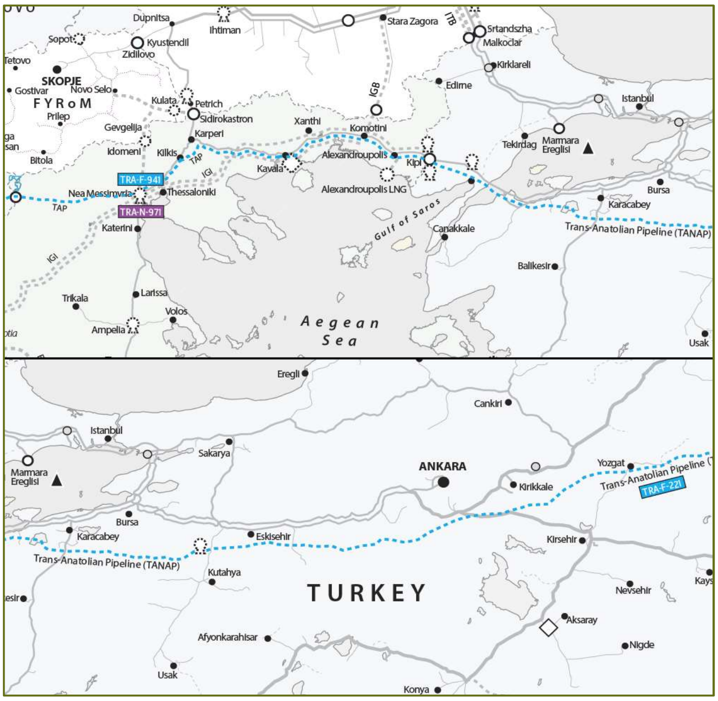
Reasons for grouping [ENTSOG]

The project group includes the projects part of the Southern Gas Corridor, the gas supply chain which aims at bringing gas to Europe from the Caspian region. The corridor starting point is Turkmenistan while the main final point in Europe is Melendugno, Italy. The group includes also three ramifications which allows gas to flow to:

> Albania via TRA-N-1303
> Croatia via TRA-N-68
> Bosnia-Herzegovina through the interconnection between Bosnia and Croatia (TRA-N-302 and TRA-N-851).

Objective of the project(s) in the group [Promoter]

The Group aim at improving the security and diversification of the internal energy market by bringing new natural gas supplies from the Caspian region to South-Eastern Europe and then, via the Italian system, spreading these benefits towards overall Europe. The Group also aims providing a platform to foster gas to gas competition in European gas market and supports, among others, the establishment of gas markets in Albania and Montenegro and the gasification of other areas (e.g. Southern part of Croatia).



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-F-1138	South Caucasus Pipeline - (Future) Expansion - SCP-(F)X	SOCAR Midstream Operations LLC	AZ	FID	7.1.1	2018	2018	Rescheduled
TRA-F-0221	TANAP - Trans Anatolian Natural Gas Pipeline Project	Socar	TR	FID	7.1.1	2018	2019	On time
TRA-F-51	Trans Adriatic Pipeline	Trans-Adriatic Pipeline AG	GR	FID	7.1.3	2019	2019	On time
TRA-F-0941	Metering and Regulating station at Nea Messimvria	DESFA S.A.	GR	FID	7.1.3	2019	2019	On time
TRA-F-1193	TAP interconnection	Snam Rete Gas	IT	FID	NA	2019	2019	NA
TRA-N-1303	IAEF - Vlora ccgt	Albgaz	AL	Less-Advanced	NA	2020	2020	On time
TRA-N-339	Trans-Caspian (TCP – String 1)	W Stream Caspian Pipeline Company	TM	Advanced	7.1.1	2021	2021	Rescheduled
TRA-N-0971	Compressor station at Nea Messimvria	DESFA S.A.	GR	Less-Advanced	7.1.3	2022	2022	On time
TRA-N-0068	Ionian Adriatic Pipeline	Plinacro Ltd	HR	Advanced	NA	2022	2023	On time
TRA-N-0302	Interconnection Croatia-Bosnia and Herzegovina (South)	Plinacro Ltd	HR	Advanced	NA	2021	3032	NA
TRA-N-0851	Southern Interconnection pipeline BiH/CRO	BH Gas d.o.o	BA	Less-Advanced	NA	2023	2023	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-51	1200	773	90
TRA-F-51	900	105	-
TRA-F-0221	1442	1347	46
TRA-F-0221	1219	460	46
TRA-F-0941	-	1	-
TRA-F-1193	1400	55	-
TRA-N-0068	800	540	1
TRA-N-339	812	300	175
TRA-N-0971	-	-	27
TRA-F-1138	1067	691	6
TRA-N-1303	400	40	-
TRA-N-0302	500	22	-
TRA-N-0851	500	165	0

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-51	Trans-Adriatic Pipeline AG	Melendugno - IT / TAP	2019	-	291
TRA-F-51	Trans-Adriatic Pipeline AG	Komotini - TAP / IGB	2019	-	142
TRA-F-51	Trans-Adriatic Pipeline AG	Kipi (TR) / Kipi (TAP)	2019	350	-
TRA-F-51	Trans-Adriatic Pipeline AG	Nea Mesimvria	2019	142	142
TRA-F-0221	TANAP TSO	Türkgözü	2018	490	-
TRA-F-0221	TANAP TSO	Kipi (TR) / Kipi (TAP)	2019	-	318
TRA-F-0941	DESFA S.A.	Nea Mesimvria	2019	114	-
TRA-F-1193	Snam Rete Gas S.p.A.	Melendugno - IT / TAP	2019	509	-
TRA-N-0068	Plinacro Ltd	Ionic-Adriatic Pipeline - IAP / Split - HR	2022	-	83.2
TRA-N-0068	Plinacro Ltd	Ionic-Adriatic Pipeline - IAP / Split - HR	2023	83.2	-
TRA-N-0068	Plinacro Ltd	Ionic-Adriatic Pipeline - IAP Entry	2023	166.5	-
TRA-N-0068	Plinacro Ltd	Ionic-Adriatic Pipeline - IAP / ME	2023	-	16.6
TRA-N-0068	Plinacro Ltd	Ionic-Adriatic Pipeline - IAP / AB	2023	-	33.3
TRA-N-0068	Plinacro Ltd	Trans-Adriatic Pipeline (TAP) / Ionic-Adriatic Pipeline (IAP)	2023	166.5	-
TRA-N-339	W Stream Caspian Pipeline Company	TCP / South Caucasus Pipeline	2021	500	-
TRA-N-0971	DESFA S.A.	Nea Mesimvria	2022	-	142
TRA-FN-1138	SOCAR Midstream Operations	Türkgözü	2018	-	464
TRA-N-1303	Albgaz Sha	Fier (AL) / (GR)	2020	0.0123	-
TRA-N-0302	Plinacro Ltd.	Posušje	2021	81	81
TRA-N-0851	BH Gas d.o.o.	Posušje	2023	73	38

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	TRA-N-302	TRA-N-851	TRA-N-339	TRA-F-1138	TRA-F-221	TRA-F-51	TRA-F-941	TRA-N-971	TRA-F-1193	TRA-N-1303	TRA-N-68
CAPEX [mln. EUR]	16.12*	100.00	1500.0	1047.48*	7477.00	4500.0**	12.00	60.0	183.0	21.86*	576.00*
Range CAPEX	0%	5%	30%	10%	10%	0%	10%	10%	10%	5%	0%
OPEX [mln. EUR/y]	0.29*	1.00	16.0	34.57*	246.74	55.0**	0.22	7.8	0.1	0.39*	10.37*

	Total Cost
CAPEX [mln. EUR]	15493.45
OPEX [mln. EUR/y]	372.48

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

Costs represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018) or they are just forecasts and the actual results may differ from the forecasted amounts. Since 2018, further detailed analysis have been carried out and costs appraisals might have been changed. CAPEX ranges take into account the maturity of the projects and the cost contingencies which could reasonably be anticipated at the moment of TYNDP 2018 data collection.

> TRA-N-339

Clarification on CAPEX of TCP (TRA-N-339): indicated CAPEX of 1500.00 mln. EUR represents costs of both strings of TCP – the first one to serve this project group will cost 750.00 mln. EUR. It will have capacity of 15 bcma. The rest of indicated 1500.00 mln. EUR is for the String 2, to serve SCP/White Stream – SCP_06 (or SCP_08). Indicated OPEX is similarly attributable to both strings with total capacity 30 bcma.

> TRA-N-302 (Interconnection Croatia-Bosina and Herzegovina (South)

100% of the CAPEX of the Interconnection Croatia-Bosnia and Herzegovina (South) refers to the costs of the designing and engineering, civil works, assembly and installation works, material and equipment.

> TRA-N-0851 Southern Interconnection pipeline BiH/CRO

Estimated CAPEX includes investments in the construction of the pipeline (114 km of the main route and 48 km of branch to Mostar) and aboveground facilities, land acquisition, project documentation and permits. BH-Gas data source: Pre-Feasibility Study COWI-IPF, 2013 and CBA Mott Macdonalds-Connecta, 2018. CAPEX range is estimated as 5% because of the age and maturity of available data. Once the Feasibility Study and Preliminary Design will be developed, CAPEX data will be more accurate.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Italy.

The project group **improves also the diversification of entry capacities** in Bosnia-Herzegovina and Croatia, as the commissioning of this project group will entail a new entry point for both countries. Diversification of entry capacities is measured by LNG and Interconnection capacity indicator which is an HHI indicator and ranges from 0 to 10.000 (which represents only one EU-entry point). Therefore, as this interconnector measures only with-in EU entry points the improvement in diversification of entry capacities is not captured by LICD indicator as import entry points from Non-EU countries are not considered by LICD indicator, Enabling the connection of Europe to new supply sources from the Caspian region, the group realisation also allows to **significantly reduce the dependence** from the two main supply sources, Russia and LNG, for South-Eastern Europe and Italy. Thanks to the realisation of the southern gas corridor, in the Sustainable Transition scenario also Germany and Benelux can benefit from a modest reduction of their dependence from LNG supply. Compared to projects group SGC_01a, this variant that include also project TRA-N-68 further reduces the risk of demand curtailment in Croatia. Under the Advanced infrastructure level, even more countries benefit from a supply dependence reduction.

Thanks to the projects group, several countries in those areas can now have **access to an additional supply source**. Also, Italy, being the final delivery point of the Southern Gas Corridor project, is reached by the new source. The fact that the Supply Source Access indicator (SSA) does not show an increase in the number of supply sources for Italy is linked to the standard threshold applied by ENTSOG to all the supply sources.

> **Security of Supply:**

The projects group increases the **remaining flexibility** in Bulgaria, Greece, Hungary, Croatia and Italy in case of peak demand and 2-weeks cold spell situation. Benefits stemming from the realisation of this group are further spread among different countries due to other projects part of the considered reference grid (e.g. interconnection Greece-Bulgaria). Compared to group SGC_01a, and depending on the demand scenarios considered, the projects groups partially or fully mitigates risk of disruption for Croatia.

The projects group contributes to the **mitigation of risk demand curtailment** in South-Eastern countries in case of disruption of the Ukrainian route.

Always in case of Ukrainian disruption and in Sustainable Transition, most of Europe could overall face risk of curtailed demand. The projects group allows to mitigate such risk and has a positive impact on countries such as Italy, Germany and other Western countries.

The project significantly mitigates the risk of demand curtailment in Eastern countries like Bulgaria, Greece, FYROM and Bosnia Herzegovina in **case of disruption of their respective single largest infrastructure**. Additionally, the project group allows for full mitigation of risk of demand curtailment in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - Velké Kapušany) in Sustainable Transition.

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. In the reference situation and under the LOW infrastructure level Europe can access to a new source of gas from the Caspian region. Compared to group SGC_01a, this group presents more benefits in the LOW infrastructure level due to the implementation of projects such as TRA-N-1303 and TRA-N-68, other projects allowing to connect Albania and Croatia to the new gas source. However, in the ADVANCED infrastructure level supply costs benefits are similar to group SGC_1a, since additional supply arrives to Croatia through competing projects in the Advanced infrastructure level.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects group allows the replacement of more pollutant fuels (such as coal, heavy oil and diesel/gasoline) with natural gas, which triggers the following positive effects: reduction of both the EU energy bill and CO2 emissions. These positive effects are expected to materialise considering the current fuel mix for power generation, heating and transportation sectors in the countries reached by the projects constituting this group.
In particular, for **Italy** gas plays an important role in the decarbonization process. The most important contribution of gas is envisaged in the power generation sector, where a complete phase-out of coal is expected by 2025 (8 coal power plants of approx. 8 GW will be shut down). Gas will also have a primary role in decarbonizing the transport sector (used in substitution of oil products, with the potential of covering between 20% and 35% of the sector energy demand by 2040, share growing from around 2% today) and the industry sector (especially in the processes where high temperature heat is required). Gas will also have a more limited but important role in the emission reduction of the residential and commercial sectors given the gas heat pumps installed for substituting older oil and gas boilers. For **Greece**, the additional quantities of gas will mainly replace oil in the residential and commercial sectors where gas penetration is still progressing. Gas demand in this sector is expected to increase from 8% in 2016 to 17% in 2030. Decarbonisation of the power generation, where the larger part of gas is used, in the power sector is expected to be mainly supported by RES. Natural gas will have an important role to play in meeting the intermittency issues, thus helping RES penetration. For **Albania**, Caspian gas will enable the creation of a gas market in Albania, will support intermittent RES (balancing), security of supply and competition (if RD Shell confirms oil&gas discovery at Shpirag). Vlora TPP to be transformed from oil to gas CCGT, thus eliminating increased CO2 emissions**.** For **Croatia,** the realisation of the project group SGC_01b and especially the implementation of the project TRA-N-68 will enable gasification of the residential and industrial sectors in southern parts of Croatia as well as in Albania, Montenegro and Bosnia and Herzegovina, and the development of gas fired power plants which will significantly impact the CO2 emissions reduction.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to LNG (%)all																											
Belgium																7%	4%	-3%				16%	13%	-3%			
Croatia										15%	12%	-3%										16%	13%	-3%			
Czechia										15%	12%	-3%															
France										16%	13%	-2%				7%	5%	-2%				16%	14%	-2%			
FYROM				39%	8%	-32%				41%	12%	-29%							13%	0%	-13%	28%	14%	-15%			
Germany										15%	13%	-2%				6%	4%	-3%				16%	13%	-3%			
Greece				38%	7%	-31%				40%	12%	-28%							11%	0%	-11%	27%	13%	-14%			
Ireland																7%	4%	-3%				16%	13%	-3%			
Italy				10%	7%	-3%																16%	13%	-3%			
Luxembourg																7%	4%	-3%				16%	13%	-3%			
Netherlands																7%	4%	-3%				16%	13%	-3%			
Poland										15%	12%	-3%															
Slovakia										15%	12%	-3%															
Slovenia				10%	7%	-3%																16%	13%	-3%			
Switzerland																7%	4%	-3%				16%	13%	-3%			
United Kingdom																7%	4%	-3%				16%	13%	-3%			
Dependence to RU (%)																											
Austria				25%	21%	-4%										34%	16%	-18%	2%	0%	-2%						
Bosnia Herzegovina				36%	21%	-15%	33%	9%	-24%	38%	16%	-22%	30%	1%	-29%	35%	0%	-35%	31%	0%	-31%	49%	6%	-43%	33%	0%	-33%
Bulgaria				36%	21%	-15%	33%	9%	-24%	38%	15%	-23%	30%	0%	-30%	35%	0%	-35%	31%	0%	-31%	49%	5%	-44%	33%	0%	-33%
Croatia				36%	20%	-16%	24%	5%	-19%	38%	24%	-14%	30%	5%	-25%	35%	0%	-35%	31%	0%	-31%	49%	22%	-27%	33%	0%	-33%
Czechia				35%	30%	-5%	32%	28%	-4%	37%	34%	-3%	30%	25%	-5%				30%	23%	-7%				33%	29%	-4%
France				15%	13%	-2%																					
FYROM				36%	22%	-14%	34%	10%	-24%	38%	16%	-22%	30%	0%	-30%	34%	0%	-34%	30%	0%	-30%	48%	6%	-43%	34%	0%	-34%
Germany										30%	27%	-2%															
Greece										10%	6%	-5%															
Hungary				36%	31%	-5%	33%	29%	-4%	37%	34%	-3%	30%	25%	-5%				31%	24%	-7%	49%	44%	-5%	33%	29%	-4%
Italy							12%	9%	-3%																		
Netherlands							12%	9%	-3%																		
Poland				35%	30%	-5%	32%	28%	-4%	37%	33%	-4%	29%	24%	-5%										33%	29%	-4%
Serbia				36%	21%	-15%	33%	9%	-24%	38%	16%	-22%	30%	1%	-29%	35%	0%	-35%	31%	0%	-31%	49%	5%	-44%	33%	0%	-33%
Slovakia				35%	31%	-4%	33%	28%	-5%	37%	34%	-3%	30%	25%	-5%				31%	23%	-8%				33%	29%	-4%
Slovenia				25%	21%	-4%										34%	15%	-19%	3%	0%	-3%						
Sweden										36%	33%	-3%															
LNG and Interconnection Capacity Diversification (LICD)																											
Italy	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628	3631	3003	-628
Supply Source Access (SSA)																											
Bosnia Herzegovina				3	4	1				3	4	1				3	4	1				3	4	1			
Bulgaria				3	4	1	3	4	1	3	4	1	3	4	1	3	4	1	3	4	1	2	3	1	3	4	1
Croatia				3	4	1				2	3	1										2	3	1			
Estonia				2	3	1				2	3	1															
FYROM				1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1
Hungary										2	3	1															
Romania													2	3	1				1	2	1				2	3	1
Serbia				3	4	1				3	4	1										3	4	1			
Slovenia																						2	3	1			

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				18%	0%	-18%	30%	0%	-30%	33%	4%	-30%
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	21%	0%	-21%	33%	3%	-30%	36%	9%	-28%
Greece										5%	0%	-5%															
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				18%	0%	-18%	30%	0%	-30%	33%	4%	-30%
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	21%	0%	-21%	33%	3%	-30%	36%	9%	-28%
Greece										5%	0%	-5%															
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				18%	0%	-18%	30%	0%	-30%	33%	4%	-30%
Belarus Disruption Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	21%	0%	-21%	33%	3%	-30%	36%	9%	-28%
Greece										5%	0%	-5%															
Curtailment Rate 2-Week Cold Spell (%)																											
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				18%	0%	-18%	30%	0%	-30%	33%	4%	-30%
Curtailment Rate Peak Day (%)																											
Croatia				13%	0%	-13%	10%	0%	-10%	28%	0%	-28%	28%	0%	-28%	1%	0%	-1%	21%	0%	-21%	33%	3%	-30%	36%	9%	-28%
Greece										5%	0%	-5%															
Remaining Flexibility 2-Week Cold Spell (%)																											
Bulgaria				63%	100%	37%	64%	100%	36%	63%	100%	37%	66%	100%	34%				71%	100%	29%	71%	100%	29%	67%	100%	33%
Croatia				0%	29%	29%	0%	39%	39%	0%	11%	11%	0%	12%	12%	6%	53%	47%	0%	19%	19%	0%	3%	3%			
Greece	71%	100%	29%	22%	62%	40%	43%	90%	47%	14%	52%	37%	59%	100%	41%	84%	100%	16%	31%	71%	40%	29%	69%	40%	54%	100%	46%
Italy													69%	69%	1%				81%	81%	1%	66%	69%	2%	88%	89%	1%
Romania																			18%	19%	1%						
Slovenia				66%	100%	34%	69%	100%	31%	61%	100%	39%	92%	100%	8%				57%	100%	43%	52%	63%	11%			
Remaining Flexibility Peak day (%)																											
Bulgaria				49%	88%	39%	49%	88%	39%	35%	74%	40%	40%	76%	35%				42%	79%	37%	45%	81%	36%	42%	78%	36%
Croatia				0%	22%	22%	0%	26%	26%	0%	4%	4%	0%	4%	4%	0%	42%	42%	0%	14%	14%						
Greece	19%	57%	38%	10%	46%	36%	16%	54%	38%	0%	27%	27%	16%	51%	36%	79%	100%	21%	10%	44%	34%	4%	37%	33%	12%	46%	34%
Hungary				81%	89%	7%	91%	99%	9%																		
Italy				37%	40%	2%	41%	41%	1%	26%	31%	4%	47%	50%	3%				62%	63%	1%	29%	34%	5%	61%	62%	1%
Serbia										87%	100%	13%															
Slovenia				48%	100%	52%	50%	100%	50%	43%	59%	16%	68%	86%	18%				29%	74%	46%						
Single Largest Infrastructure Disruption (SLID)-Bulgaria																											
Bosnia Herzegovina				12%	0%	-12%	10%	0%	-10%	10%	0%	-10%	10%	0%	-10%				12%	0%	-12%	12%	0%	-12%	12%	0%	-12%
Bulgaria				27%	0%	-27%	27%	0%	-27%	31%	0%	-31%	30%	0%	-30%				24%	0%	-24%	24%	0%	-24%	28%	0%	-28%
Greece										3%	0%	-3%															
Serbia				10%	0%	-10%	10%	0%	-10%	9%	0%	-9%	9%	0%	-9%				10%	0%	-10%	10%	0%	-10%	10%	0%	-10%
Single Largest Infrastructure Disruption (SLID)-Croatia																											
Croatia				33%	13%	-19%	34%	10%	-24%							41%	3%	-38%	33%	22%	-11%						
Single Largest Infrastructure Disruption (SLID)-Greece																											
FYROM	56%	18%	-38%	38%	6%	-32%	36%	2%	-34%	35%	9%	-26%	54%	20%	-34%	32%	0%	-32%	54%	22%	-32%	60%	28%	-32%	54%	22%	-32%
Greece	57%	20%	-37%	61%	27%	-34%	59%	23%	-35%	60%	36%	-24%	56%	21%	-35%	33%	0%	-33%	56%	23%	-33%	60%	29%	-32%	55%	22%	-33%
Single Largest Infrastructure Disruption (SLID)-Romania																											
Romania				23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	34%	0%	-34%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Single Largest Infrastructure Disruption (SLID)-Serbia																											
Bulgaria				6%	0%	-6%	6%	0%	-6%	12%	0%	-12%	10%	0%	-10%				5%	0%	-5%	5%	0%	-5%	9%	0%	-9%
Greece										3%	0%	-3%															
Serbia										12%	10%	-2%															
Single Largest Infrastructure Disruption (SLID)-Slovakia																											
Belgium										2%	0%	-2%															
Luxembourg										2%	0%	-2%															
Netherlands										2%	0%	-2%															
Poland																						2%	0%	-2%			
Portugal										2%	0%	-2%															
Slovenia										2%	0%	-2%										2%	0%	-2%			
Sweden										2%	0%	-2%															
Switzerland										2%	0%	-2%										2%	0%	-2%			
Single Largest Infrastructure Disruption (SLID)-Slovenia																											
Croatia				23%	1%	-22%	24%	0%	-24%	21%	17%	-4%	20%	17%	-3%	29%	0%	-29%	23%	9%	-14%						
Slovenia													46%	42%	-4%										52%	47%	-5%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
Bosnia Herzegovina				4%	0%	-4%	3%	0%	-3%	2%	0%	-2%							4%	0%	-4%	3%	0%	-3%	4%	0%	-4%
Bulgaria				29%	0%	-29%	29%	0%	-29%	29%	0%	-29%	27%	0%	-27%				29%	0%	-29%	28%	0%	-28%	31%	0%	-31%
Croatia				9%	0%	-9%	2%	0%	-2%	24%	0%	-24%	23%	0%	-23%				18%	0%	-18%	30%	0%	-30%	33%	4%	-30%
FYROM													27%	0%	-27%				28%	0%	-28%	27%	0%	-27%	30%	0%	-30%
Greece				5%	0%	-5%				11%	0%	-11%										1%	0%	-1%			
Romania				15%	12%	-4%	10%	6%	-4%	22%	19%	-4%	29%	27%	-2%				35%	34%	-1%	29%	28%	-1%			
Serbia				3%	0%	-3%	1%	0%	-1%	1%	0%	-1%							3%	0%	-3%	2%	0%	-2%	3%	0%	-3%
Ukraine Disruption Curtailment Rate Peak Day (%)																											
Bosnia Herzegovina				12%	5%	-7%	10%	4%	-6%	10%	8%	-2%	10%	6%	-4%				12%	4%	-8%	12%	8%	-4%	12%	6%	-6%
Bulgaria				32%	6%	-26%	32%	6%	-26%	36%	10%	-26%	36%	8%	-28%				36%	5%	-31%	37%	8%	-29%	38%	6%	-32%
Croatia				13%	4%	-9%	10%	0%	-10%	28%	6%	-22%	28%	0%	-28%	1%	0%	-1%	21%	0%	-21%	33%	8%	-25%	36%	9%	-28%
FYROM													34%	8%	-26%				36%	6%	-30%	38%	13%	-25%	38%	6%	-32%
Germany										7%	6%	-1%										7%	6%	-1%			
Greece	10%	0%	-10%	14%	0%	-14%	9%	0%	-9%	25%	6%	-19%	12%	0%	-12%				14%	0%	-14%	20%	4%	-16%	14%	0%	-14%
Hungary				10%	4%	-7%	6%	0%	-6%	8%	6%	-2%										8%	6%	-2%			
Italy																						6%	5%	-1%			
Luxembourg										8%	6%	-2%															
Romania				26%	23%	-3%	24%	20%	-3%	32%	29%	-3%	36%	34%	-2%												
Serbia				12%	4%	-8%	10%	4%	-6%	9%	8%	-1%	9%	6%	-3%				10%	4%	-6%	10%	8%	-2%	10%	6%	-4%
Slovenia										8%	6%	-2%															
Switzerland										8%	6%	-2%										8%	6%	-2%			

ADVANCED Infrastructure Level

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																											
Dependence to LNG (%)all																											
Bosnia Herzegovina																						5%	2%	-3%			
Croatia																						5%	2%	-3%			
Estonia																						5%	2%	-3%			
Finland																						5%	2%	-3%			
France																						6%	3%	-3%			
FYROM				39%	2%	-37%				41%	8%	-33%							13%	0%	-13%	28%	2%	-26%			
Germany																						5%	3%	-2%			
Greece				38%	2%	-36%				40%	7%	-33%							11%	0%	-11%	27%	2%	-25%			
Hungary																						5%	2%	-3%			
Ireland																						6%	3%	-3%			
Italy										9%	7%	-3%															
Latvia																						5%	2%	-3%			
Lithuania																						5%	2%	-3%			
Serbia																						5%	2%	-3%			
United Kingdom																						6%	3%	-3%			
Dependence to RU (%)																											
Austria				22%	19%	-3%	10%	7%	-3%																		
Belgium				21%	18%	-3%	10%	5%	-5%	20%	12%	-8%															
Bosnia Herzegovina				22%	19%	-3%	10%	7%	-3%																		
Croatia				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
Czechia				22%	19%	-3%	11%	8%	-3%	23%	20%	-3%															
Denmark				22%	19%	-3%	10%	7%	-3%																		
Estonia							10%	7%	-3%																		
Finland				22%	19%	-3%	11%	8%	-3%																		
France				21%	18%	-3%	10%	5%	-5%	20%	14%	-7%															
FYROM				22%	18%	-4%	10%	6%	-4%	21%	16%	-5%															
Germany				22%	19%	-3%	10%	7%	-3%				3%	0%	-3%												
Greece				21%	18%	-3%	10%	4%	-6%	20%	10%	-10%															
Hungary				22%	19%	-3%	10%	7%	-3%				3%	0%	-3%												
Italy				22%	18%	-4%	10%	7%	-3%	22%	20%	-2%	3%	0%	-3%												
Latvia				22%	19%	-3%																					
Lithuania				22%	19%	-3%	11%	8%	-3%																		
Luxembourg				21%	18%	-3%	10%	4%	-6%	21%	13%	-8%															
Netherlands				21%	18%	-3%	10%	7%	-3%																		
Poland				22%	19%	-3%	11%	8%	-3%	23%	21%	-2%															
Serbia				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
Slovakia				22%	19%	-3%	11%	8%	-3%																		
Slovenia				22%	19%	-3%	10%	7%	-3%																		
Sweden				22%	19%	-3%	10%	7%	-3%	21%	18%	-3%															
Switzerland				22%	18%	-4%	10%	7%	-3%				3%	0%	-3%												
LNG and Interconnection Capacity Diversification (LICD)																											
Italy	3631	3003	-628	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336	2555	2218	-336

	2020			2025						2030									2040								
	BEST ESTIMATE (CbG)			BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																											
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Baltics Finland Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Belarus Disruption Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Curtailment Rate Peak Day (%)																											
Greece										5%	0%	-5%															
Remaining Flexibility 2-Week Cold Spell (%)																											
Greece	71%	100%	29%	22%	62%	40%	43%	90%	47%	14%	52%	37%	59%	100%	41%	84%	100%	16%	31%	71%	40%	29%	69%	40%	54%	100%	46%
Italy																									89%	89%	1%
Remaining Flexibility Peak day (%)																											
Greece	19%	57%	38%	10%	46%	36%	16%	54%	38%	0%	27%	27%	16%	51%	36%	79%	100%	21%	10%	44%	34%	4%	37%	33%	12%	46%	34%
Italy																						47%	50%	3%	62%	63%	1%
Single Largest Infrastructure Disruption (SLID)-Greece																											
FYROM	56%	18%	-38%																2%	0%	-2%	8%	0%	-8%	2%	0%	-2%
Greece	57%	20%	-37%	6%	0%	-6%				13%	0%	-13%							4%	0%	-4%	10%	0%	-10%	2%	0%	-2%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																											
FYROM																						2%	0%	-2%			
Greece				5%	0%	-5%				11%	0%	-11%															
Ukraine Disruption Curtailment Rate Peak Day (%)																											
FYROM													12%	0%	-12%				14%	3%	-11%	20%	13%	-7%	14%	0%	-14%
Greece	10%	0%	-10%	14%	0%	-14%	9%	0%	-9%	25%	0%	-25%	10%	0%	-10%				14%	0%	-14%	19%	0%	-19%	12%	0%	-12%

C.3. Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

		Reference					
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	549	712	604	530	738	612
	Supply Maximization	1,065	1,233	1,110	1,218	1,463	1,306
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	11	12	12	2	3	3
	2 Weeks	4	37	38	1	6	6
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	41	83	54	18	37	23
	Fuel Switch savings	11	15	16	11	9	8

C.4 Sensitivities analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	541	351	794	600	819	615	712	549
Supply Maximization	1,062	172	1,317	427	1,400	1,187	617	532
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	12	11	12	11	7	4	12	11
2 Weeks	38	4	38	4	39	33	38	4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	83	41	83	41	86	48	83	41
Fuel Switch savings	16	11	16	11	19	11	16	11

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	602	363	828	588	852	593	738	530
Supply Maximization	1,320	125	1,585	0	1,679	1,372	732	609
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	3	2	3	2	2	1	3	2
2 Weeks	6	1	6	1	6	1	6	1
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	37	18	37	18	38	20	37	18
Fuel Switch savings	11	8	11	8	11	6	11	8

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-F-51	Pipeline (onshore and offshore) Above ground installations	765,000 m 48inch diameter pipeline (onshore) 113,000 m 36inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station - 1,500,000 m2.	Whist where ever possible the pipeline route has been selected to avoid environmentally sensitive areas, over the 878km pipeline length, the pipeline intersects protected areas on 37 occasions.
TRA-F-0221	Pipeline	DN 1400 (56”) length: 1347 km DN 1200 (48”) length: 460 km	During the EIA, 67 terrestrial and 27 freshwater sensitive areas were identified, which were not included in the Habitats listed in the 92/43/EEC.
TRA-F-0941	M/R station	N/A	N/A
TRA-N-0971	Compressor station	Design is not yet initiated	
TRA-F-1193	Pipeline	DN 1400 (56”), length 55 km	Not direct interference with environmental sensitive areas. During the EIA only one Habitat listed in the 92/43/EEC has been identified, it is crossed trenchless (Habitat 6210).
TRA-N-0068	Transmission pipeline	DN 800 (32’’), total length 540 km	No
TRA-F-1138	Transmission pipeline and compressor station	93 km	N/A
TRA-N-0339	Pipeline (onshore and offshore) Above ground installations	300 km 32inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station	The project activities undertaken in Turkmenistan and Azerbaijan will comply with good international practice. The project will be planned, constructed and operated in compliance with the laws of Turkmenistan and Azerbaijan, which require an environmental impact assessment (EIA). In addition to meeting national EIA requirements, the project will be undertaken in accordance with EIA/ESIA requirements of the World Bank Group, EU legislation and other major European finance institutions, and the requirements of relevant regional and international conventions
TRA-N-0302	Transmission pipeline	DN 500, length 22 km	No
TRA-N-851	Transmission pipeline	The South Interconnection of BiH and Croatia project is located mainly on the territory of BiH in the length of 165 km. The project falls within the administrative boundaries of the following cantons: Herzegovina-Neretva, West Herzegovina, Canton 10 and Central Bosnia Canton.	Potential sensitive area will be identified during EIA procedure and development of Preliminary Design.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-F-51 **Environmental social and cultural heritage impact**	TAP completed comprehensive environmental and social impact assessments (ESIA), following international lender guidelines (including IFC, EIB, EBRD performance requirements and the Equator Principles) and EU regulatory requirements. All ESIA's have been approved by the host country competent authorities and involved significant public stakeholder engagement. During planning and construction phase, TAP's environmental, social and cultural heritage (ESCH) performance management is focused on implementation of a set of prioritised steps, known as a 'mitigation hierarchy'. This is a systematic and dynamic process of assessment, activity planning, management, mitigation and monitoring. TAP has disclosed its ESCH management system (https://www.tap-ag.com/resource-library/reference-documents/project-finance-disclosure) to supplement material already presented to project stakeholders through TAP's extensive engagement programme to the ESIA consultation and disclosure process.	Included in the project costs information	

TRA-F-0221 For fauna: Interference to breeding activities of the target species triggering the sensitive areas. For flora: Degradation on the habitats of the target flora species.	Specific mitigation measures were identified and implemented in accordance with the mitigation hierarchy to preserve biodiversity throughout the pipeline right of way: **Avoidance**: Ecologically sensitive areas were avoided by route changes to the extent technically possible. Freshwater critical habitats were crossed trenchless. Seasonal constraints were identified and strictly applied for the construction activities. Minimisation: The pipeline right of way was narrowed from 36 meters to 30 meters at ecologically sensitive areas and forest habitats. **Restoration**: The pipeline right of way was reinstated to its original condition. Topsoil was preserved and repositioned following the construction. Collected seeds were replanted and the preserved bulbs were translocated back to pipeline right of way. Trees were planted on the forest sections with a ratio of 1 to 1. **Compensation**: Residual impacts on sensitive areas were calculated. Associated biodiversity offsets were identified and are being implemented. Trees were planted at forest offset locations with a ratio of 3 to 1.	Included in the project costs information.	Not expected.
TRA-F-0941 N/A	N/A	N/A	
TRA-N-0971 Noise, air pollution, visual impact	Building, Turbo-compressor enclosure, Chimney height, selection of low NOx emitting units.	Not yet estimated	Not yet estimated
TRA-F-1193 The only habitat included in the EU Habitats Directive (92/43/EEC) is crossed trenchless	General mitigations not related to sensitive areas: • Olive trees transplanted before works and re-planted after works; • Reconstruction of dry stones; • Humus preservation; • Geomorphologic and vegetation restorations.	Included in the project costs information.	Not expected
TRA-N-0068 During construction period the potential impacts on the environment are likely for: air quality, noise, geomorphology, habitats, cultural heritage	For Croatian part of the route TRA-N-0068 EIA procedures have been carried out and Decisions on acceptability have been issued by the Croatian line Ministry. The Ministry' Decision on acceptability includes prescribed relevant environmental protection measures for reducing the potential impacts to the lowest level. EIA procedures were carried out in accordance with Croatian national legislation that is aligned with EU requirements. For the pipeline sections in Albania and Montenegro appropriate assessments have also been carried out within Feasibility study.	Included in project CAPEX	Not expected
TRA-N-0339	Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process.	CAPEX and OPEX not confirmed yet but estimates included in CAPEX and OPEX provided to ENTSOG	Not expected

TRA-N-0302 During construction period the potential impacts on the environment are likely to appear in the following areas: air quality, noise, geomorphology, habitats, cultural heritage	For the project TRA-N-0302, EIA procedure has been carried out and a Decision on acceptability has been issued by the Croatian line Ministry. The Decision on acceptability issued by the Ministry includes prescribed relevant environmental protection measures for reducing the potential impacts to the lowest level. EIA procedures were carried out in accordance with the Croatian national legislation, that is, they have been aligned with the EU requirements.	Included in project CAPEX	Not expected
TRA-N-851 Major potentially environmental impact of the project occurs during the construction period (disturbance, impacts due to the dust, noise from transport and machineries). Impacts on the environment to be considered during EIA procedure are for: air quality, noise, geomorphology, habitats, flora and fauna, cultural heritage, occupational health, waste and accidents.	Mitigation measures to mitigate possible impacts to the lowest possible level will be proposed through the EIA procedure, all in line with national legislation and EU requirements. Mitigation measures during the construction phase, MM during operation, MM in case of accident, MM after termination of use and socio-economic MM will include responsibilities of design company, contractor, engineer, operator and potential other parties.	The environmental protection and mitigation measures costs will be assessed in EIA procedure	Related costs will be assessed in EIA procedure.

Environmental Impact explained [Promoter]

The environmental impacts are typical for pipeline and compressor station projects, and they have been minimized by a careful evaluation and choice of the possible routes for the projects' layouts narrowing as much as feasible working strips. Additionally, mitigation measures and environmental restoration works ensure that the realization of the project respect the crossed areas further minimising potential impacts on fauna, flora and biodiversity.

Additional information (Environmental impact) [Promoter]

Considering the substitution of more pollutant fuels across several sectors (e.g. power generation, residential and transportation), these projects have substantial benefits in terms of reduction of air contaminants, such as NOx, SOx, PMx, which are highly dangerous for human health and for the overall environment.

Since the PS-CBA currently captures only CO2 emission reductions, these benefits are not monetised but should be taken into account for a proper evaluation of the project's benefits. Moreover, the projects group allows new competitive gas sources in the European network that can enhance, both environmentally and economically, the support of RES production. In fact, the growth of electricity renewable sources is strictly connected to the availability of flexible back-up solutions. Considering the flexibility, low CO2 impacts and affordable costs of CCGT and cogeneration solutions, they are best placed to deliver the back-up required by renewable sources.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

In case of single large infrastructure unavailability stretching for a period longer than a single day (a realistic case if technical or geopolitical problem cannot be immediately solved), the projects group shows benefits in terms of reduction of demand curtailment. Taking into account a single large infrastructure unavailability longer than a single day and also considering average demand conditions, countries such as Italy, Greece and Bulgaria could experience demand disruptions: the gas from the Caspian region available to the Southern European markets will improves security of supply, enabling diversification of sources. As a reference, in a scenario where the main Italian import infrastructure should be impacted by a 30-day flow interruption, the projects group could mitigate the gas shortage with benefits ranging from €140 Million to €4 Billion, depending on the following conditions: other sources availability, such as North African gas, and reference years taken into account for benefits determination.
An additional benefit may be accounted also in the North European markets: considering the recently commissioned reverse-flow projects, which made available up to 40mcm/d capacity from Italy to France and Germany, the new reserves from Caspian Basin can be used to cope with issues affecting a broader part of Europe, such as L-gas replacement and North-Sea decreasing production.
Regarding the benefit related to the availability of competitive gas for North-Western Europe, the assessment triggers the following result: for example, any 0,5 €/MWh price difference (the lower price of the gas made possible by diversification and competition effects materialised because of new gas sources via the Southern Corridor), applied to an annual demand of around 5 bcm (an conservative estimation, considering that L-gas consumption just for France, Germany and Belgium is around 30 bcm/year) would lead to potential benefits of 26 M€/year.
The Group provides diversification of routes and supplies (significant cross-border effect, certain projects within this Group enable other PCI and non-PCI projects), enables the connection of the SGC with the existing Croatian transmission system and the supply of Central Eastern Europe and South Eastern Europe countries and facilitates the gasification of Montenegro, southern Croatia and Bosnia and Herzegovina.
Additionally, the implementation of the interconnection between BA and Croatia will have a positive impact on the integration of the Croatian and BA gas markets. It will enhance security of supply for BA and provide additional volumes of gas available to the market and will create a potential for using gas for power generation in BA. Natural gas consumption means using clean, environmentally friendly source of energy, because it is of low-carbon intensity compared to other fossil fuels. Therefore, use of gas for heating and power generation lead to reduction of environmental pollution i.e. reduction of CO_2, SO_2, NO_x and other particulate matter emissions. Thus, project group will improve the situation with air pollution in BA that significantly increases during the winter season and especially in urban areas. Additionally, lower usage of firewood in the energy consumption sectors (residential and industrial) means significant contribution to forest protection in BA. The main economic benefits from the implementation of the project are the savings made on avoiding interruptions in gas supply when the existing connection is cut (because of the age and poor condition) and savings from the avoidance of gas disruptions on the route via Ukraine, from Russia. Other benefits include market enhancement, increased economic activity and employment growth, savings related to lower costs of gas purchase (potential less expensive supply sources become available) and increased bargaining power in negotiation with the current gas supplier.

F. Useful Links

SCPFX: www.socarmidstream.az **TANAP**: www.tanap.com
TAP: https://www.tap-ag.com/the-pipeline/the-big-picture/the-eu-status
DESFA: http://desfa.gr/en/national-natural-gas-system/development-of-the-nngs/development-plan
SNAM: http://www.snam.it/repository-srg/file/it/business-servizi/Processi_Online/Allacciamenti/informazioni/piano-decennale/pd_2018_2027/Piano_decennale_2018-2027.pdf, Pages 63, 109 – 111.
TCP: http://www.w-stream-transcaspian.com/ **PLINACRO Ltd.**: http://www.plinacro.hr/default.aspx?id=648
PLINACRO NDP2018-2027 (p.64) :
http://www.plinacro.hr/UserDocsImages/dokumenti/Desetogodi%C5%A1nji%20plan%20razvoja%20PTS%202018-2027.pdf
BH-Gas Framework Energy Strategy of Bosnia and Herzegovina until 2035:
http://www.mvteo.gov.ba/data/Home/Dokumenti/Energetika/Framework_Energy_Strategy_of_Bosnia_and_Herzegovina_until_2035_ENG_FINAL....pdf
BH-Gas Conclusion of Government of Federation of BiH on Stategic importance of the South Interconnection of BiH and Croatia Gaspipeline Project, route Zagvozd (CRO) – Posušje (BiH) – Novi Travnik with branch to Mostar:
http://www.fbihvlada.gov.ba/bosanski/sjednica_v2.php?sjed_id=642&col=sjed_saopcenje

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group SGC_02

Reasons for grouping [ENTSOG]

The project group includes a stand-alone project consisting of a floating solution (FSRU) for LNG imports to Cyprus, including all facilities needed to receive, store and regasify liquefied natural gas.

Objective of the project(s) in the group [Promoter]

The project aims to improve Cyprus' security of energy supply and diversification of imported energy sources and fuels. It will also support objectives of sustainability, as it will contribute to the reduction of GHG emissions and prepare for a low carbon economy on the island.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year	Last Comm. Year	Compared to TYNP 2017
LNG-N-1146	Cyprus Gas2EU	Ministry of Energy, Commerce and Industry of Cyprus	CY	Advanced	7.3.5	2020	2020	On time

Projects Overview

Technical Information

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-1146	-	125.000	125.000

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-1146	Cygas/ETYFA	Terminal 2 Vassiliko - Lemesos Port	2020	-	76

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[1]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-1146
CAPEX [mln. EUR]	261.00	261.00
Range CAPEX		20%
OPEX [mln. EUR/y]	7.83	7.83

Description of costs and range [Promoter]

Due to tender process currently in place (from October 5th, 2018), the Project Promoter may provide the accurate data at a later stage, following award.

[1] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Gasification Benefits explained [ENTSOG]

> **Competition:**

The project **increases the number of supply sources** Cyprus has access to ensuring gasification of the country and contributes to remove Cyprus from isolation.

Fuel Switch benefits explained [Promoter]

Benefits may include potential Cost Synergies and Revenue Synergies. The Cost Synergies involve gas contract portfolio efficiencies, peaking supply/weather risk, EU supply shortages and shipping synergies with the following allocation of benefit for each synergy. On the other hand, the Revenue Synergies involve LNG bunkering in Eastern Mediterranean and LNG trading opportunities with allocation of benefit 50% to Cyprus and 50% to Greece for both synergies.
(Data may be provided as per pending tender process for the development of the infrastructure initiated on 5/10/2018 is concluded and data to be available then. Additionally, once the separate LNG Supply procurement process concludes with all monetary figures available, the benefits can be analysed in detail).

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Supply Source Access (SSA)																								
Cyprus	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Supply Source Access (SSA)																								
Cyprus	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1	0	1	1

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	37.0	37.0
Fuel Switch savings	175.4	175.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

Sensitivity (Commissioning Year)

	GASIFICATION BENEFITS	
	Low	Advanced
Fuel & CO_2 Savings (MEUR/y)		
CO_2 Savings	37.0	37.0
Fuel Switch savings	175.4	175.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. Tables have been filled in by the promoter.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs

Environmental Impact explained [Promoter]

> Avoiding the cost of CO2 emission due to the switch in fuel mix;
> Complementarity with other infrastructure gas projects;
> Decrease of other harmful emission such as SOx and PM;
> Development of more clean and efficient transport through the deployment of bunkering services.
> CO2, SOx, and PM savings are related to the fact that NG/LNG is an environmentally friendly fuel and can significantly reduce these emissions comparing to conventional fuels.

(Data may be provided as per pending tender process procured on 5/10/2018 is concluded and data to be available then)

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project will end Cyprus' energy isolation indefinitely, will ensure security of supply and will increase import capacity, which is likely to have a significant impact on improving investor confidence.
The project provides benefits as it promotes the establishment of the internal market for gas and enforces the overall internal energy market mix with an additional more environmentally friendly source. It also promotes the integration of the EU Natural Gas (NG) market as it will connect the newly created market of Cyprus with the established Greek market. Furthermore, the project promotes the concept of a spot LNG market within the Mediterranean Sea, thus interconnecting the respective markets of several Member States and implementing virtual reverse flow to allow export of gas.
The project may include other benefits such as it provides sustainability, competition, interoperability and system flexibility. Regarding sustainability, CyprusGas2EU contributes to EU's energy and climate goals as it facilitates the gasification of Cyprus and the reduction of oil in its energy mix and the respective dependence from oil. It will also encourage the development of an optimal fuel mix at regional level minimizing CO_2 emissions and utilizing greener sources of energy.
(Data may be provided after the pending tender process procured on 5/10/2018 is concluded and data to be available then)

F. Useful Links

CyprusGas2EU Project Link :
http://www.cyprusgas2eu.eu/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

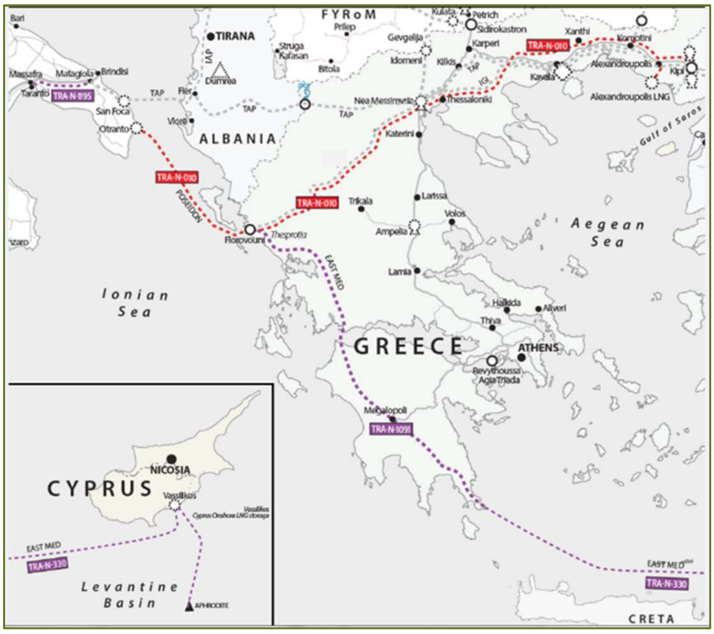
Project Group SGC_03a

Reasons for grouping [ENTSOG]

The project group represents a gas supply chain which aims at connecting the East Mediterranean gas resources to the European gas system. The corridor starting point is the off-shore gas field production in Levantine Basin (Cyprus and Israel) while the destination point is Greece and, in conjunction with the off-shore section of Poseidon Pipeline (TRA-N-10), southern Italy and further north towards Europe via Matagiola - Massafra pipeline (TRA-N-1195) and Adriatica Line (TRA-N-7).

Objective of the project(s) in the group [Promoter]

The primary objective of the project group is to provide a multi-source option for the completion of the Southern Gas Corridor by delivering gas from the Caspian Region, the Middle East and Central Asia, and to provide a permanent cone ction to the recently discovered gas reserves in the Levantine Basin. Specific objectives: (i) strengthening security of supply though diversification of routes and sources for the EU market, (ii) enhancing market integration and competition, (iii) enabling gasification of Cyprus and Crete, and (iv) providing a permanent connection of the gas reserves in the Levantine Basin with European gas markets, thus enabling additional supplies from indigenous EU sources and contributing to EU gas import dependence reduction, (v) in particular Matagiola – Massafra and Adriatica Line are network developments having a character of generality, required to create new entry capacity in the south/centre of Italy to intake additional gas quantities from any new or existing entry points located from Sicily to the middle Adriatic Sea (for Adriatica Line) and, in particular, from Apulia region (for Matagiola –Massafra pipeline).



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0010	Poseidon Pipeline	IGI Poseidon S.A.	GR	Advanced	7.3.3	2022	2025	Rescheduled
TRA-N-0007	Development for new import from the South (Adriatica Line)	Snam Rete Gas S.p.A.	IT	Less-Advanced	7.3.4	2025	2025	NA
TRA-N-0330	EastMed Pipeline	IGI Poseidon S.A.	GR	Less-Advanced	7.3.1	2025	2025	Rescheduled
TRA-N-1091	Metering and Regulating station at Megalopoli	DESFA S.A.	GR	Less-Advanced	7.3.1	2025	2025	Rescheduled
TRA-N-1195	Matagiola - Massafra pipeline	Snam Rete Gas	IT	Less-Advanced	NA	2025	2025	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0007	1200	430	33
TRA-N-0010	915	210	75
TRA-N-0010	1220	770	75
TRA-N-0330	1070	553	-
TRA-N-0330	660	1153	220
TRA-N-0330	610	165	-
TRA-N-1091	-	-	-
TRA-N-1195	1400	80	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0007	Snam Rete Gas S.p.A.	Italy Mezzogiorno Import Fork	2025	264	-
TRA-N-0010	IGI Poseidon S.A.	Kipi (TR) / Kipi (GR)	2022	480	-
TRA-N-0010	IGI Poseidon S.A.	Otranto - IT / IGI Poseidon	2022	160	380
TRA-N-0010	IGI Poseidon S.A.	Komotini (DESFA) - GR / IGB	2022	-	95
TRA-N-0010	IGI Poseidon S.A.	Kipi (TR) / Kipi (GR)	2025	160	-
TRA-N-0010	IGI Poseidon S.A.	Otranto - IT / IGI Poseidon	2025	-	250
TRA-N-0010	IGI Poseidon S.A.	East Med / Thesprotia (Poseidon)	2025	320	-
TRA-N-0010	IGI Poseidon S.A.	Komotini (DESFA) - GR / IGB	2025	-	65
TRA-N-0330	IGI Poseidon S.A.	East Med / Cyprus/Israeli Production Field	2025	330	-
TRA-N-0330	IGI Poseidon S.A.	East Med / Cyprus (CY)	2025	-	30
TRA-N-0330	IGI Poseidon S.A.	East Med / Crete (GR)	2025	190	20
TRA-N-0330	IGI Poseidon S.A.	East Med / Thesprotia (Poseidon)	2025	-	350
TRA-N-0330	IGI Poseidon S.A.	East Med / Peloponnesus (GR)	2025	-	90

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

TRA-N-1091	DESFA S.A.	East Med / Peloponnesus (GR)	2025	90	-
TRA-N-1195	Snam Rete Gas S.p.A.	Melendugno - IT / TAP	2025	310	-
TRA-N-1195	Snam Rete Gas S.p.A.	Otranto - IT / IGI Poseidon	2025	310	-

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with “*” if the alternative cost has been calculated by ENTSOG OR with “**” if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-330	TRA-N-1091	TRA-N-10	TRA-N-7	TRA-N-1195
CAPEX [mln. EUR]	9826.50	5200.00	7.50	3000.00	1379.00	240.00
Range CAPEX		30%	25%	30%	30%	30%
OPEX [mln. EUR/y]	181.99	90.00	0.15	90.00	1.70	0.14

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

Costs represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018), and the actual results may differ from the forecasted amounts. Since 2018, further detailed analysis has been carried out and costs appraisals might have changed. CAPEX ranges take into account the maturity of the projects and the cost contingencies which could reasonably be anticipated at the moment of TYNDP 2018 data collection.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Summary of project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **increases the diversification of entry points** in Greece and Italy. The impact on Greece is very significant with the LICD indicator halving compared to the situation without the project.
Enabling the connection of Europe to new supply sources mainly from East Mediterranean Basin and potentially from Caspian region (through Turkey), the group realisation also allows to **reduce the dependence** from the two main supply sources, Russia and LNG. Such benefits can further spread to different European countries thanks to the infrastructure included in the reference grid (Low infrastructure level). Under the Advanced infrastructure level, even more countries benefit from a supply dependence reduction.
With the realisation of this project group, Bosnia Herzegovina, Bulgaria, FYROM, Greece and Serbia can now **access to an additional supply source**. The project has also a significant impact on Cyprus, **contributing to remove the country from isolation** from the rest of Europe. Cases where the number of new sources results particularly high has to be understood as an effect of withdraw propagation of prices as consequence of the fact that now all those markets are further interconnected. Also Italy, being the final delivery point of this project group, is reached by new source from the Levantine basin. The fact that the Supply Source Access indicator (SSA) does not show an increase in the number of supply sources for Italy is linked to the standard threshold applied by ENTSOG to all the supply sources together with the consideration of this new source as a national production.

> **Security of Supply:**

The projects group increases the **remaining flexibility** in Greece, Italy and Bulgaria in case of peak demand and 2-weeks cold spell situation and of course of Cyprus. Benefits stemming from the realisation of this group are further spread among different countries due to other projects part of the considered reference grid (e.g. interconnection Greece-Bulgaria).
In case of Ukrainian disruption and in Sustainable Transition the projects group contributes to the **mitigation of risk demand curtailment** in Europe. In such situation most of Europe could in fact overall face risk of demand curtailment.
The project significantly mitigates the risk of demand curtailment in Greece **in case of disruption of its single largest infrastructure** (Agia Triada in the Low infrastructure level).

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. Thanks to the realisation of the project, Europe can access to new source of gas from the Levantine basin and from the Caspian region, Middle East and Central Asia.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The projects group allow the replacement of more pollutant fuels (such as coal, heavy oil and diesel/gasoline) with natural gas, which triggers the following positive effects: reduction of both the EU energy bill and CO2 emissions. These positive effects are expected to materialise considering the current fuel mix for power generation, heating and transportation sectors in the countries reached by the projects constituting this group.

> Fuel Switching in Italy

Gas will play an important role in the Italian decarbonization process, particularly in the power generation sector, where a complete phase-out of coal is expected by 2025 (8 coal power plants of approx. 8 GW will be shut down). Gas will also have a primary role in decarbonizing the transport sector (used in substitution of oil products, with the potential of covering between 20% and 35% of the sector energy demand by 2040, growing from around 2% today) and the industry sector (especially in the processes where high temperature heat is required). Gas will also have a role in the emission reduction of the residential & commercial sector given the gas heat pumps installed for substituting older oil and gas boilers. As in the case of Greece, implementation of Project Group SGC 03 will enable access of the Italian market to gas from the East Mediterranean Basin, the Caspian Region and Middle East. Marginal price in the market will decrease in all price scenarios, with the decrease reaching 2 €/MWh in some cases. Consequently, Project Group SGC 03a will contribute to the benefits of fuel switching. Following the same rationale as for Greece, it is assumed that each entry point in the system will supply gas for fuel switching proportionately to its capacity.

Fuel Switch benefits explained *(cont'd)*

> Fuel Switching in Greece

For **Greece**, the additional quantities of gas will mainly replace oil in the residential and commercial sectors where gas penetration is still progressing. Gas demand in this sector is expected to increase from 8% in 2016 to 17% in 2030. Decarbonisation of the power generation, where the largest part of gas is used, in the power sector is expected to be mainly supported by renewable sources (RES). Natural gas will have an important role to play in meeting the intermittency issues thus helping RES penetration. The main sectors in which demand increases are electricity generation (switching of lignite to natural gas), and transport (use of CNG instead of gasoline).

Implementation of Project Group SGC_03a will enable access of the Greek market to gas from the East Mediterranean Basin, Caspian Region, and Middle East, leading to reduction of gas supply prices, thus increasing the attractiveness of gas vis-à-vis alternative fuels. Marginal price in the market will decrease in most of the examined scenarios, in some cases up to 1 €/MWh. Consequently, Project Group SGC_03a will contribute to the benefits of fuel switching in Greece. The exact share of each supply source in the gas volumes substituting alternative fuels cannot be calculated, it is assumed that each entry point in the system will supply gas for fuel switching proportionately to its capacity.

> Gasification of Cyprus

EastMed Pipeline (TRA-N-0330), will enable gasification of **Cyprus**, through the relevant offtake. This is the only project in the TYNDP 2018 Low infrastructure level that allows gas supplies to the country. As a result, all the benefits from fuel switching and CO2 reduction savings in Cyprus are attributed to Project Group SGC_03a.

According to the TYNDP 2018 gas demand scenarios, gas in Cyprus will be used for electricity generation. Since natural gas will be a new fuel for the country, all foreseen gas demand will replace other fuels. Currently fuel oil is the dominant fuel used at the conventional power plants; in 2016 85% of electricity was generated using fuel oil, and 15% using diesel (source: Eurostat). Therefore, it is expected that natural gas will substitute fuel oil.

Due to the difference in efficiency between using natural gas and fuel oil for electricity generation, the fuel oil energy input at power plants substituted will be higher than the corresponding gas input. The existing oil-fired power plants in Cyprus have an average efficiency factor of 37% (source: IC Generation), while for the use of natural gas at the combined cycle gas-fired power plants, an efficiency factor of 58% is assumed. The resulting fuel replacement is presented in the table below.

Table 1: Fuel switching to gas per scenario

Unit: GWd/yr	2025 (CBG)	2025 (GBC)	2030 (Sustainable)	2040 (Sustainable)	2030 (Distributed)	2040 (Distributed)	2030 (EUCO)	2040 (Global Climate)
Gas demand (ENTSOG TYNDP 2018)	8,365	9,773	8,567	2,871	8,352	2,326	7,903	2,975
Substituted fuel oil input (based on efficiency difference)	13,078	15,280	13,394	4,488	13,058	3,637	12,356	4,652

The benefits of fuel switching are calculated based on the total cost of using gas input vis-à-vis using the corresponding fuel oil costs.

The reduction of CO2 emissions is monetized on the basis of the lower carbon footprint for gas compared to the fuel oil substituted, and the CO2 prices forecasted for the 20-year period of analysis. Fuel oil has a footprint of 0.28 tCO2/MWh, and of natural gas 0.20 tCO2/MWh.

The calculated benefits for fuel switching and CO2 reduction savings from gasification of Cyprus are presented in the table below. As there are no other projects in Cyprus in the Low infrastructure level, the results are the same for both scenarios

Table 2: Monetized benefits for Cyprus gasification (Low and Advanced Infrastructure Scenarios)

Unit: Mil. EUR	2025 (CBG)	2025 (GBC)	2030 (Sustainable)	2040 (Sustainable)	2030 (Distributed)	2040 (Distributed)	2030 (EUCO)	2040 (Global Climate)
CO2 Emission Saving	51	125	172	31	99	44	158	89
Fuel Switch Saving	498	452	592	169	577	180	453	121

As explained in the “Other Benefits” section, the project group will lead also to the gasification of **Crete Island**.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Belgium							13%	11%	-3%															
Croatia							13%	10%	-3%										13%	10%	-3%			
Czechia													4%	1%	-3%				13%	10%	-3%			
Denmark							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
France													5%	2%	-3%				14%	11%	-3%			
FYROM																			13%	10%	-3%			
Germany							13%	10%	-3%				4%	1%	-3%				13%	11%	-3%			
Ireland																			14%	11%	-3%			
Italy							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Luxembourg							13%	10%	-3%															
Netherlands							13%	10%	-3%				4%	2%	-2%									
Poland													4%	1%	-3%				13%	10%	-3%			
Slovakia													4%	1%	-3%				13%	10%	-3%			
Slovenia							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Sweden							13%	10%	-3%				4%	1%	-3%									
Switzerland							13%	10%	-3%				4%	1%	-3%									
Dependence to RU (%)																								
Belgium							13%	11%	-2%	3%	0%	-3%												
Bosnia Herzegovina	21%	17%	-4%				16%	0%	-16%										6%	0%	-6%			
Bulgaria	21%	16%	-5%				15%	0%	-15%										5%	0%	-5%			
France							15%	12%	-3%	3%	0%	-3%							13%	9%	-4%			
FYROM							16%	0%	-16%										6%	0%	-6%			
Germany							28%	26%	-2%	9%	6%	-3%												
Italy							24%	19%	-5%	5%	0%	-5%	15%	5%	-10%				22%	13%	-9%			
Luxembourg							13%	11%	-2%	3%	0%	-3%												
Netherlands							24%	19%	-5%	5%	0%	-5%	16%	13%	-3%									
Serbia	21%	16%	-5%				16%	0%	-16%										5%	0%	-5%			
Switzerland							24%	19%	-5%	5%	0%	-5%	16%	6%	-10%				22%	15%	-7%			
LNG and Interconnection Capacity Diversification (LICD)																								
Greece							10000	5927	-4073	10000	5014	-4986	10000	5000	-5000	10000	5485	-4515	10000	5665	-4335	10000	5244	-4756
Italy	3003	2457	-545	3003	2457	-545	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672
Supply Source Access (SSA)																								
Bosnia Herzegovina	3	4	1				3	4	1										3	4	1			
Bulgaria	3	4	1																2	3	1			
Cyprus							0	4	4	0	4	4	0	4	4	0	4	4	0	3	3	0	4	4
FYROM	1	2	1				1	3	2	2	3	1	2	3	1	2	3	1	1	2	1	2	3	1
Greece	2	3	1				2	5	3	3	5	2	3	5	2	3	5	2	2	5	3	3	5	2
Serbia	3	4	1				3	4	1										3	4	1			

Row Labels	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Greece							52%	81%	29%							71%	100%	29%	69%	100%	31%			
Italy							55%	61%	6%	70%	76%	6%	70%	77%	6%	82%	87%	6%	69%	75%	6%	89%	96%	7%
Remaining Flexibility Peak day (%)																								
Bulgaria	88%	88%	1%	88%	89%	1%	75%	99%	24%	77%	100%	23%				79%	100%	21%	81%	100%	19%	78%	100%	22%
Greece							27%	51%	25%	51%	80%	28%				44%	71%	27%	37%	62%	26%	46%	72%	27%
Italy							32%	38%	6%	51%	56%	5%	48%	53%	5%	63%	68%	5%	35%	41%	6%	62%	67%	6%
Single Largest Infrastructure Disruption (SLID)-Greece																								
FYROM	6%	0%	-6%	2%	0%	-2%	9%	0%	-9%	20%	0%	-20%				22%	0%	-22%	28%	0%	-28%	22%	0%	-22%
Greece	27%	0%	-27%	23%	0%	-23%	36%	0%	-36%	21%	0%	-21%				23%	0%	-23%	29%	0%	-29%	22%	0%	-22%
Single Largest Infrastructure Disruption (SLID)-Serbia																								
Bosnia Herzegovina				12%	10%	-2%																		
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
EU export to Ukraine							2%	0%	-2%															
Ireland							2%	0%	-2%															
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria							6%	2%	-4%															
Bosnia Herzegovina							8%	4%	-4%	6%	0%	-6%				4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Bulgaria							9%	4%	-5%	7%	0%	-7%				5%	0%	-5%	8%	6%	-2%	6%	0%	-6%
Czechia							4%	2%	-2%										6%	5%	-1%			
FYROM										8%	0%	-8%				6%	3%	-3%				6%	0%	-6%
Germany							5%	2%	-3%										6%	5%	-1%			
Greece							4%	2%	-2%										2%	0%	-2%			
Hungary							6%	4%	-2%															
Italy							6%	2%	-4%										3%	0%	-3%			
Luxembourg							6%	4%	-2%										8%	6%	-2%			
Serbia							8%	4%	-4%	6%	0%	-6%				4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Slovakia							6%	2%	-4%															
Slovenia							6%	4%	-2%										8%	6%	-2%			
Switzerland							6%	4%	-2%															

ADVANCED Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria							8%	5%	-3%										3%	0%	-3%			
Belgium							8%	5%	-3%										4%	1%	-3%			
Bosnia Herzegovina							8%	4%	-4%										3%	0%	-3%			
Bulgaria							7%	0%	-7%										3%	0%	-3%			
Croatia							8%	4%	-4%										3%	0%	-3%			
Czechia							8%	5%	-3%										3%	0%	-3%			
Denmark							8%	4%	-4%										3%	0%	-3%			
Estonia							7%	4%	-3%										3%	0%	-3%			
Finland							7%	4%	-3%										3%	0%	-3%			
France							8%	5%	-3%										4%	1%	-3%			
FYROM							8%	4%	-4%										4%	0%	-4%			
Germany							8%	4%	-3%										4%	0%	-3%			
Greece							8%	4%	-4%										3%	0%	-3%			
Hungary							8%	4%	-4%										3%	0%	-3%			
Ireland							8%	5%	-3%										4%	1%	-3%			
Italy							8%	5%	-3%										4%	0%	-4%			
Latvia							7%	4%	-3%										3%	0%	-3%			
Lithuania							7%	4%	-3%										3%	0%	-3%			
Luxembourg							8%	5%	-3%										4%	1%	-3%			
Netherlands							8%	5%	-3%										4%	1%	-3%			
Poland							8%	4%	-4%										3%	0%	-3%			
Serbia							8%	4%	-4%										3%	0%	-3%			
Slovakia							8%	5%	-3%										3%	0%	-3%			
Slovenia							8%	5%	-3%										3%	0%	-3%			
Sweden							8%	5%	-3%										3%	0%	-3%			
Switzerland							8%	5%	-3%										4%	0%	-4%			
United Kingdom							8%	5%	-3%										4%	1%	-3%			
Dependence to RU (%)																								
Austria							21%	18%	-3%				13%	10%	-3%									
Belgium							13%	10%	-3%															
Bosnia Herzegovina							21%	18%	-3%				13%	10%	-3%									
Bulgaria	19%	9%	-11%	8%	0%	-8%	20%	0%	-20%															
Croatia							21%	18%	-3%															
Czechia							21%	18%	-3%															
Denmark							21%	18%	-3%				13%	10%	-3%									
Estonia							21%	18%	-3%															
Finland							21%	18%	-3%															
France							14%	11%	-3%															
FYROM							20%	14%	-6%															
Germany							21%	18%	-3%				12%	10%	-2%									
Hungary							21%	18%	-3%				12%	10%	-2%									
Italy							21%	17%	-4%				12%	5%	-7%				21%	12%	-9%			
Latvia							21%	18%	-3%															
Lithuania							21%	18%	-3%															
Luxembourg							14%	10%	-4%															
Netherlands							21%	18%	-3%															
Poland							21%	18%	-3%															
Serbia							21%	18%	-3%															
Slovakia							21%	18%	-3%															
Slovenia							21%	18%	-3%				13%	10%	-3%									
Sweden							19%	17%	-2%				13%	10%	-3%									
Switzerland							21%	17%	-4%				12%	6%	-6%				21%	13%	-8%			
LNG and Interconnection Capacity Diversification (LICD)																								
Greece							10000	5927	-4073	10000	5014	-4986	10000	5000	-5000	10000	5485	-4515	10000	5665	-4335	10000	5244	-4756
Italy	2641	2218	-423	2641	2218	-423	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530
Supply Source Access (SSA)																								
Cyprus							0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4
Finland																			2	3	1			
FYROM							2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Greece							2	4	2	2	4	2	2	4	2	2	4	2	2	4	2	2	4	2

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Greece							52%	81%	29%							71%	100%	29%	69%	100%	31%			
Italy							55%	61%	6%	70%	77%	6%	70%	77%	7%	81%	88%	7%	69%	75%	6%	89%	96%	7%
Remaining Flexibility Peak day (%)																								
Greece							27%	51%	25%	51%	80%	28%				44%	71%	27%	37%	62%	26%	46%	72%	27%
Italy							41%	46%	5%	51%	57%	5%	48%	54%	6%	63%	69%	6%	50%	55%	5%	63%	69%	6%

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	**EU Bill Benefits (MEUR/y)**						
	Reference	472.8	772.8	537.6	329.8	537.8	386.3
	Supply Maximization	740.8	1,044.9	739.2	492.4	803.0	549.4
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.7	10.2	7.1	0.0	0.0	0.0
	2 Weeks	0.5	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	141.7	214.4	156.6	131.8	195.9	150.3
	Fuel Switch savings	379.4	392.2	330.2	379.4	388.1	325.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	612.3	289.5	870.5	519.7	884.9	538.3	772.8	472.8
Supply Maximization	881.4	102.6	1,142.8	312.0	1,179.5	794.0	522.4	369.6
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	10.2	2.7	10.2	2.7	7.8	0.6	10.2	2.7
2 Weeks	0.5	0.0	0.5	0.0	0.0	0.0	0.5	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	214.4	141.7	214.4	141.7	197.9	134.7	214.4	141.7
Fuel Switch savings	392.2	330.2	392.2	330.2	365.0	296.7	392.2	330.2

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	248.2	42.4	445.2	233.0	622.5	381.9	537.8	329.8
Supply Maximization	683.3	0.0	888.8	0.0	926.3	562.2	401.5	246.2
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	195.9	131.8	195.9	131.8	180.3	124.4	195.9	131.8
Fuel Switch savings	388.1	325.4	388.1	325.4	359.9	290.8	388.1	325.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0010[3]	Pipeline	The overall permanent land acquisition for Poseidon Project is planned to be 3.043.200 m2. However, in most of this area, there will be no environmental or other impact. The temporary land acquisition for the Pipeline Working strip including temporary facilities at crossings is planned to be 24.192.828m2, while 348.040m2 is planned for the Stations (Compressor Stations and M-01), 240.840m2 for the Stations (25 BVSs and 2 SS) and 104.740m2 for the Operation and Maintenance Buildings (O&Ms).	Natura 2000 sites: - GR1110009 - GR1130006 - GR1130009 - GR1130010 - GR1150001 - GR1150005 - GR1150010 - GR1210001 - GR1220002 - GR1220010 - GR1230001 - GR1230004 - GR2120006 - GR2120008 - GR2130006 - GR2130011 - GR2130012 - GR2130013 National Parks: ▪ National Park of Eastern Macedonia and Thrace ▪ Northern Pindos National Park ▪ National Park of Tzoumerka, Peristeri and Arachthos Gorge Wildlife Refuges: ▪ Wildlife Refuge Kavissos - Pilea - Ferres ▪ Wildlife Refuge Kirki, Municipality of Alexandroupolis ▪ Chatisio (Kosmio) ▪ Kotza Orman of Nestos Municipality of Topiro ▪ Kastene Ntag of Orino Municipality ▪ Wildlife refuge Louggas - Kava - Gikia - Ntermentersi (Krinides - Phyllidos) ▪ Wildlife Refuge Gallikos River (Eptalofos-Koronouda-Terpyllos-Anavrytos) ▪ Wildlife Refuge Koutsochori ▪ Wildlife Refuge Kouri - Ag. Eleftherios ▪ Wildlife Refuge Kissavos ▪ Wildlife Refuge Tsouka Karali- Veloni ▪ Wildlife refuge Metsovo - Chrysovitsa - Grevenitio Wildife refuge Paramythia - Petousi - Ag. Kyriaki

[3] *The information provided in the above table summarizes the results of: (i) the final Environmental Impact Assessment (EIA) for the offshore section, which has been approved by the Greek Ministry of Environment and Energy in January 2015, and (ii) the EIA for the onshore section, which has been submitted to the Greek Ministry of Environment and Energy in July 2018 towards completion of the Project's environmental permitting process and is currently undergoing public consultation, expected to be concluded in March 2019.*

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Construction phase 1. General - Accidental pollution 2. Health and Safety - Injuries and Casualties, Emergencies 3. LANDSCAPE AND MORPHOLOGICAL CHARACTERISTICS - Landscape Modification 4. **NATURAL ENVIRONMENT - Vegetation / Habitat loss, Fauna Loss / Disturbance** 5. SPATIAL PLANNING - LAND USE Alteration of land use 6. CULTURAL HERITAGE - Direct effect, Indirect effect, Negative impacts on scenery and character 7. SOCIOECONOMIC IMPACTS & LOCAL ECONOMY - Economic Impact on Rural Income 8. TECHNICAL INFRASTRUCTURE & ENVIRONMENTAL INFRASTRUCTURE SYSTEMS - Production of waste 9. NOISE & VIBRATIONS - Noise from project construction 10. SURFACE WATER BODIES - Modification of morphology, Impacts on the quality, Impacts on quantity	Construction phase: 1. Preparation of a Pollution Prevention and Managing Plan, a Waste Management Plan and a Hazardous Waste Management Plan. 2. Preparation of a Health and Safety and an Emergency Response Plan to be prepared by the EPC Contractor and to be reviewed by the Supervision. 3. Selection of a predefined working strip according to the area based on the area type. Typical working strip shall be 38 m wide; in forests 22 m, in shrublands 28 m. - Landscape Management and Restoration and Erosion Control Plan shall be developed with details regarding phytotechnical restoration, reforestation of forest areas (in compliance to L. 4280/2014), erosion control measures, possible hydroseeding. The pipeline protection strip (8 m wide) will be, according to the regulations, free of deep-rooted trees. 4. - Establishment of a pre-construction biodiversity baseline. - Establishment of reduced working strip (22 m) through forest areas and sensitive areas for biodiversity. - Avoidance, where possible, to open new access roads. Upgrade of existing roads is recommended. - An ecology specialist will monitor implementation of environmental terms, per construction front, especially in areas of biodiversity interest. - For the protection of riparian vegetation, trenchless techniques will be applied, where techno-economically recommended. - Preparation of Appropriate Assessments for Natura 2000 areas will be included in the Environmental Impact Assessment and will be reviewed by the competent Public Authorities. - Develop a Biodiversity Management Plan (including Large Mammals Management Plan). - Avoidance of construction activities during the avifauna breeding period in environmentally sensitive areas. 5. Land Rights Acquisition Plan will be prepared. 6. Appropriate siting of the Project and its facilities (temporary or permanent). - Signing a Memorandum of Understanding between the Project Owner and the Ministry of Culture. In the event that antiquities are found during the work, the work will be interrupted in the section deemed necessary by the competent Authority for the protection of antiquities, followed by the updating of the Memorandum of Cooperation with the newest details of the works and an excavation survey by a specialist team, at a cost that will be borne by the Project Owner, including	The additional costs have been incorporated in the relevant cost estimations (CAPEX) and concern the following main items: ▪ Route modifications in order to maximize the distance from sensitive receptors as well as settlements, monuments, etc. ▪ Cost of environmental mitigation measures in environmentally sensitive areas. ▪ Cost of reforestation areas in working zone and (possibly) other areas expected to be defined by the Forest Authorities. ▪ Cost of follow up during the construction and operation period. ▪ Best Available Technology for the equipment to be installed for the Project.	N/A

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
	the maintenance of the findings. - All excavation works shall be supervised by the competent Archaeological Authority. 7. Restoration framework for the means of livelihood which reliably determines the compensation to be paid to the eligible land owners. - Treatment and disposal of waste products shall be implemented by following strictly the applicable regulations. - Disposal of forest products to residents and users of forests, after consultation with the competent authorities. 8. Hazardous Waste and non - Hazardous Waste Management Plan. - Minimization of excavated and other construction waste by re-use in cases when this is technically feasible according to specifications. 9. Compliance to the legislative provisions for mechanical equipment. - Application of best noise reduction techniques to mechanical equipment. - Avoidance of explosives use in populated areas. - Avoidance of explosives use in protected areas during breeding season. 10. - Trenchless methods will be applied, where techno-economically recommended. - Water Management Plan to identify and manage any surface and/or groundwater pumping needs and to manage surface water runoff. - Waste Management Plan and Hazardous Waste and Materials Management Plan. - Pollution Prevention and Response Plan. - Wherever possible, contact of machinery with surface water will be avoided. - Appropriate scheduling of construction work during periods of low flow or preferably during dry conditions (August - November). - Flood and erosion control measures will be implemented. - The construction contractor will obtain all relative permits from the Competent Authorities, prior to water abstraction and hydrotest water discharge. - The Contractor shall prepare a Hydtotesting Plan, which shall be included in the Water Management Plan, for each pipeline's hydrotesting section plus any hydrotesting of above ground facilities (i.e. compressor stations). - Hydrotest water will not be discharged in different river basin and will be free of biocides prior of discharge. - Any additives used will be included in the PLONOR list.		
Operation phase 1. CLIMATIC AND BIOCLIMATIC CHARACTERISTICS - Greenhouse gas emissions increase 2. LANDSCAPE AND MORPHOLOGICAL CHARACTERISTICS - Landscape Modification,	Operation phase: 1. - In compliance with MD 36060/1155/E.103/2013, (HGG 1450/B/14.6.2013), NOx, SO2, CO emissions, during operation, should be monitored and the results forwarded to the competent Greek Authority for check and emissions monitoring	The additional costs have been incorporated in the relevant cost estimations (OPEX)	N/A

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Viewer nuisance 3. SOCIO-ECONOMIC ENVIRONMENT – LOCAL ECONOMY 4. AIR QUALITY / EMISSIONS 5. NOISE AND VIBRATIONS - Noise from Stations operation	- Monitoring of plant restoration for at least 3 years after the completion of planting works. 2. Buildings will be designed (including the use of appropriate materials and colors) so as to match the landscape as much as possible. 3. - Fair and transparent recruitment process for all new jobs. - Publicize jobs so that they are accessible locally. - Provision of information locally (chambers of commerce and business organizations). 4. - Best Available Technologies shall be implemented. - Compression Station location will be away from sensitive recipients. - Regular maintenance of the equipment. - Installation of NOx, SOx & CO emission monitoring systems. 5. Application of appropriate sound insulation measures to equipment inside the Compression Stations so as to comply with legislative limits within property boundaries.		

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0330	Pipeline	4,480,732 m^2 *Note1: The area in m^2 of impact zone has been calculated concerning exclusively the environmentally sensitive areas and considering a conservative 38m width working strip. The overall area of the working strip along the pipeline route is estimated conservatively to be 20,388,154 m^2. However, in most of this area, there will be no environmental or other impact. **Note2: The referred areas are based on the existing studies and they are expected to be confirmed during the next design phase.	▪ Natura (GR2540007), ▪ Natura (GR2310001 & GR2310015), ▪ Natura (GR2110001 & GR2110004), ▪ Natura (GR2310009), ▪ National Park ▪ (Messolongi-Aitoliko Lagoon), ▪ Wildlife Refuge (Mountain Arakynthos-Mataragas-Gavalo), ▪ Wildlife Refuge (Petalas), ▪ Wildlife Refuge ▪ (Monastery of Retha & Longos), ▪ National Park (Amvrakikos), ▪ Wildlife Refuge (Lekatsa), Wildlife Refuge (Pratagos - Aetofolia)

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
Construction phase	Construction phase:	The additional costs have been	N/A

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
1. General - Accidental pollution 2. Health and Safety - Injuries and Casualties, Emergencies 3. LANDSCAPE AND MORPHOLOGICAL CHARACTERISTICS - Landscape Modification 4. **NATURAL ENVIRONMENT - Vegetation / Habitat loss, Fauna Loss / Disturbance** 5. CULTURAL HERITAGE - Direct effect, Indirect effect, Negative impacts on scenery and character 6. SOCIOECONOMIC IMPACTS & LOCAL ECONOMY - Economic Impact on Rural Income 7. TECHNICAL INFRASTRUCTURE & ENVIRONMENTAL INFRASTRUCTURE SYSTEMS - Production of waste 8. NOISE & VIBRATIONS - Noise from project construction 9. SURFACE WATER BODIES - Modification of morphology, Impacts on the quality, Impacts on quantity	1. Preparation of a Pollution Prevention and Managing Plan, a Waste Management Plan and a Hazardous Waste Management Plan. 2. Preparation of a Health and Safety and an Emergency Response Plan to be prepared by the EPC Contractor and to be reviewed by the Supervision. 3. - Selection of a predefined working strip according to the area based on the area type. Typical working strip shall be 38 m wide; in forests 22 m, in shrublands 28 m. - Preparation of a phytotechnical restoration study of the forest area, while erosion control measures will be implemented. The pipeline access and protection strip (8 m wide) will be maintained, according to the regulations, free of deep-rooted trees. 4. - Establishment of a pre-construction biodiversity baseline. - Establishment of reduced working strip (22 m) through forest areas and sensitive areas for biodiversity. - Avoidance, where possible, to open new access roads. Upgrade of existing roads is recommended. - For the protection of riparian vegetation, trenchless techniques will be applied, where techno-economically recommended. - Preparation of Appropriate Assessments for Natura 2000 areas will be included in the Environmental Impact Assessment and will be reviewed by the competent Public Authorities. - Develop a Biodiversity Management Plan (including Large Mammals Management Plan). - Avoidance of construction activities during the avifauna breeding period in environmentally sensitive areas. 5. - Appropriate siting of the Project and its facilities (temporary or permanent). - Signing a Memorandum of Understanding between the Project Owner and the Ministry of Culture. - All excavation work shall be supervised by the competent Archaeological Authority. 6. - Land Rights Acquisition Plan will be prepared. - Restoration framework for the means of livelihood which reliably determines the compensation to be paid to the eligible land owners. 7. - Hazardous Waste and non - Hazardous Waste Management Plan. - Minimization of excavated and other construction waste by re-use in cases when this is technically feasible according to specifications. - Treatment and disposal of waste products shall be implemented by following strictly the applicable regulations. 8. - Compliance to the legislative provisions for mechanical equipment. -	incorporated in the relevant cost estimations (CAPEX) and concern the following main items: ▪ Route modifications in order to maximize the distance from sensitive receptors as well as settlements, monuments, etc. ▪ Cost of environmental mitigation measures in environmentally sensitive areas. ▪ Cost of reforestation areas in working zone and (possibly) other areas expected to be defined by the Forest Authorities. ▪ Cost of follow up during the construction and operation period. ▪ Best Available Technology for the equipment to be installed for the Project.	

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
	Avoidance of explosives use in populated areas. 9. - Trenchless methods will be applied, where techno-economically recommended. - Preparation of a Water Management Plan and a Pollution Prevention and Response Plan. - Appropriate scheduling of construction work during periods of low flow or preferably during dry conditions (August - November). - Flood and erosion control measures will be implemented. - The construction contractor will obtain all relative permits from the Competent Authorities, prior to water abstraction and hydrotest water discharge.		
Operation phase 1. LANDSCAPE AND MORPHOLOGICAL CHARACTERISTICS - Landscape Modification, Viewer nuisance 2. AIR QUALITY / EMISSIONS 3. NOISE AND VIBRATIONS - Noise from Stations operation	Operation phase: 1. - Monitoring of plant restoration for at least 3 years after the completion of planting works. - Buildings will be designed (including the use of appropriate materials and colors) so as to match the landscape as much as possible. 2. - Studies of air emissions dispersion will be included in the EIA. Moreover, in compliance with the legislative requirements, NOx, SO2, CO emissions, during operation, shall be monitored and the results forwarded to the competent Authority for check and emissions monitoring. - Compression Station location will be away from sensitive recipients. - Regular maintenance of the equipment. - Installation of NOx, SOx & CO emission monitoring systems. 3. Application of appropriate sound isolation measures to equipment inside the Compression Stations so as to comply with legislative limits within property boundaries.	The additional costs have been incorporated in the relevant cost estimations (OPEX)	N/A

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-007	Sulmona-Foligno pipeline	DN 1200 (48") length 170,22 km	SIC IT7110097 “Fiumi Giardino – Sagittario – Aterno – Sorgenti del Pescara”; ZPS IT7110128 “Parco Nazionale Gran Sasso Monti della Laga”; SIC IT5210067 “Monti Pizzuto – Alvagnano”; SIC IT5210059 “Marcite di Norcia”; SIC IT5210046 “Valnerina”.
	Foligno-Sestino Pipeline	DN 1200 (48") length 113,65 (km)	SIC IT5210024 “Fiume Topino”; SIC IT5210013 “Boschi del Bacino di Gubbio”; SIC IT5210004 “Boschi di Pietralunga”.
	Sestino-Minerbio pipeline	DN 1200 (48") length 140,70 (km)	SIC-ZPS IT4050022 “Biotopi e ripristini ambientali di Medicina e Molinella”; ZPS IT4050023 “Biotopi e ripristini ambientali di Budrio e Minerbio”;

			SIC IT4050006 “Valle Benni”; SIC IT4080014 “Rio Mattero e Rio Cuneo”.
	Sulmona Compressor station	119.176 sqm	There is not direct interference between the site and the surrounding protected area both Natura 2000 Network and National or regional protected areas
TRA-N-1195	Matagiola- Massafra pipeline	DN 1400 (56”) lenght: 79 km	SIC IT9130007 "Aree delle Gravine"

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-N-007 - Sulmona-Foligno pipeline Presence of priority habitats and priority fauna species (invertebrates, reptiles, amphibious, mammals, birds and fish). (Att 1-2 Dir.92/43/CEE)	Mitigation project for each area SIC agreed with the Region; Optimization of the routing of the pipeline to preserve the Habitats, use of a reduced right of way, care in the execution of the works to preserve wet areas Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries. Conservation measures for at least three years following the construction works.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-007 - Foligno-Sestino pipeline Presence of priority habitats and priority fauna species (invertebrates, birds and fish). (Att. 1-2 Dir.92/43/CEE)	Mitigation project for each area SIC agreed with the Region; Optimization of the routing of the pipeline to preserve the Habitats, use of a reduced right of way, care in the execution of the works to preserve wet areas Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries. Conservation measures for at least three years following the construction works.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-007 - Sestino-Minerbio pipeline Presence of primary habitats and priority fauna species (invertebrates, reptiles, amphibious, birds and fish). (Att.1-2 Dir.92/43/CEE)	Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-N-007 - Sulmona Compressor station The EIA and the asssessment under the habitat directive conducted for the site highlighted that the impact on the surrounding protected areas is negligible	A General mitigations measure not related to sensitive areas is the revegetation of the area of the compressor station	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-1195 Matagiola- Massafra pipeline Interference with the Habitat and the species (flora and fauna) listed the EU Habitats Directive (92/43/EEC) inside the SIC	To further analyse the possibility of a trenchless to cross the SIC "Aree delle Gravine"; To further analyse the Olive trees transplant before works and re-planted after works.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A

***Note3: The referred mitigation measures will be further detailed and enriched in the next development phase.

Environmental Impact explained [Promoter]

The realization of projects in the Group will follow the best practices and all environmental laws and prescriptions. The environmental impacts have been minimized by a careful evaluation and choice of the possible routes for the projects' layouts. Additionally, mitigation measures and environmental restoration works ensure that the realization of the projects respects the crossed areas, further minimising potential impacts.

Additional information (Environmental impact) [Promoter]

Considering the substitution of more pollutant fuels across several sectors (e.g. power generation, residential and transportation), the projects of the Group have substantial benefits in terms of reduction of air contaminants, such as NOx, SOx, PMx, which are highly dangerous for human health and for the overall environment. Since the PS-CBA currently captures only CO2 emission reductions, these benefits are not monetised but should be taken into account for a proper evaluation of the projects' benefits.

Moreover, the projects of the Group allow new competitive gas sources in the European network that can enhance, both environmentally and economically, the support of RES production. In fact, the growth of electricity renewable sources is strictly connected to the availability of flexible back-up solutions. CCGT and cogeneration solutions, thanks to their flexibility, low CO2 impacts and affordable costs, are best placed to deliver the back-up required by renewable sources.

All additional costs related to measures for the mitigation of environmental impact have been incorporated in the relevant cost estimations (CAPEX & OPEX).

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

> **Enhancing Security of Supply by providing a multi-source route,** including the Caspian Region, the Middle East, Central Asia and the Levantine Basin, for completion of the SGC and the supply of Greek, Italian and European markets, also enabling supplies from indigenous EU production. Indicatively, in a scenario where the main Italian import infrastructure is disrupted for 30 days, the promoters estimate that the Group's projects could mitigate the resulting gas shortage with benefits of up to 1.8 billion €, depending on the reference year and the availability of other sources such as North African gas.

> **Enhanced market liquidity in Italian, Greek and EU markets**, exerting downward pressure on European gas prices, through reverse flow capacity of the Group's projects and of recently commissioned reverse-flow interconnections from Italy to France and Germany, which will enhance inter-regional transactions between South East Europe and Western Europe. Levantine Basin reserves can address broader EU issues, such as L-gas replacement and Groeningen/North-Sea decreasing production. Indicatively, a 0.5 €/MWh price differential between L-gas and gas supplied by the Group's projects, applied to demand of 5 bcm/yr (considering that L-gas consumption just for France, Germany and Belgium is around 30 bcm/year) would lead to potential benefits of about 26 M€/year.

> **Improved operation logistics of European transmission system** as it will enable imports of up to 20 bcm/yr through the southern part of the system, improving the EU South-North corridor potential.

> **Gasification of Cyprus and Greek regions (Crete, Peloponnese and Western Greece)** contributing to a cleaner and more efficient energy mix and overcoming dependence on imported petrol products. With reference to Crete, the gasification of the island with impact on residential and, in particular, on power generation sectors, will allow switch from traditional fuels, such as heavy oil, to gas in the different scenarios and for the whole period. The maximum potential benefit is up to about 8.5 bn€ in the reference case (25 years undiscounted benefit). The additional benefit related to Crete gasification could lead to a maximum improvement in the B/C ratio in the range of 0,4 points.

> **Ending isolation and enhancing market integration of Cyprus to the EU gas market**, through the dual-flow EastMed Pipeline which is the only economically efficient option providing a direct physical connection of Cyprus with Greece.

> **Enhanced flexibility in Greece** as Poseidon Pipeline offers the possibility of developing one or more additional off-takes in Greece, within limited time and with low capital requirement.

> **Diversification of counterparts** in Greece, Italy, and South East Europe as it will allow potential new participants to enter the respective markets.

F. Useful Links

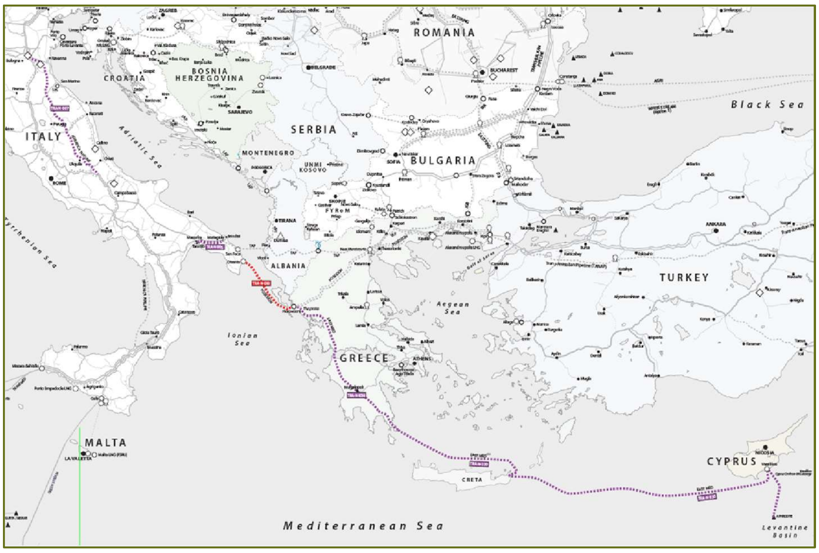
TRA-N-0007, TRA-N-1195: http://www.snam.it/repository-srg/file/it/business-servizi/Processi_Online/Allacciamenti/informazioni/piano-decennale/pd_2018_2027/Piano_decennale_2018-2027.pdf
pages 67 – 69 and 112 – 114.
TRA-N-0330: http://igi-poseidon.com/
TRA-N-0010: http://igi-poseidon.com/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group SGC_03b

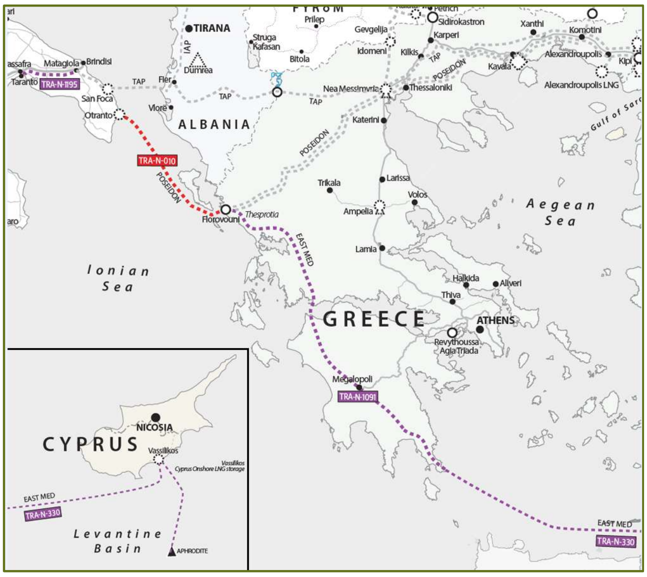
Reasons for grouping [ENTSOG]

The project group represents a gas supply chain which aims at connecting the East Mediterranean gas resources to the European gas system. The corridor starting point is the off-shore gas field production in Levantine Basin (Cyprus and Israel) while the destination point is Greece and southern Italy (via Off-Shore section of Poseidon Pipeline) and further north towards Europe via Matagiola - Massafra pipeline (TRA-N-1195) and Adriatica Line (TRA-N-7).



Objective of the project(s) in the group [Promoter]

The primary objective of the project group is to provide a multi-source option for the completion of the Southern Gas Corridor by providing a permanent connection to the recently discovered gas reserves in the Levantine Basin. Specific objectives: (i) strengthening security of supply though diversification of routes and sources for the EU market, (ii) enhancing market integration and competition, (iii) enabling gasification of Cyprus and Crete, and (iv) providing a permanent connection of the gas reserves in the Levantine Basin with European gas markets, thus enabling additional supplies from indigenous EU sources and contributing to EU gas import dependence reduction, (v) in particular Matagiola – Massafra and Adriatica Line are network developments having a character of generality, required to create new entry capacity in the south/centre of Italy to intake additional gas quantities from any new or existing entry points located from Sicily to the middle Adriatic Sea (for Adriatica Line) and, in particular, from Apulia region (for Matagiola –Massafra pipeline).



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0010	Off-Shore Section of Poseidon Pipeline	IGI Poseidon S.A.	GR	Advanced	7.3.3	2022	2025	Rescheduled
TRA-N-0007	Development for new import from the South (Adriatica Line)	Snam Rete Gas S.p.A.	IT	Less-Advanced	7.3.4	2025	2025	NA
TRA-N-0330	EastMed Pipeline	IGI Poseidon S.A.	GR	Less-Advanced	7.3.1	2025	2025	Rescheduled
TRA-N-1091	Metering and Regulating station at Megalopoli	DESFA S.A.	GR	Less-Advanced	7.3.1	2025	2025	Rescheduled
TRA-N-1195	Matagiola - Massafra pipeline	Snam Rete Gas	IT	Less-Advanced	NA	2025	2025	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0007	1200	430	33
TRA-N-0010	915	210	75
TRA-N-0330	1070	553	-
TRA-N-0330	660	1153	220
TRA-N-0330	610	165	-
TRA-N-1091	-	-	-
TRA-N-1195	1400	80	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-0007	Snam Rete Gas S.p.A.	Italy Mezzogiorno Import Fork	2025	264	-
TRA-N-0010	IGI Poseidon S.A.	Otranto - IT / IGI Poseidon	2022	160	380
TRA-N-0010	IGI Poseidon S.A.	Otranto - IT / IGI Poseidon	2025	-	250
TRA-N-0010	IGI Poseidon S.A.	East Med / Thesprotia (Poseidon)	2025	320	-
TRA-N-0330	IGI Poseidon S.A.	East Med / Cyprus/Israeli Production Field	2025	330	-
TRA-N-0330	IGI Poseidon S.A.	East Med / Cyprus (CY)	2025	-	30
TRA-N-0330	IGI Poseidon S.A.	East Med / Crete (GR)	2025	190	20
TRA-N-0330	IGI Poseidon S.A.	East Med / Thesprotia (Poseidon)	2025	-	350
TRA-N-0330	IGI Poseidon S.A.	East Med / Peloponnesus (GR)	2025	-	90
TRA-N-1091	DESFA S.A.	East Med / Peloponnesus (GR)	2025	90	-
TRA-N-1195	Snam Rete Gas S.p.A.	Melendugno - IT / TAP	2025	310	-
TRA-N-1195	Snam Rete Gas S.p.A.	Otranto - IT / IGI Poseidon	2025	310	-

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-330	TRA-N-1091	TRA-N-10	TRA-N-7	TRA-N-1195
CAPEX [mln. EUR]	7800.00	5200.00	7.50	973.70*	1379.00	240.00
Range CAPEX		30%	25%	30%	30%	30%
OPEX [mln. EUR/y]	167.69	90.00	0.15	75.7*	1.70	0.14

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

Costs represent best estimations available to project promoters at the moment of TYNDP 2018 call for projects (start of 2018), and the actual results may differ from the forecasted amounts. Since 2018, further detailed analysis has been carried out and costs appraisals might have changed. CAPEX ranges take into account the maturity of the projects and the cost contingencies which could reasonably be anticipated at the moment of TYNDP 2018 data collection.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

The project group **increases the diversification of entry points** in Greece and Italy. The impact on Greece is very significant with the LICD indicator halving compared to the situation without the project.

Enabling the connection of Europe to new supply sources mainly from East Mediterranean Basin, the group realisation also allows to **significantly reduce the dependence** from the two main supply sources, Russia and LNG. Such benefits can further spread to different European countries thanks to the infrastructure included in the reference grid (Low infrastructure level). Under the Advanced infrastructure level, even more countries benefit from a supply dependence reduction.

With the realisation of this project group FYROM and Greece can now **access to an additional supply source**. The project has also a significant impact on Cyprus, **contributing to remove the country from isolation** from the rest of Europe. Cases where the number of new sources results particularly high has to be understood as an effect of withdraw propagation of prices as consequence of the fact that now all those markets are further interconnected. Also, Italy, being the final delivery point of this project group, is reached by new source from the Levantine basin. The fact that the Supply Source Access indicator (SSA) does not show an increase in the number of supply sources for Italy is linked to the standard threshold applied by ENTSOG to all the supply sources together with the consideration of this new source as a national production.

> **Security of Supply:**

The projects group increases the **remaining flexibility** in Greece, and Italy in case of peak demand and 2-weeks cold spell situation and of course of Cyprus.

In case of Ukrainian disruption and in Sustainable Transition the project group contributes to the **mitigation of risk demand curtailment** in Europe. In such situation most of Europe could in fact overall face risk of demand curtailment.

The project significantly mitigates the risk of demand curtailment in Greece **in case of disruption of its single largest infrastructure** (Agia Triada in the Low infrastructure level).

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. Thanks to the realisation of the project group, Europe can access to new source of gas from the East Mediterranean basin.

Fuel Switch benefits explained [Promoter]

The projects group allow the replacement of more pollutant fuels (such as coal, heavy oil and diesel/gasoline) with natural gas, which triggers the following positive effects: reduction of both the EU energy bill and CO2 emissions. These positive effects are expected to materialise considering the current fuel mix for power generation, heating and transportation sectors in the countries reached by the projects constituting this group.

> **Fuel Switching in Italy**

Gas will play an important role in Italian the decarbonization process, particularly in the power generation sector, where a complete phase-out of coal is expected by 2025 (8 coal power plants of approx. 8 GW will be shut down). Gas will also have a primary role in decarbonizing the transport sector (used in substitution of oil products, with the potential of covering between 20% and 35% of the sector energy demand by 2040, growing from around 2% today) and the industry sector (especially in the processes where high temperature heat is required). Gas will also have a role in the emission reduction of the residential & commercial sector given the gas heat pumps installed for substituting older oil and gas boilers.

Implementation of Project Group SGC_03b will enable access of the Italian market to gas from the East Mediterranean Basin, the Caspian Region and Middle East, leading to reduction of gas supply prices, thus increasing the attractiveness of gas vis-à-vis alternative fuels. Marginal price in the market will decrease in all price scenarios, with the decrease reaching 2 €/MWh in some cases. Consequently, Project Group SGC_03b will contribute to the benefits of fuel switching. Following the same rationale as for Greece, it is assumed that each entry point in the system will supply gas for fuel switching proportionately to its capacity.

Fuel Switch benefits explained (*cont'd*)

> Fuel Switching in Greece

For **Greece**, the additional quantities of gas will mainly replace oil in the residential and commercial sectors where gas penetration is still progressing. Gas demand in this sector is expected to increase from 8% in 2016 to 17% in 2030. Decarbonisation of the power generation, where the largest part of gas is used, in the power sector is expected to be mainly supported by RES. Natural gas will have an important role to play in meeting the intermittency issues thus helping renewable sources (RES) penetration.
The main sectors in which demand increases are electricity generation (switching of lignite to natural gas), and transport (use of CNG instead of gasoline).
Implementation of Project Group SGC_03b will enable access of the Greek market to gas from the East Mediterranean Basin, leading to reduction of gas supply prices, thus increasing the attractiveness of gas vis-à-vis alternative fuels. Marginal price in the market will decrease in most of the examined scenarios, in some cases up to 1 €/MWh. Consequently, Project Group SGC_03b will contribute to the benefits of fuel switching in Greece. The exact share of each supply source in the gas volumes substituting alternative fuels cannot be calculated, it is assumed that each entry point in the system will supply gas for fuel switching proportionately to its capacity.

> Gasification of Cyprus

EastMed Pipeline (TRA-N-0330), will enable gasification of **Cyprus**, through the relevant offtake. This is the only project in the TYNDP 2018 Low Infrastructure Level that allows gas supplies to the country. As a result, all the benefits from fuel switching and CO2 reduction savings in Cyprus are attributed to Project Group SGC_03b.
According to the TYNDP 2018 gas demand scenarios, gas in Cyprus will be used for electricity generation. Since natural gas will be a new fuel for the country, all foreseen gas demand will replace other fuels. Currently fuel oil is the dominant fuel used at the conventional power plants; in 2016 85% of electricity was generated using fuel oil, and 15% using diesel (source: Eurostat). Therefore, it is expected that natural gas will substitute fuel oil.
Due to the difference in efficiency between using natural gas and fuel oil for electricity generation, the fuel oil energy input at power plants substituted will be higher than the corresponding gas input. The existing oil-fired power plants in Cyprus have an average efficiency factor of 37% (source: IC Generation), while for the use of natural gas at the combined cycle gas-fired power plants, an efficiency factor of 58% is assumed. The resulting fuel replacement is presented in the table below.

Table 1: Fuel switching to gas per scenario

Unit: GWd/yr	2025 (CBG)	2025 (GBC)	2030 (Sustainable)	2040 (Sustainable)	2030 (Distributed)	2040 (Distributed)	2030 (EUCO)	2040 (Global Climate)
Gas demand (ENTSOG TYNDP 2018)	8,365	9,773	8,567	2,871	8,352	2,326	7,903	2,975
Substituted fuel oil input (based on efficiency difference)	13,078	15,280	13,394	4,488	13,058	3,637	12,356	4,652

The benefits of fuel switching are calculated based on the total cost of using gas input vis-à-vis using the corresponding fuel oil costs.
The reduction of CO2 emissions is monetized on the basis of the lower carbon footprint for gas compared to the fuel oil substituted, and the CO2 prices forecasted for the 20-year period of analysis. Fuel oil has a footprint of 0.28 tCO2/MWh, and of natural gas 0.20 tCO2/MWh.
The calculated benefits for fuel switching and CO2 reduction savings from gasification of Cyprus are presented in the table below. As there are no other projects in Cyprus in the Low or Advanced Infrastructure scenarios, the results are the same for both scenarios

Table 2: Monetized benefits for Cyprus gasification (Low and Advanced Infrastructure Scenarios)

Unit: Mil. EUR	2025 (CBG)	2025 (GBC)	2030 (Sustainable)	2040 (Sustainable)	2030 (Distributed)	2040 (Distributed)	2030 (EUCO)	2040 (Global Climate)
CO2 Emission Saving	51	125	172	31	99	44	158	89
Fuel Switch Saving	498	452	592	169	577	180	453	121

As explained in the "Other Benefits" section, the project group will lead also to the gasification of **Crete Island**.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

Sum of Value	Column Labels																							
	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to LNG (%)all																								
Austria							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Belgium							13%	11%	-3%															
Croatia							13%	10%	-3%										13%	10%	-3%			
Czechia													4%	1%	-3%				13%	10%	-3%			
Denmark							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
France													5%	2%	-3%				14%	11%	-3%			
FYROM																			13%	10%	-3%			
Germany							13%	10%	-3%				4%	1%	-3%				13%	11%	-3%			
Ireland																			14%	11%	-3%			
Italy							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Luxembourg							13%	10%	-3%															
Netherlands							13%	10%	-3%				4%	2%	-2%									
Poland													4%	1%	-3%				13%	10%	-3%			
Slovakia													4%	1%	-3%				13%	10%	-3%			
Slovenia							13%	10%	-3%				4%	1%	-3%				13%	10%	-3%			
Sweden							13%	10%	-3%				4%	1%	-3%									
Switzerland							13%	10%	-3%				4%	1%	-3%									
Dependence to RU (%)																								
Belgium							13%	11%	-2%	3%	0%	-3%												
France							15%	12%	-3%	3%	0%	-3%							13%	9%	-4%			
Germany							28%	26%	-2%	9%	6%	-3%												
Italy							24%	19%	-5%	5%	0%	-5%	15%	5%	-10%				22%	13%	-9%			
Luxembourg							13%	11%	-2%	3%	0%	-3%												
Netherlands							24%	19%	-5%	5%	0%	-5%	16%	13%	-3%									
Switzerland							24%	19%	-5%	5%	0%	-5%	16%	6%	-10%				22%	15%	-7%			
LNG and Interconnection Capacity Diversification (LICD)																								
Greece							10000	5927	-4073	10000	5014	-4986	10000	5000	-5000	10000	5485	-4515	10000	5665	-4335	10000	5244	-4756
Italy	3003	2457	-545	3003	2457	-545	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672	3003	2331	-672
Supply Source Access (SSA)																								
Cyprus							0	4	4	0	4	4	0	4	4	0	4	4	0	3	3	0	4	4
FYROM							1	2	1	2	3	1	2	3	1	2	3	1				2	3	1
Greece							2	4	2	3	5	2	3	5	2	3	5	2	2	4	2	3	5	2

Sum of Value	Column Labels																		
	2025	2030												2040					
	BEST ESTIMATE (GbC)	BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels		WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																						
Remaining Flexibility 2-Week Cold Spell (%)																						
Greece					52%	81%	29%							71%	100%	29%	69%	100%	31%			
Italy					55%	61%	6%	70%	76%	6%	70%	77%	6%	82%	88%	6%	69%	75%	6%	89%	96%	7%
Remaining Flexibility Peak day (%)																						
Greece					27%	51%	25%	51%	80%	28%				44%	71%	27%	37%	62%	26%	46%	72%	27%
Italy					32%	38%	6%	51%	56%	5%	48%	53%	5%	63%	68%	5%	35%	41%	6%	62%	67%	6%
Single Largest Infrastructure Disruption (SLID)-Greece																						
FYROM	0%	2%	0%	-2%	9%	0%	-9%	20%	0%	-20%				22%	0%	-22%	28%	0%	-28%	22%	0%	-22%
Greece	0%	23%	0%	-23%	36%	0%	-36%	21%	0%	-21%				23%	0%	-23%	29%	0%	-29%	22%	0%	-22%
Single Largest Infrastructure Disruption (SLID)-Slovakia																						
EU export to Ukraine					2%	0%	-2%															
Ireland					2%	0%	-2%															
Ukraine Disruption Curtailment Rate Peak Day (%)																						
Austria					6%	4%	-2%															
Germany					5%	3%	-2%															
Greece					4%	2%	-2%										2%	0%	-2%			
Hungary					6%	4%	-2%															
Italy					6%	3%	-3%										3%	0%	-3%			
Luxembourg					6%	4%	-2%															
Slovakia					6%	4%	-2%															
Slovenia					6%	4%	-2%															
Switzerland					6%	4%	-2%															

ADVANCED Infrastructure Level

Sum of Value / Row Labels	2025 BEST ESTIMATE (GbC)	2030 BEST ESTIMATE (CbG) WITHOUT	WITH	DELTA	SUSTAINABLE WITHOUT	WITH	DELTA	DISTRIBUTED WITHOUT	WITH	DELTA	EUCO30 WITHOUT	WITH	DELTA	2040 CLIMATE WITHOUT	WITH	DELTA	SUSTAINABLE WITHOUT	WITH	DELTA	DISTRIBUTED WITHOUT	WITH	DELTA
Competition																						
Dependence to LNG (%)all																						
Austria					8%	5%	-3%															
Belgium																	4%	1%	-3%			
Bosnia Herzegovina					8%	5%	-3%															
Croatia					8%	5%	-3%															
Czechia					8%	5%	-3%															
Denmark					8%	5%	-3%															
FYROM					8%	6%	-3%															
Germany					8%	5%	-2%										4%	1%	-3%			
Greece					8%	5%	-3%															
Hungary					8%	5%	-3%															
Ireland																	4%	1%	-3%			
Italy					8%	5%	-3%										4%	1%	-3%			
Luxembourg																	4%	1%	-3%			
Netherlands																	4%	1%	-3%			
Poland					8%	5%	-3%															
Serbia					8%	5%	-3%															
Slovakia					8%	5%	-3%															
Slovenia					8%	5%	-3%															
Sweden					8%	5%	-3%															
Switzerland																	4%	1%	-3%			
United Kingdom																	4%	1%	-3%			
Dependence to RU (%)																						
Austria					21%	18%	-3%				13%	10%	-3%									
Belgium					13%	10%	-3%															
Bosnia Herzegovina					21%	18%	-3%				13%	10%	-3%									
Bulgaria					20%	17%	-3%															
Croatia					21%	18%	-3%															
Czechia					21%	18%	-3%															
Denmark					21%	18%	-3%				13%	10%	-3%									
Estonia					21%	18%	-3%															
Finland					21%	18%	-3%															
France					14%	11%	-3%															
FYROM					20%	18%	-3%															
Germany					21%	18%	-3%				12%	10%	-2%									
Hungary					21%	18%	-3%				12%	10%	-2%									
Italy					21%	18%	-3%				12%	5%	-7%				21%	12%	-9%			
Latvia					21%	18%	-3%															
Lithuania					21%	18%	-3%															
Luxembourg					14%	10%	-4%															
Netherlands					21%	18%	-3%															
Poland					21%	18%	-3%															
Serbia					21%	18%	-3%															
Slovakia					21%	18%	-3%															
Slovenia					21%	18%	-3%				13%	10%	-3%									
Sweden					19%	17%	-2%				13%	10%	-3%									
Switzerland					21%	18%	-3%				12%	6%	-6%				21%	13%	-8%			
LNG and Interconnection Capacity Diversification (LICD)																						
Greece					10000	5927	-4073	10000	5014	-4986	10000	5000	-5000	10000	5485	-4515	10000	5665	-4335	10000	5244	-4756
Italy	4436	2641	2218	-423	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530	2641	2111	-530
Supply Source Access (SSA)																						
Cyprus					0	4	4	0	4	4	0	4	4	0	4	4	0	4	4	0	4	4
Finland																	2	3	1			
FYROM					2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1
Greece					2	4	2	2	4	2	2	4	2	2	4	2	2	4	2	2	4	2

Sum of Value / Row Labels	2030 SUSTAINABLE WITHOUT	WITH	DELTA	DISTRIBUTED WITHOUT	WITH	DELTA	EUCO30 WITHOUT	WITH	DELTA	2040 CLIMATE WITHOUT	WITH	DELTA	SUSTAINABLE WITHOUT	WITH	DELTA	DISTRIBUTED WITHOUT	WITH	DELTA
Security of Supply																		
Remaining Flexibility 2-Week Cold Spell (%)																		
Greece	52%	81%	29%							71%	100%	29%	69%	100%	31%			
Italy	55%	61%	6%	70%	77%	6%	70%	77%	7%	81%	88%	7%	69%	75%	6%	89%	96%	7%
Remaining Flexibility Peak day (%)																		
Greece	27%	51%	25%	51%	80%	28%				44%	71%	27%	37%	62%	26%	46%	72%	27%
Italy	41%	46%	5%	51%	57%	5%	48%	54%	6%	63%	69%	6%	50%	55%	5%	63%	70%	7%

E. Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	477.2	747.2	553.0	363.2	593.5	442.0
	Supply Maximization	731.8	949.0	709.7	536.1	878.9	621.9
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	2.2	8.7	6.2	0.0	0.0	0.0
	2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	141.7	214.4	156.6	131.8	195.9	150.3
	Fuel Switch savings	379.4	392.2	330.2	379.4	388.1	325.4

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	611.3	320.5	815.2	524.4	853.4	545.4	747.2	477.2
Supply Maximization	813.1	118.0	1,017.0	322.0	1,079.4	779.2	474.5	354.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	8.7	2.2	8.7	2.2	6.1	0.0	8.7	2.2
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	214.4	141.7	214.4	141.7	197.9	134.7	214.4	141.7
Fuel Switch savings	392.2	330.2	392.2	330.2	365.0	296.7	392.2	330.2

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	457.5	223.4	661.5	427.3	678.5	415.7	593.5	363.2
Supply Maximization	743.0	51.9	946.9	0.0	1,005.2	610.5	439.5	268.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	195.9	131.8	195.9	131.8	180.3	124.4	195.9	131.8
Fuel Switch savings	388.1	325.4	388.1	325.4	359.9	290.8	388.1	325.4

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0010[3]	Pipeline	The overall permanent land acquisition for Poseidon Project is planned to be 3.043.200 m2. However, in most of this area, there will be no environmental or other impact. The temporary land acquisition for the Pipeline Working strip including temporary facilities at crossings is planned to be 24.192.828m2, while 348.040m2 is planned for the Stations (Compressor Stations and M-01), 240.840m2 for the Stations (25 BVSs and 2 SS) and 104.740m2 for the Operation and Maintenance Buildings (O&Ms).	Natura 2000 sites: - GR1110009 - GR1130006 - GR1130009 - GR1130010 - GR1150001 - GR1150005 - GR1150010 - GR1210001 - GR1220002 - GR1220010 - GR1230001 - GR1230004 - GR2120006 - GR2120008 - GR2130006 - GR2130011 - GR2130012 - GR2130013 >

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
Construction phase: 1. General - Accidental pollution 2. Health and Safety - Injuries and Casualties, Emergencies 3. Landscape and morphological Characteristics- Landscape Modification 4. Natural environment - Vegetation / Habitat loss, Fauna Loss / Disturbance 5. Spatial Planning / Land use - Alteration of land use 6. Cultural Heritage - Direct effect, Indirect effect, Negative impacts on scenery and character 7. Socioeconomic impacts & Local Economy - Economic Impact on Rural Income 8. Technical Infrastructure & Environmental infrastructure systems - Production of waste 9. Noise & Vibrations - Noise from project construction	**Construction phase:** 1. Preparation of a Pollution Prevention and Managing Plan, a Waste Management Plan and a Hazardous Waste Management Plan. 2. Preparation of a Health and Safety and an Emergency Response Plan to be prepared by the EPC Contractor and to be reviewed by the Supervision. 3. Selection of a predefined working strip according to the area based on the area type. Typical working strip shall be 38 m wide; in forests 22 m, in shrublands 28 m. - Landscape Management and Restoration and Erosion Control Plan shall be developed with details regarding phytotechnical restoration, reforestation of forest areas (in compliance to L. 4280/2014), erosion control measures, possible hydroseeding. The pipeline protection strip (8 m wide) will be, according to the regulations, free of deep-rooted trees.	The additional costs have been incorporated in the relevant cost estimations (CAPEX) and concern the following main items: > Route modifications in order to maximize the distance from sensitive receptors as well as settlements, monuments, etc. > Cost of environmental mitigation measures in environmentally sensitive areas. > Cost of reforestation areas in working zone and (possibly) other areas expected to be defined by the Forest Authorities. > Cost of follow up during the construction and operation period. > Best Available Technology for the	N/A

[3] The information provided in the above table summarizes the results of the final Environmental Impact Assessment (EIA) for the offshore section, which has been approved by the Greek Ministry of Environment and Energy in January 2015.

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
10. Surface Water Bodies - Modification of morphology, Impacts on the quality, Impacts on quantity	4. Establishment of a pre-construction biodiversity baseline. Establishment of reduced working strip (22 m) through forest areas and sensitive areas for biodiversity. Avoidance, where possible, to open new access roads. Upgrade of existing roads is recommended. An ecology specialist will monitor implementation of environmental terms, per construction front, especially in areas of biodiversity interest. For the protection of riparian vegetation, trenchless techniques will be applied, where techno-economically recommended. Preparation of Appropriate Assessments for Natura 2000 areas will be included in the Environmental Impact Assessment and will be reviewed by the competent Public Authorities. Develop a Biodiversity Management Plan (including Large Mammals Management Plan). Avoidance of construction activities during the avifauna breeding period in environmentally sensitive areas. 5. Land Rights Acquisition Plan will be prepared. 6. Appropriate siting of the Project and its facilities (temporary or permanent). - Signing a Memorandum of Understanding between the Project Owner and the Ministry of Culture. In the event that antiquities are found during the work, the work will be interrupted in the section deemed necessary by the competent Authority for the protection of antiquities, followed by the updating of the Memorandum of Cooperation with the newest details of the works and an excavation survey by a specialist team, at a cost that will be borne by the Project Owner, including the maintenance of the findings. All excavation works shall be supervised by the competent Archaeological Authority. 7. Restoration framework for the means of livelihood which reliably determines the compensation to be paid to the eligible land owners. Treatment and disposal of waste products shall be implemented by following strictly the applicable regulations. Disposal of forest products to residents and users of forests, after consultation with the competent authorities. 8. Hazardous Waste and non - Hazardous Waste Management Plan. Minimization of excavated and other construction waste by re-use in cases when this is technically feasible according to specifications. 9. Compliance to the legislative provisions for mechanical equipment. Application of best noise reduction techniques to mechanical equipment. Avoidance of explosives use in populated areas. - Avoidance of explosives use in protected areas during breeding	equipment to be installed for the Project.	

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
	season. 10. Trenchless methods will be applied, where techno-economically recommended. Water Management Plan to identify and manage any surface and/or groundwater pumping needs and to manage surface water runoff. Waste Management Plan and Hazardous Waste and Materials Management Plan. Pollution Prevention and Response Plan. Wherever possible, contact of machinery with surface water will be avoided. Appropriate scheduling of construction work during periods of low flow or preferably during dry conditions (August - November). Flood and erosion control measures will be implemented. The construction contractor will obtain all relative permits from the Competent Authorities, prior to water abstraction and hydrotest water discharge. - The Contractor shall prepare a Hydtotesting Plan, which shall be included in the Water Management Plan, for each pipeline's hydrotesting section plus any hydrotesting of above ground facilities (i.e. compressor stations). Hydrotest water will not be discharged in different river basin and will be free of biocides prior of discharge. Any additives used will be included in the PLONOR list.		
Operation phase: 1. Climatic and Bioclimatic Characteristics - Greenhouse gas emissions increase 2. Landscape and Morphological Characteristics - Landscape Modification, Viewer nuisance 3. Socio-economic Environment – Local Economy 4. Air Quality/ Emissions 5. Noise & Vibrations - Noise from Stations operation	**Operation phase:** 1. In compliance with MD 36060/1155/E.103/2013, (HGG 1450/B/14.6.2013), NOx, SO2, CO emissions, during operation, should be monitored and the results forwarded to the competent Greek Authority for check and emissions monitoring Monitoring of plant restoration for at least 3 years after the completion of planting works. 2. Buildings will be designed (including the use of appropriate materials and colors) so as to match the landscape as much as possible. 3. Fair and transparent recruitment process for all new jobs. Publicize jobs so that they are accessible locally. Provision of information locally (chambers of commerce and business organizations). 4. Best Available Technologies shall be implemented. Compression Station location will be away from sensitive recipients. Regular maintenance of the equipment. Installation of NOx, SOx & CO emission monitoring systems. 5. Application of appropriate sound insulation measures to equipment inside the Compression Stations so as to comply with	The additional costs have been incorporated in the relevant cost estimations (OPEX)	N/A

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
	legislative limits within property boundaries.		

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0330	Pipeline	4,480,732 m^2 (*)Note1: The area in m^2 of impact zone has been calculated concerning exclusively the environmentally sensitive areas and considering a conservative 38m width working strip. The overall area of the working strip along the pipeline route is estimated conservatively to be 20,388,154 m^2. However, in most of this area, there will be no environmental or other impact. (**)Note2: The referred areas are based on the existing studies and they are expected to be confirmed during the next design phase.	> Natura (GR2540007), > Natura (GR2310001 & GR2310015), > Natura (GR2110001 & GR2110004), > Natura (GR2310009), > National Park > (Messolongi-Aitoliko Lagoon), > Wildlife Refuge (Mountain Arakynthos-Mataragas-Gavalo), > Wildlife Refuge (Petalas), > Wildlife Refuge > (Monastery of Retha & Longos), > National Park (Amvrakikos), > Wildlife Refuge (Lekatsa), Wildlife Refuge (Pratagos - Aetofolia)

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
Construction phase: 1. General - Accidental pollution 2. Health and Safety - Injuries and Casualties, Emergencies 3. Landscape and morphological Characteristics- Landscape Modification 4. Natural Environment - Vegetation / Habitat loss, Fauna Loss / Disturbance 5. Cultural Heritage - Direct effect, Indirect effect, Negative impacts on scenery and character 6. Socio-economic Environment – Local Economy 7. Economic Impact on Rural Income 8. Technical Infrastructure & Environmental infrastructure systems -- Production of waste 9. Nois & Vibrations - Noise from project construction	**Construction phase:** 1. Preparation of a Pollution Prevention and Managing Plan, a Waste Management Plan and a Hazardous Waste Management Plan. 2. Preparation of a Health and Safety and an Emergency Response Plan to be prepared by the EPC Contractor and to be reviewed by the Supervision. 3. Selection of a predefined working strip according to the area based on the area type. Typical working strip shall be 38 m wide; in forests 22 m, in shrublands 28 m. Preparation of a phytotechnical restoration study of the forest area, while erosion control measures will be implemented. The pipeline access and protection strip (8 m wide) will be maintained, according to the regulations, free of deep-rooted trees. 4. Establishment of a pre-construction biodiversity baseline.	The additional costs have been incorporated in the relevant cost estimations (CAPEX) and concern the following main items: > Route modifications in order to maximize the distance from sensitive receptors as well as settlements, monuments, etc. > Cost of environmental mitigation measures in environmentally sensitive areas. > Cost of reforestation areas in working zone and (possibly) other areas expected to be defined by	N/A

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
10. Surface Water Bodies - Modification of morphology, Impacts on the quality, Impacts on quantity	Establishment of reduced working strip (22 m) through forest areas and sensitive areas for biodiversity. - Avoidance, where possible, to open new access roads. Upgrade of existing roads is recommended. - For the protection of riparian vegetation, trenchless techniques will be applied, where techno-economically recommended. Preparation of Appropriate Assessments for Natura 2000 areas will be included in the Environmental Impact Assessment and will be reviewed by the competent Public Authorities. - Develop a Biodiversity Management Plan (including Large Mammals Management Plan). - Avoidance of construction activities during the avifauna breeding period in environmentally sensitive areas. 5. Appropriate siting of the Project and its facilities (temporary or permanent). - Signing a Memorandum of Understanding between the Project Owner and the Ministry of Culture. - All excavation work shall be supervised by the competent Archaeological Authority. 6. Land Rights Acquisition Plan will be prepared. - Restoration framework for the means of livelihood which reliably determines the compensation to be paid to the eligible land owners. 7. Hazardous Waste and non - Hazardous Waste Management Plan. - Minimization of excavated and other construction waste by re-use in cases when this is technically feasible according to specifications. - Treatment and disposal of waste products shall be implemented by following strictly the applicable regulations. 8. Compliance to the legislative provisions for mechanical equipment. - Avoidance of explosives use in populated areas. 9. - Trenchless methods will be applied, where techno-economically recommended. - Preparation of a Water Management Plan and a Pollution Prevention and Response Plan. - Appropriate scheduling of construction work during periods of low flow or preferably during dry conditions (August - November). - Flood and erosion control measures will be implemented. - The construction contractor will obtain all relative permits from the Competent Authorities, prior to water abstraction and hydrotest water discharge.	the Forest Authorities. > Cost of follow up during the construction and operation period. > Best Available Technology for the equipment to be installed for the Project.	

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
Operation phase: 1. Landscape and morphological characteristics - Landscape Modification, Viewer nuisance 2. Air Quality/ Emissions 3. Noise and Vibrations - Noise from Stations operation	**Operation phase:** 1. Monitoring of plant restoration for at least 3 years after the completion of planting works. - Buildings will be designed (including the use of appropriate materials and colors) so as to match the landscape as much as possible. 2. Studies of air emissions dispersion will be included in the EIA. Moreover, in compliance with the legislative requirements, NOx, SO2, CO emissions, during operation, shall be monitored and the results forwarded to the competent Authority for check and emissions monitoring. - Compression Station location will be away from sensitive recipients. - Regular maintenance of the equipment. - Installation of NOx, SOx & CO emission monitoring systems. 3. Application of appropriate sound isolation measures to equipment inside the Compression Stations so as to comply with legislative limits within property boundaries.	The additional costs have been incorporated in the relevant cost estimations (OPEX)	N/A

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-007	Sulmona-Foligno pipeline	DN 1200 (48") length 170,22 km	SIC IT7110097 “Fiumi Giardino – Sagittario – Aterno – Sorgenti del Pescara”; ZPS IT7110128 “Parco Nazionale Gran Sasso Monti della Laga”; SIC IT5210067 “Monti Pizzuto – Alvagnano”; SIC IT5210059 “Marcite di Norcia”; SIC IT5210046 “Valnerina”.
	Foligno-Sestino Pipeline	DN 1200 (48") length 113,65 (km)	SIC IT5210024 “Fiume Topino”; SIC IT5210013 “Boschi del Bacino di Gubbio”; SIC IT5210004 “Boschi di Pietralunga”.
	Sestino-Minerbio pipeline	DN 1200 (48") length 140,70 (km)	SIC-ZPS IT4050022 “Biotopi e ripristini ambientali di Medicina e Molinella”; ZPS IT4050023 “Biotopi e ripristini ambientali di Budrio e Minerbio”; SIC IT4050006 “Valle Benni”; SIC IT4080014 “Rio Mattero e Rio Cuneo”.
	Sulmona Compressor station	119.176 sqm	There is not direct interference between the site and the surrounding protected area both Natura 2000 Network and National or regional protected areas
TRA-N-1195	Matagiola-Massafra pipeline	DN 1400 (56”) lenght: 79 km	SIC IT9130007 "Aree delle Gravine"

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-N-007 - Sulmona-Foligno pipeline Presence of priority habitats and priority fauna species (invertebrates, reptiles, amphibious, mammals, birds and fish). (Att 1-2 Dir.92/43/CEE)	Mitigation project for each area SIC agreed with the Region; Optimization of the routing of the pipeline to preserve the Habitats, use of a reduced right of way, care in the execution of the works to preserve wet areas Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries. Conservation measures for at least three years following the construction works.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-007 - Foligno-Sestino pipeline Presence of priority habitats and priority fauna species (invertebrates, birds and fish). (Att. 1-2 Dir.92/43/CEE)	Mitigation project for each area SIC agreed with the Region; Optimization of the routing of the pipeline to preserve the Habitats, use of a reduced right of way, care in the execution of the works to preserve wet areas Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries. Conservation measures for at least three years following the construction works.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-007 - Sestino-Minerbio pipeline Presence of primary habitats and priority fauna species (invertebrates, reptiles, amphibious, birds and fish). (Att.1-2 Dir.92/43/CEE)	Reintroduction of species of flora and fauna through conservation and naturalization methods; Construction works performed outside of the nesting period of the animal species; Building site areas set up as much as possible outside the Natura 2000 site boundaries.	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-007 - Sulmona Compressor station The EIA and the asssessment under the habitat directive conducted for the site highlighted that the impact on the surrounding protected areas is negligible	A General mitigations measure not related to sensitive areas is the revegetation of the area of the compressor station	The additional costs have been incorporated in the relevant cost estimations (CAPEX & OPEX)	N/A
TRA-N-1195 Matagiola- Massafra pipeline	To further analyse the possibility of a trenchless to cross the SIC	The additional costs have been	N/A

Potential impact	Mitigation measures ***	Related costs included in project CAPEX and OPEX	Additional expected costs
Interference with the Habitat and the species (flora and fauna) listed the EU Habitats Directive (92/43/EEC) inside the SIC	"Aree delle Gravine"; To further analyse the Olive trees transplant before works and re-planted after works.	incorporated in the relevant cost estimations (CAPEX & OPEX)	

Environmental Impact explained [Promoter]

The realization of projects in the Group will follow the best practices and all environmental laws and prescriptions. The environmental impacts have been minimized by a careful evaluation and choice of the possible routes for the projects' layouts. Additionally, mitigation measures and environmental restoration works ensure that the realization of the projects respects the crossed areas, further minimising potential impacts.

Additional information (Environmental Impact) [Promoter]

Considering the substitution of more pollutant fuels across several sectors (e.g. power generation, residential and transportation), the projects of the Group have substantial benefits in terms of reduction of air contaminants, such as NOx, SOx, PMx, which are highly dangerous for human health and for the overall environment. Since the PS-CBA currently captures only CO2 emission reductions, these benefits are not monetised but should be taken into account for a proper evaluation of the projects' benefits.
Moreover, the projects of the Group allow new competitive gas sources in the European network that can enhance, both environmentally and economically, the support of RES production. In fact, the growth of electricity renewable sources is strictly connected to the availability of flexible back-up solutions. CCGT and cogeneration solutions, thanks to their flexibility, low CO2 impacts and affordable costs, are best placed to deliver the back-up required by renewable sources.
All additional costs related to measures for the mitigation of environmental impact have been incorporated in the relevant cost estimations (CAPEX & OPEX).

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

- **Enhancing Security of Supply by providing a new supply source from Levantine Basin**, for completion of the SGC and the supply of Greek, Italian and European markets, also enabling supplies from indigenous EU production. Indicatively, in a scenario where the main Italian import infrastructure is disrupted for 30 days, the promoters estimate that the Group's projects could mitigate the resulting gas shortage with benefits of up to 1.8 billion €, depending on the reference year and the availability of other sources such as North African gas.
- **Enhanced market liquidity in Italian, Greek and EU markets**, exerting downward pressure on European gas prices, through reverse flow capacity of the Group's projects and of recently commissioned reverse-flow interconnections from Italy to France and Germany, which will enhance inter-regional transactions between South East Europe and Western Europe. Levantine Basin reserves can address broader EU issues, such as L-gas replacement and Groeningen/North-Sea decreasing production. Indicatively, a 0.5 €/MWh price differential between L-gas and gas supplied by the Group's projects, applied to demand of 5 bcm/yr (considering that L-gas consumption just for France, Germany and Belgium is around 30 bcm/year) would lead to potential benefits of about 26 M€/year.
- **Improved operation logistics of European transmission system** as it will enable imports of up to 20 bcm/yr through the southern part of the system, improving the EU South-North corridor potential.
- **Gasification of Cyprus and Greek regions (Crete, Peloponnese and Western Greece)** contributing to a cleaner and more efficient energy mix and overcoming dependence on imported petrol products. With reference to Crete, the gasification of the island with impact on residential and, in particular, on power generation sectors, will allow switch from traditional fuels, such as heavy oil, to gas in the different scenarios and for the whole period. The maximum potential benefit is up to about 8.5 bn€ in the reference case (25 years undiscounted benefit). The additional benefit related to Crete gasification could lead to a maximum improvement in the B/C ratio in the range of 0,4 points.
- **Ending isolation and enhancing market integration of Cyprus to the EU gas market**, through the dual-flow EastMed Pipeline which is the only economically efficient option providing a direct physical connection of Cyprus with Greece.
- **Diversification of counterparts in Greece**, Italy, and South East Europe as it will allow potential new participants to enter the respective markets.

F. Useful Links

SNAM National Development Plan 2018-2027 for Project Links TRA-N-0007 (pages 67-69) and TRA-N-1195 (pages 112-114):
http://www.snam.it/repository-srg/file/it/business-servizi/Processi_Online/Allacciamenti/informazioni/piano-decennale/pd_2018_2027/Piano_decennale_2018-2027.pdf

Eastmed Project Link:
TRA-N-0330: http://igi-poseidon.com/en/eastmed

Poseidon Project Link:
TRA-N-0010: http://igi-poseidon.com/en/poseidon

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

Project Group SGC_05

Reasons for grouping [ENTSOG]

The group consists of projects aiming at increasing the capacity and Kulata (BG) / Sidirokastron (GR) IP. On the Bulgarian side, the capacity increase is achieved via the project TRA-F-298 while on the Greek side projects TRA-N-1276 and TRA-N-1278 contribute to the capacity increase at Kulata (BG) / Sidirokastron (GR) IP.

Objective of the project(s) in the group [Promoter]

The projects in the group aim at increasing the capacity of the IP Kulata (BG) / Sidirokastro (GR) in both the forward and the reverse flow direction.

Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-1276	Compressor station at Nea Messimvria (3rd unit)	DESFA S.A.	GR	Less-Advanced	NA	2021	2021	NA
TRA-F-0298	Rehabilitation, Modernization and Expansion of the NTS	Bulgartransgaz EAD	BG	FID	6.8.2	2021	2024	Delayed
TRA-N-1278	Compressor station at Ambelia	DESFA S.A.	GR	Less-Advanced	NA	2022	2022	NA

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-F-0298	700	100	20
TRA-F-0298	1000	20	-
TRA-N-1276	-	-	-
TRA-N-1278	-	-	-

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-F-0298	Bulgartransgaz EAD	Strandzha (BG) / Malkoclar (TR)	2021	-	58.08
TRA-F-0298	Bulgartransgaz EAD	Kulata (BG) / Sidirokastron (GR)	2021	-	13.78
TRA-F-0298	IBS Future Operator	Interconnector BG RS	2024	19.36	19.36
TRA-N-1276	DESFA S.A.	Kulata (BG) / Sidirokastron (GR)	2021	11.4	-
TRA-N-1278	DESFA S.A.	Kulata (BG) / Sidirokastron (GR)	2022	54.7	60

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	TRA-N-1276	TRA-N-1278	TRA-F-298
CAPEX [mln. EUR]	403.59	15.00	49.00	339.59
Range CAPEX		25%	25%	7%
OPEX [mln. EUR/y]	7.75	0.80	2.40	4.55

Description of costs and range [Promoter]

Costs are representative of the best estimations available at the moment of the TYNDP 2018 data collection. Especially for the projects that are more mature like TRA-F-298 which is already in the implementation phase and TRA-N-1276 which consists in the addition of a third turbo-compressor unit next to the two same units already installed, the estimations are considered more accurate.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Further reducing the LICD indicator value, the projects group **contributes to the diversification of entry points** (precondition for competition and arbitrage) in Bulgaria.
The project **slightly decreases the dependence from Russia** of Serbia and Bosnia Herzegovina (through Serbia).

> **Security of Supply:**

The projects group increases the **remaining flexibility** in Bulgaria in both peak demand and 2-weeks cold spell situation and in Hungary only in peak day situation.
In case of Ukrainian supply disruption, the projects group **decreases the risk of demand curtailment** for Bulgaria and, in some scenarios, for FYROM.
Additionally, the projects group significantly reduces the risk of demand curtailment for Bosnia Herzegovina and Serbia and, more limited, in Bulgaria in case of disruption of their respective single largest infrastructure.

> **Market Integration:**

The projects group brings limited improvement in terms of **supply cost savings** for Europe with, depending on the demand scenarios and supply configuration considered, a positive impact around 0.4 Mln EUR/y (on average). Such reduction is mainly driven by tariffs saving.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The group of projects will facilitate the further penetration of natural gas in the Greek and the Bulgarian markets, which have not yet reached a level of maturity similar to that of western European markets. This will take place thanks to the increase of capacity at the existing IP between the two countries. In Greece the displaced fuel is expected to be oil in the residential and commercial sector. The expansion of the use of natural gas for domestic and industrial needs is also expected in Bulgaria. In this way a reduction of the emissions of harmful substances in the atmosphere is expected in the region. as a result of fuel switch (replacing the fuel base with environmentally friendly fuel). An ecological effect (reduction of pollutants released into the atmosphere) will also be achieved by the implementation of the modernization project of the compressor stations thanks to the replacement of the old gas turbine compressor units with new, high efficiency and low emission gas turbine compressors. Increasing the efficiency by only 1% is expected to reduce the amount of fuel gas used at the same capacity of the compressor by about 3% and a proportional reduction of the harmful emissions, including the amount of CO2 released. The impact of the project group on climate change sustainability is reflected in the expected long-term and sustainable reduction of greenhouse gas emissions in the affected areas.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Bosnia Herzegovina										5%	1%	-4%							14%	6%	-8%			
Serbia										4%	1%	-4%							14%	5%	-9%			
LNG and Interconnection Capacity Diversification (LICD)																								
Bulgaria	5264	4976	-287	5264	4976	-287	5472	5093	-379	5241	4966	-276	5192	4944	-249	5302	4995	-306	5474	5094	-380	5253	4971	-282

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Remaining Flexibility 2-Week Cold Spell (%)																								
Bulgaria	98%	100%	2%	98%	100%	2%	96%	100%	4%	99%	100%	1%												
Romania																18%	19%	1%						
Remaining Flexibility Peak day (%)																								
Bulgaria	85%	88%	3%	85%	88%	3%	71%	75%	4%	73%	77%	3%				75%	79%	4%	78%	81%	3%	75%	78%	3%
Hungary	81%	83%	2%	90%	92%	2%																		
Single Largest Infrastructure Disruption (SLID)-Bulgaria																								
Bulgaria							3%	0%	-3%	2%	0%	-2%												
Single Largest Infrastructure Disruption (SLID)-Serbia																								
Bosnia Herzegovina	30%	12%	-18%	28%	12%	-16%	28%	10%	-18%	28%	11%	-17%				30%	12%	-18%	30%	12%	-18%	30%	12%	-18%
Serbia	28%	12%	-17%	28%	11%	-17%	26%	9%	-17%	28%	10%	-18%				28%	12%	-17%	28%	11%	-17%	28%	12%	-17%
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Bulgaria	7%	0%	-7%	5%	0%	-5%	6%	0%	-6%	2%	0%	-2%												
FYROM										1%	0%	-1%												
Romania																35%	34%	-1%						
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Bulgaria	11%	10%	-1%	11%	6%	-5%	17%	9%	-7%	13%	7%	-6%				9%	5%	-4%	10%	8%	-2%	11%	6%	-5%
FYROM										12%	8%	-4%				10%	6%	-4%				10%	6%	-4%

ADVANCED Infrastructure Level

	2025						2030						2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																					
LNG and Interconnection Capacity Diversification (LICD)																					
Bulgaria	3938	3823	-115	3938	3823	-115	4152	3963	-189	3916	3809	-106	3977	3847	-130	4154	3964	-190	3928	3816	-111

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

Reference

Project benefits (Meur)	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
	EU Bill Benefits (MEUR/y)						
	Reference	0.4	0.5	0.2	0.0	0.0	0.0
	Supply Maximization	0.5	1.2	0.2	0.2	0.3	0.0
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	0.7	0.5	0.7	0.0	0.0	0.0
	2 Weeks	0.2	3.4	4.1	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	3.1	3.3	3.8	1.4	1.6	1.7
	Fuel Switch savings	0.8	1.4	1.4	0.8	0.6	0.6

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	6.3	4.5	0.5	0.1	0.5	0.2
Supply Maximization	0.1	0.0	6.4	4.5	1.4	0.1	0.6	0.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.7	0.5	0.7	0.5	0.2	0.0	0.7	0.5
2 Weeks	4.1	0.2	4.1	0.2	3.6	1.8	4.1	0.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	3.8	3.1	3.8	3.1	3.9	3.4	3.8	3.1
Fuel Switch savings	1.4	0.8	1.4	0.8	1.6	0.7	1.4	0.8

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	0.0	0.0	4.1	1.7	0.0	0.0	0.0	0.0
Supply Maximization	0.0	0.0	6.2	0.0	0.4	0.0	0.2	0.0
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	1.7	1.4	1.7	1.4	1.8	1.6	1.7	1.4
Fuel Switch savings	0.8	0.6	0.8	0.6	0.7	0.3	0.8	0.6

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-1276	Compressor station	The ESIA has not yet been finalized	Protected areas are not affected
TRA-F-0298	Gas pipeline section 58,3 km.	Length: 58.3 km	Protected areas are not affected.
TRA-N-1278	Compressor station		Protected areas are not affected

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
The compressor stations operation will generate exhaust gas emissions and noise. The M/R station will not have any impact on air and sea water.	Noise will be mitigated by housing the station in a building and by using enclosures for the turbo-compressors. Moreover, the station will be located at 3 km distance from the closer village. Chimney height and selection of low NOx emitting units will mitigate the exhaust gas emissions.	Not yet estimated	Not yet estimated
The investment proposal is not likely to have a significant negative impact on natural habitats, populations and habitats of species subject to conservation in protected areas.	The EIA Decision No. 3-3/2018 lays down mandatory conditions for implementation during the design phase of the investment proposal and during execution of construction works, incl. measures regarding the environmental components. Information on the website of the competent authority MoEW: http://registers.moew.government.bg/ovos/lot/21192		

Environmental Impact explained

TRA-F-298. The design phase of the project (activities included in Phase 2) is in the process of being finalized. The 58,3 km section was subject to an EIA. The EIA Decision No 3-3/2018г was issued on 29.10.2018 (information is provided in table 1). The 23,3 km section was subject to a procedure for assessing the necessity of environmental impact and Decision No. 14-ПР/2018 was issued according to which EIA is not required. For Stage 2 of the modernization of three compressor stations the following decisions were issued: Decision No. БД-26-ПР/2018, Decision No. 2-ПР/2018 and Decision No. 5-ПР/2018 for CS Petrich, CS Ihtiman, CS Lozenets respectively, stating that the investment proposals will not have harmful effect on the environment and EIA is not required.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project brings benefits to both Greece and Bulgaria as it will increase the Security of supply by increasing the capacity of the IP Kulata / Sidirokastro in both directions:

- the modernization of the Bulgarian Transmission system will allow the increase of the capacity from the Bulgarian side and the two compressors in Greece will allow DESFA to benefit from this capacity increase at the IP by enabling the gas to flow to the main consumption centre in the southern part of the country;
- on the other hand, the compressor stations in Greece will allow the increase of the reverse flow capacity offered at the IP and the modernized Bulgarian system will allow BULGARTRANSGAZ to benefit to a larger extent of the access to diversified sources of gas, including LNG.

F. Useful Links

DESFA National Development Plan: http://www.desfa.gr/en/national-natural-gas-system/development-of-the-nngs/development-plan
BulgartransgazEAD project: https://www.bulgartransgaz.bg/bg/pages/rehabilitaciya-modernizaciya-i-razshirenie-na-sashtestvuvash-133.html
BulgartransgazEAD National Development Plan: https://www.bulgartransgaz.bg/en/pages/desetgodishni-planove-za-razvitie-na-mrejite-na-bulgartransg-142.html

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

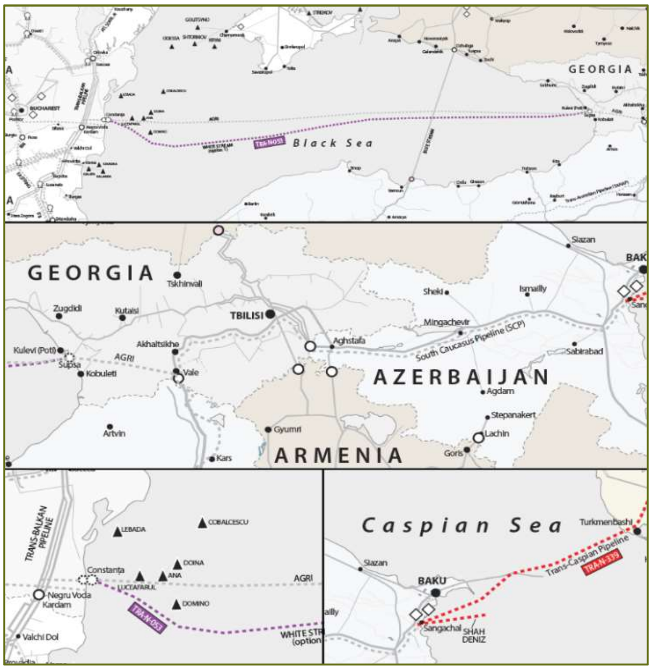
Project Group SGC_06

Reasons for grouping [ENTSOG]

The project group consists of projects aiming at bringing Turkmen/Caspian gas to Europe. Trans Caspian Pipeline (TRA-N-339) and SCP(F)X (TRA-F-1138) are considered as enabler projects for White Stream pipeline (TRA-N-53) which will transport the gas across the Black Sea from Georgia to Romania. Further on, White Stream gas can be supplied into the existing Trans-Balkan Pipeline and/or BRUA corridor.

Objective of the project(s) in the group [Promoter]

The Project objective is to link gas resources from Turkmenistatn, Azerbaijan and over the Caspian region to markets in Europe. The significant gas resources of Shah Deniz Field open new additional opportunities to meet European gas consumption requirement. The group aims at providing a new, reliable source of gas, which will help to reduce Europe's dependency from today main sources and increase supply diversification.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0339	Trans-Caspian (TCP – String 2)	W-Stream Caspian Pipeline Company	TM	Advanced	7.1.1	2021	2022	NA
TRA-N-0053	White Stream	White Stream	GE	Less-Advanced	NA	2022	2022	On time
TRA-F-1138	South Caucasus Pipeline - (Future) Expansion - SCP-(F)X	SOCAR Midstream Operations LLC	AZ	FID	7.1.1	2018	2018	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0053	726	1115	375
TRA-N-0053	1039	135	-
TRA-N-0339 (2nd string)	812	300	175
TRA-F-1138	1,067	691	6

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
TRA-N-053	White Stream	Constanta (White Stream)	2022	-	505
TRA-N-053	White Stream	South Caucasus Pipeline / White Stream	2022	505	-
TRA-N-339	W-Stream Caspian Pipeline Company	TCP / South Caucasus Pipeline	2021	500	-
TRA-F-1138	SOCAR Midstream Operations LLC	Türkgözü	2018	-	464

B. Project Cost Information

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	Total Cost	TRA-N-53	TRA-N-339	TRA-F-1138
CAPEX [mln. EUR]	6447.48	3900.00	1500.00	1047.48*
Range CAPEX		30%	30%	10%
OPEX [mln. EUR/y]	105.57	55.00	16.00	34.57*

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

The TCP project will transport gas from Turkmenistan to Europe via Azerbaijan, Georgia, Turkey, and Greece and will be developed in two phases (two strings).
The costs (CAPEX) for the first string will be spread over the construction period, with some upfront cost for pre-engineering and permitting. The costs include the engineering and procurement services, purchase of linepipe and all equipment, construction &installation of the works, with completion and put into operation. Once operations start, there will be annual operating costs which include personnel, maintenance & inspection, spare parts and fuel for generators and compressors, plus any tariff for gas purchase/transit in third party pipelines.
Costs related to the second string will be spread over the construction period and will include the engineering, purchase of materials and equipment, installation and put into operation the expansion as described above. The commissioning of the second leg will be subject to the completion of the White Stream (WS) pipeline.

WS Pipeline will transport Turkmengas received via the second string of the TCP and expanded SCP in Georgia, directly to Romania and other EU Member States. The costs (CAPEX) will be spread over the construction period, with some upfront cost for pre-engineering and permitting. The costs include the engineering and procurement services, purchase of linepipe and all equipment, construction and installation of the works, with completion and put into operation, in conjunction with bringing online the second leg of TCP.

[2] https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Enabling the connection of Europe to new supply sources from Caspian region the group realisation allows to **reduce the dependence** of Europe from one of its main sources in all scenarios under low infrastructure level. The group has a significant impact in reducing such dependency especially for Romania.

> **Security of Supply:**

The projects group increases **remaining flexibility** in Romania in both peak day and 2-weeks cold spell situation.
In case of Ukrainian supply route disruption, the projects group ensures **full mitigation of risk of demand curtailment** for Romania, Serbia, Bulgaria, Bosnia-Herzegovina and Hungary. In case of the same route disruption and in Sustainable Transition the projects group contributes to the mitigation of risk demand curtailment also in other European countries. In such situation most of Europe could in fact overall face risk of demand curtailment.
Romania can benefit from the projects group realisation also in case of disruption of its main infrastructure. The risk of curtailed demand in such situation is **fully mitigated** by the new capacity in all scenarios.
Additionally, the project group allows for **full mitigation of risk of demand curtailment** also in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - VelkéKapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. In the reference situation and under the low infrastructure level Europe can access to a new source of gas from the Caspian region. Those benefits are clearly higher in case South supply maximisation (south gas considered cheaper than all the other sources). In the Advanced infrastructure level, there are more projects that can potentially share those benefits and spreading to more European countries (like SGC_08). This translates in lower benefit in the advanced infrastructure level.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

Gas supplied by SGC_06 will replace gas from other sources and routes and also induce fuel switching. Although a definitive allocation of the total of the supplied gas to the relevant markets cannot be done at this stage, our preliminary estimates, based on the specific CO2 emissions/kWh and the forecast price developments for CO2 emissions, confirms CO2 savings stemming from the realisation of the project could range between 18.8 Mln EUR/y and 35.2 Mln EUR/y, depending on the level of gas demand evolution and its consequent replacement of more polluting fuels. CO2 savings will have an impact – besides Romania – on other markets such as Serbia, Bosnia Herzegovina and FYROM where the specific CO2 savings per kWh are higher.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																								
Dependence to RU (%)																								
Austria													33%	22%	-11%									
Bosnia Herzegovina	21%	18%	-3%	11%	8%	-3%	16%	10%	-6%										6%	0%	-6%			
Bulgaria	21%	18%	-3%	11%	7%	-4%	15%	9%	-6%										5%	0%	-5%			
Croatia	31%	27%	-5%	24%	17%	-8%	35%	27%	-8%	27%	10%	-17%	33%	23%	-10%	27%	7%	-20%	48%	23%	-25%	31%	9%	-22%
Czechia	31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	21%	-5%				27%	20%	-7%				31%	28%	-3%
Denmark	29%	26%	-3%				34%	30%	-4%															
FYROM				12%	9%	-3%	16%	10%	-6%										6%	0%	-6%			
Hungary	32%	26%	-6%	29%	17%	-12%	35%	27%	-8%	27%	10%	-17%	34%	23%	-10%	27%	6%	-21%	48%	22%	-26%	31%	9%	-22%
Poland	31%	26%	-5%	28%	22%	-6%	34%	31%	-3%	26%	21%	-5%												
Romania	43%	0%	-43%	35%	0%	-35%	54%	0%	-54%	41%	0%	-41%	50%	0%	-50%	53%	0%	-53%	64%	0%	-64%	49%	0%	-49%
Serbia	21%	18%	-3%	11%	8%	-3%	16%	10%	-6%										5%	0%	-5%			
Slovakia	31%	27%	-4%	28%	22%	-6%	35%	31%	-4%	26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
Slovenia													33%	23%	-10%									
Sweden	30%	26%	-4%				34%	31%	-3%															

	2025						2030									2040								
	BEST ESTIMATE (GbC)			BEST ESTIMATE (CbG)			SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																								
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																								
Croatia																19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Baltics Finland Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Curtailment Rate Peak Day (%)																								
Croatia																22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																								
Denmark																						89%	91%	1%
Romania	51%	100%	49%	60%	100%	40%	43%	100%	57%	28%	100%	72%	18%	88%	71%	19%	90%	72%	30%	100%	70%	23%	97%	74%
Remaining Flexibility Peak day (%)																								
Bulgaria																79%	81%	2%						
Romania	30%	100%	70%	34%	100%	66%	23%	94%	71%	12%	77%	65%	4%	65%	62%	2%	63%	61%	10%	71%	61%	8%	72%	65%
Single Largest Infrastructure Disruption (SLID)-Romania																								
Romania	23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	35%	0%	-35%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Single Largest Infrastructure Disruption (SLID)-Slovakia																								
Austria							2%	0%	-2%															
Belgium							2%	0%	-2%															
Germany							2%	0%	-2%															
Luxembourg							2%	0%	-2%															
Slovenia							2%	0%	-2%										2%	0%	-2%			
Sweden							2%	0%	-2%															
Switzerland							2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																								
Croatia																19%	18%	-1%						
Romania	12%	0%	-12%	6%	0%	-6%	19%	0%	-19%	27%	0%	-27%	34%	0%	-34%	34%	0%	-34%	28%	0%	-28%	32%	0%	-32%
Ukraine Disruption Curtailment Rate Peak Day (%)																								
Austria							6%	4%	-2%										6%	4%	-2%			
Bosnia Herzegovina	10%	0%	-10%	6%	0%	-6%	8%	6%	-2%	6%	0%	-6%				4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Bulgaria	10%	0%	-10%	6%	0%	-6%	9%	6%	-3%	7%	2%	-6%				5%	0%	-5%	8%	6%	-2%	6%	0%	-6%
Croatia																22%	21%	-1%						
Czechia																			6%	4%	-2%			
FYROM										8%	2%	-6%				6%	3%	-3%				6%	0%	-6%
Germany																			6%	5%	-1%			
Hungary	9%	0%	-9%	5%	0%	-5%	6%	4%	-2%										6%	4%	-2%			
Italy							6%	4%	-2%															
Luxembourg																			8%	6%	-2%			
Romania	23%	0%	-23%	20%	0%	-20%	29%	0%	-29%	35%	0%	-35%	41%	0%	-41%	43%	0%	-43%	38%	0%	-38%	40%	0%	-40%
Serbia	10%	0%	-10%	6%	0%	-6%	8%	6%	-2%	6%	0%	-6%				4%	0%	-4%	8%	6%	-2%	6%	0%	-6%
Slovakia							6%	4%	-2%										6%	4%	-2%			
Slovenia																			8%	6%	-2%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios.

	Reference					
SCENARIO	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**	**DISTRIBUTED GENERATION**	**SUSTAINABLE TRANSITION**	**GLOBAL CLIMATE**
Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)						
EU Bill Benefits (MEUR/y)						
Reference	196.1	319.8	249.7	46.2	141.4	73.3
Supply Maximization	600.3	819.8	700.7	187.4	402.1	255.3
Mitigation in Disrupted Demand (MEUR/y)						
Peak Day	15.4	15.7	15.9	0.0	0.0	0.0
2 Weeks	8.4	48.1	56.8	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)						
CO_2 Savings	35.2	32.2	48.1	20.5	18.8	28.1
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	193.0	80.6	383.3	225.3	353.4	205.9	319.8	196.1
Supply Maximization	692.8	0.0	883.2	5.9	908.0	643.7	409.9	300.1
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	15.9	15.4	15.9	15.4	10.7	9.2	15.9	15.4
2 Weeks	56.8	8.4	56.8	8.4	71.8	56.0	56.8	8.4
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	48.1	32.2	48.1	32.2	61.2	39.7	48.1	32.2
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	93.1	6.2	193.6	74.1	172.1	53.7	141.4	46.2
Supply Maximization	433.3	0.0	454.4	0.0	487.9	222.9	201.1	93.7
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	28.1	18.8	28.1	18.8	35.8	23.2	28.1	18.8
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
TRA-N-0053	Pipeline (onshore and offshore) Above ground installations	1115 km 32inch diameter offshore; 135 km 40-inch diameter onshore) Total area of the compressor stations, block valve stations and pipeline receiving station	The project activities undertaken in Turkmenistan and Azerbaijan will comply with good international practice. The project will be planned, constructed and operated in compliance with the laws of Turkmenistan and Azerbaijan, which require an environmental impact assessment (EIA). In addition to meeting national EIA requirements, the project will be undertaken in accordance with EIA/ESIA requirements of the World Bank Group, EU legislation and other major European finance institutions, and the requirements of relevant regional and international conventions
TRA-F-1138	Transmission pipeline and compressor station	93 km	N/A
TRA-N-0339	Pipeline (onshore and offshore) Above ground installations	300 km 32inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station	The project activities undertaken in Turkmenistan and Azerbaijan will comply with good international practice. The project will be planned, constructed and operated in compliance with the laws of Turkmenistan and Azerbaijan, which require an environmental impact assessment (EIA). In addition to meeting national EIA requirements, the project will be undertaken in accordance with EIA/ESIA requirements of the World Bank Group, EU legislation and other major European finance institutions, and the requirements of relevant regional and international conventions

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
TRA-N-0053	Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process.	CAPEX and OPEX not confirmed yet but estimates included in CAPEX and OPEX provided to ENTSOG	Not expected
TRA-F-1138	N/A	N/A	N/A
TRA-N-0339	Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process.	CAPEX and OPEX not confirmed yet but estimates included in CAPEX and OPEX provided to ENTSOG	Not expected

Environmental Impact explained [Promoter]

Operational policies that govern the projects and activities to ensure they are economically, financially, socially and environmentally sound. Of interest to the TCP, SCP-FX and WS projects are 'safeguard policies', which include environmental assessments and policies designed to prevent unintended adverse effects on third parties, social and the environmental structures.
The work will follow the indication of the RSK environmental Scoping Study.
Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process. The procedures will provide a comprehensive management system that links all the environmental and social management documents together. It will include a series of specific environmental and social management plans and project standards and contractors' implementation plans. These procedures will be the results of EIA/ASIA assessments that will identify both negative and positive impacts which may arise from design strategy, construction, commissioning, operation / maintenance and decommissioning of the projects.
The environmental and social risks and impacts of the project will be managed through implementation of the procedures which will include the plans, including monitoring, to ensure that the identified environmental and social risks and impacts of the project are addressed. In view of the EU's involvement with the proposed TCP, SCP-FX and WS, the projects will be required to comply with EU directives and guidance, in addition to international and national social & environmental legislations.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project group SGC_06, consisting of TCP - SCP-FX and WS – is a project within the SGC which – as branch off of the SCP-FX – will be heading towards the Black Sea coast, crossing the Black Sea and land in Romania. The branch off of the SCP-FX allows for a (further) gasification of the region along the pipeline towards the Black Sea coast and of the Black Sea coast as such in Georgia. By doing so an investor friendly environment – from the perspective of availability of natural gas at highly competitive prices – will be induced and gas demanding industry, including harbour facilities, can be established. Alike, natural gas can be supportive to the development of tourism at the Black Sea coast since tourist usually demand for comfort - which can be provided by natural gas (warm water/eventually heating). Besides, the availability of natural gas provides a supportive environment for the installation of RES, namely wind parks and PVs (highly fluctuating supply respectively matching the fluctuating demand). On top, WS can help also Energy Community countries (like Georgia), to fulfil their thereto related commitment like the gas directive, the thereto linked Regulations, energy efficiency, environmental provisions as well as towards the RES goals and the establishment of infrastructure for alternative fuels. Such achievements would be strongly supportive to the concept of Energy Community Treaty.

The expected stronger deployment of gas in the transport sector (mainly truck sector) will induce, besides lowering CO2 and other GHG emissions, a significant decrease of NOX and sulphur content as well as noise, emitted by Diesel-engines, not taken into account in the monetised benefits published with this Project Fiche.

F. Useful Links

TCP: http://www.w-stream-transcaspian.com/
SCPFX: www.socarmidstream.az
WS: http://www.white-stream.com/

Before going through the content of each specific Project Fiches, it is highly recommended to read the common introduction (Pages 1-6) in order to fully understand the different sections and indicators.

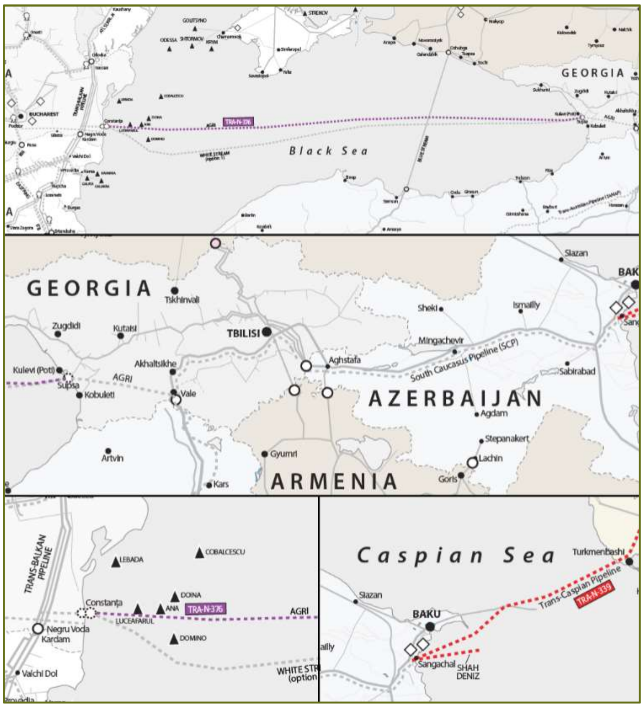
Project Group SGC_08

Reasons for grouping [ENTSOG]

The project group consists of projects aiming at bringing Caspian gas to Europe. Trans Caspian Pipeline (TRA-N-339) and SCPFX (TRA-F-1138) are enabler projects for AGRI LNG project (LNG-N-376) which will transport LNG from the liquefaction facilities on Georgian shore to the Romanian shore.

Objective of the project(s) in the group [Promoter]

AGRI Project, the SCP FX and TCP as parts of SGC_08, are proposed as a new and independent gas corridor for EU import gas market. The Project group objective is to link gas resources from Azerbaijan (significant gas resources of Shah Deniz Field) and over the Caspian region to markets in Europe. The project group aims at providing a new, reliable source of gas, which will help to reduce Europe's dependency from today main sources and increase supply diversification.



Projects constituting the group

TYNDP Project Code	Project Name	Promoter	Hosting Country	Project Status	3rd PCI List Code	First Comm. Year[1]	Last Comm. Year	Compared to TYNP 2017
TRA-N-0339	Trans-Caspian (TCP – String 2)	W-Stream Caspian Pipeline Company	TM	Advanced	7.1.1	2021	2022	NA
LNG-N-0376	Azerbaijan, Georgia, Romania Interconnector - AGRI	AGRI LNG	RO	Less-Advanced	NA	2026	2026	Delayed
TRA-F-1138	South Caucasus Pipeline - (Future) Expansion - SCP-(F)X	SOCAR Midstream Operations LLC	AZ	FID	7.1.1	2018	2018	Rescheduled

Projects Overview

Technical Information

TYNDP Project Code	Diameter [mm]	Length [km]	Compressor Power [MW]
TRA-N-0339	812	300	175
TRA-F-1138	1,067	691	6

TYNDP Project Code	Yearly Volume [bcm/y]	Storage Capacity [m3 LNG]	Ship Size [m3 LNG]
LNG-N-0376	8	160000	280000

[1] First and Last Commissioning Year: in case of projects bringing more than one capacity increment to a specific point, those two columns indicate the commissioning year of the first capacity increment of the project and that of the last capacity increment to be commissioned.

Capacity Increment

TYNDP Project Code	Operator	Point	Increment Commissioning Year	Entry Capacity [GWh/d]	Exit Capacity [GWh/d]
LNG-N-0376	AGRI	AGRI / Poti (GE)	2026	240	-
LNG-N-0376	AGRI	AGRI / Constanta (RO)	2026	-	240
TRA-N-0339	W-Stream Caspian Pipeline Company	TCP / South Caucasus Pipeline	2021	500	-
TRA-N-0339	W-Stream Caspian Pipeline Company	Constanta (White Stream)	2022	-	500
TRA-F-1138	SOCAR Midstream Operations LLC	Türkgözü	2018	-	464

B. Project Cost Information

During the TYNDP 2018 Project Data Collection, promoters were asked to indicate whether their costs are confidential or not. The following tables display the costs provided by the promoters (as of February 2018, end of TYNDP 2018 project collection), unless declared confidential. The amounts provided can differ from the figures used by the project promoters in other contexts, where costs can be updated and/or evaluated using different methodologies or assumptions. For the purposes of this project fiche, in case promoters identified their costs as confidential alternative costs have been directly calculated by ENTSOG (and mainly based on ACER Unit Investment Cost Report[2]) OR provided by the promoter. The alternative costs are identified with "*" if the alternative cost has been calculated by ENTSOG OR with "**" if the alternative cost has been provided by the promoter.

	Total Cost	LNG-N-376	TRA-N-339	TRA-F-1138
CAPEX [mln. EUR]	3735.86	1188.39*	1500.00	1047.48*
Range CAPEX		30%	30%	10%
OPEX [mln. EUR/y]	92.16	41.59*	16.00	34.57*

In line with the TYNDP 2018 supply cost methodology, ENTSOG identified the price of each considered supply source at the European border. This supply price already includes the cost to deliver the gas at EU border. When computing the economic performance indicators this aspect should be duly taken into account and only the project group costs not already included in the supply price assumptions should be considered.

Description of costs and range [Promoter]

For AGRI Project - LNG-N-376 the CAPEX data include

- Liquefaction of gas; new terminal (Georgian Coast); built in 2 phases of 3MTPA train size; storage 160,000m3 for 2 tanks;
- Ship transport of LNG from Georgia to Romania – two LNGC carriers of 140,000m3 capacity;
- Re-gasification of LNG to gas at new regasification terminal on Romanian Coast built in one phase; storage of 160,000m3.

CAPEX and OPEX for SCPFX have been taken from the SCPFX pre-feasibility study. Cost Elements of CAPEX estimation consist of costs for line pipes, logistics, pipeline and compressor station construction costs, costs for engineering and site supervision, other costs including costs for cathodic protection system, fibre optic cable, block valve stations, metering stations, tie-ins into the SCP system and special crossings, contingencies and etc. OPEX consist of fuel gas costs for operation of the compressor units, maintenance costs (stations and pipeline), personnel costs and costs for other OPEX items (HSE, insurance, administration).

The second string of the TCP will boost the capacity to 30bcma, but this additional supply will be routed to Romania through AGRI-LNG, from an offtake on the SCPFX. The second leg will comprise a new/expanded compression station at Belek, the expansion of the compressor station at the shore, and a second 32inch pipeline crossing the Caspian Sea. The second string costs will be spread over the construction period and will include the engineering, purchase of materials and equipment, installation and put into operation the expansion as described above. The commissioning of the second leg will be subject to the completion of AGRI, since half (15bcma) of the TCP (1st and 2nd string) throughput is destined to export to Europe via AGRI LNG.
Clarification on CAPEX of TCP (TRA-N-339): indicated CAPEX of 1500.00 mln. € represents costs of both strings of TCP – the second one to serve this project group will cost 750.00 mln. €. It will have capacity of 15 bcma. The rest of indicated 1500.00 mln. EUR is for string 1, to serve SGC_-01a /SGC_01b. Indicated OPEX is similarly attributable to both strings with total capacity 30 bcma.

[2]https://www.acer.europa.eu/official_documents/acts_of_the_agency/publication/uic%20report%20-%20gas%20infrastructure.pdf

C. Project benefits

C.1 Summary of project benefits

This section provides a summarised analysis by ENTSOG of the main benefits stemming from the realisation of the overall group and according to the guidelines included in the ENTSOG 2nd CBA Methodology. More details on the indicators are available in sections D and E.

Benefits explained (but fuel switch) [ENTSOG]

> **Competition:**

Enabling the connection of Europe to new supply sources from the Caspian region the group realisation allows to **reduce the dependence** of Europe from one of its main sources, LNG, in all scenarios under low infrastructure level. The group has a significant impact in reducing such dependency especially for Romania.

> **Security of Supply:**

The projects group increases **remaining flexibility** in Romania in both peak day and 2-weeks cold spell situation.
In case of Ukrainian supply route disruption, the projects group ensures **significant mitigation of risk of demand curtailment** in Romania and more limited in other countries like Serbia, Bulgaria and Bosnia Herzegovina.
Romania can benefit from the projects group realisation also in case of disruption of its main infrastructure. The risk of curtailed demand in such situation is **significantly mitigated** by the new capacity in all scenarios.
Additionally, the project group allows for **full mitigation of risk of demand curtailment** also in other European countries in case of disruption of the single largest infrastructures in Slovakia (Uzhgorod - VelkéKapušany) in Sustainable Transition. In this demand scenario such disruption would have in fact an impact on overall Europe.

> **Market Integration:**

The project has a **significant positive impact in terms of supply cost savings** for Europe. In the reference situation and under the low infrastructure level, Europe can access to a new source of gas from the Caspian region. Those benefits are clearly higher in case South supply maximisation. Those benefits are clearly higher in case South supply maximisation (south gas considered cheaper than all the other sources). In the Advanced infrastructure level, there are more projects that can potentially share those benefits and spreading to more European countries (like SGC_08). This translates in lower benefit in the advanced infrastructure level.

CO_2 Savings & Fuel Switch benefits explained [Promoter]

The project group's aim is to mainly supply the EU markets. Gas supplied by SGC_08 will compete with gas from other sources and routes and induce fuel switching. SGC_08 preliminary estimates, based on the specific C02 emissions/kWh and the forecasted price developments for CO2 emissions, confirms CO2 savings stemming from the realisation of the project could range between 28.2 Mln EUR/y and 63.1 Mln EUR, depending on the level of gas demand evolution and its consequent replacement of more polluting fuels. Overall, this covers the required sensitivity analysis regarding CO2 economic analysis and monetization of gas replacing other fuels.

C.2 Quantitative benefits [ENTSOG]

The following tables displays all the benefits quantified by ENTSOG through specific indicators and stemming from the realisation of the considered project group. Some of those benefits are measured through quantitative indicators (i.e. SLID and Curtailment rate) and monetised ex-post. Their monetised value is displayed in section E. When assessing those type of benefits, it is important to avoid any double counting considering them both in quantitative and monetised terms.

LOW Infrastructure Level

	2030									2040								
	SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Competition																		
Dependence to RU (%)																		
Austria							33%	22%	-11%									
Croatia	35%	27%	-8%	27%	10%	-17%	33%	23%	-10%	27%	7%	-20%	48%	24%	-24%	31%	9%	-22%
Czechia	35%	31%	-4%	26%	21%	-5%				27%	20%	-7%				31%	28%	-3%
Denmark	34%	30%	-4%															
Hungary	35%	27%	-8%	27%	10%	-17%	34%	23%	-10%	27%	6%	-21%	48%	24%	-24%	31%	9%	-22%
Poland	34%	31%	-3%	26%	21%	-5%												
Romania	54%	14%	-40%	41%	0%	-41%	50%	3%	-47%	53%	4%	-48%	64%	23%	-41%	49%	0%	-49%
Slovakia	35%	31%	-4%	26%	22%	-4%				27%	20%	-7%				31%	28%	-3%
Slovenia							33%	23%	-10%									
Sweden	34%	31%	-3%															

	2030									2040								
	SUSTAINABLE			DISTRIBUTED			EUCO30			CLIMATE			SUSTAINABLE			DISTRIBUTED		
Row Labels	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA	WITHOUT	WITH	DELTA
Security of Supply																		
Algeria Pipe Disruption Curtailment Rate 2-Weeks Cold Spell (%)																		
Croatia										19%	18%	-1%						
Algeria Pipe Disruption Curtailment Rate Peak Day (%)																		
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Baltics Finland Disruption Curtailment Rate 2-Week Cold Spell (%)																		
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Baltics Finland Disruption Curtailment Rate Peak Day (%)																		
Croatia										22%	21%	-1%						
Belarus Disruption Curtailment Rate 2-Week Cold Spell (%)																		
Croatia										19%	18%	-1%						
Belarus Disruption Curtailment Rate Peak Day (%)																		
Croatia										22%	21%	-1%						
Curtailment Rate 2-Week Cold Spell (%)																		
Croatia										19%	18%	-1%						
Curtailment Rate Peak Day (%)																		
Croatia										22%	21%	-1%						
Remaining Flexibility 2-Week Cold Spell (%)																		
Denmark																89%	91%	2%
Romania	43%	82%	40%	28%	63%	36%	18%	52%	34%	19%	53%	34%	30%	68%	38%	23%	58%	36%
Remaining Flexibility Peak day (%)																		
Bulgaria										79%	81%	2%						
Poland				80%	81%	1%												
Romania	23%	57%	34%	12%	43%	31%	4%	33%	30%	2%	31%	29%	10%	42%	31%	8%	39%	31%
Single Largest Infrastructure Disruption (SLID)-Romania																		
Romania	29%	0%	-29%	35%	4%	-31%	41%	11%	-30%	43%	14%	-29%	38%	7%	-31%	40%	9%	-31%
Single Largest Infrastructure Disruption (SLID)-Slovakia																		
Austria	2%	0%	-2%															
Belgium	2%	0%	-2%															
Germany	2%	0%	-2%															
Luxembourg	2%	0%	-2%															
Slovenia	2%	0%	-2%										2%	0%	-2%			
Sweden	2%	0%	-2%															
Switzerland	2%	0%	-2%															
Ukraine Disruption Curtailment Rate 2-Week Cold Spell (%)																		
Croatia										19%	18%	-1%						
Romania	19%	0%	-19%	27%	0%	-27%	34%	1%	-33%	34%	1%	-34%	28%	0%	-28%	32%	0%	-32%
Ukraine Disruption Curtailment Rate Peak Day (%)																		
Bosnia Herzegovina	8%	6%	-2%	6%	4%	-2%												
Bulgaria	9%	6%	-3%	7%	4%	-3%												
Croatia										22%	21%	-1%						
FYROM				8%	4%	-4%												
Italy	6%	4%	-1%															
Romania	29%	6%	-23%	35%	6%	-29%	41%	11%	-30%	43%	14%	-29%	38%	8%	-30%	40%	9%	-31%
Serbia	8%	6%	-2%	6%	4%	-2%							8%	6%	-2%			
Slovakia	6%	4%	-2%															
Slovenia													8%	6%	-2%			

C.3 Monetised benefits

This section includes all benefits stemming from the realisation of a project that are quantified and monetised. Some benefits are monetised ex-post while others directly as a result of the simulations and are impacted by the modelling assumptions chosen (e.g. tariffs or supply price assumptions). Monetised benefits are showed at EU level. In order to keep the results in a manageable number, those have been aggregated per Infrastructure Level and Demand Scenarios

Reference							
	SCENARIO	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE	DISTRIBUTED GENERATION	SUSTAINABLE TRANSITION	GLOBAL CLIMATE
	Infrastructure level	Low	Low	Low	Advanced	Advanced	Advanced
Project benefits (Meur)	EU Bill Benefits (MEUR/y)						
	Reference	128.6	231.9	182.8	40.9	131.9	75.9
	Supply Maximization	432.8	547.2	495.5	167.8	363.5	253.3
	Mitigation in Disrupted Demand (MEUR/y)						
	Peak Day	10.5	10.0	10.0	0.0	0.0	0.0
	2 Weeks	5.2	43.8	51.9	0.0	0.0	0.0
	Fuel & CO_2 Savings (MEUR/y)						
	CO_2 Savings	46.2	42.3	63.1	28.2	25.8	38.5
	Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0

C.4 Sensitivity analysis on monetised benefits

In line with ENTSOG Adapted 2nd CBA Methodology, ENTSOG has also run sensitivities on some relevant assumptions such as tariffs, commissioning year and lower supply source price differential. The results included in the tables below have to be compared with the ones included in section C.3. Further information is available in the common introduction (Pages 1-6) to all project fiches.

LOW INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	151.8	53.3	271.9	167.6	319.0	178.4	231.9	128.6
Supply Maximization	467.2	0.0	587.3	3.0	757.0	602.7	273.6	216.4
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	10.5	10.0	10.5	10.0	7.3	7.2	10.5	10.0
2 Weeks	51.9	5.2	51.9	5.2	85.6	64.9	51.9	5.2
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	63.1	42.3	63.1	42.3	103.5	65.4	63.1	42.3
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ADVANCED INFRASTRUCTURE LEVEL

PROJECT BENEFITS	Sensitivity HIGHER TARIFF		Sensitivity LOWER TARIFF		Sensitivity LATER COMMISSIONING YEAR		Sensitivity LOWER SUPPLY PRICE DIFFERENCE	
	Max	Min	Max	Min	Max	Min	Max	Min
EU Bill Benefits (MEUR/y)								
Reference	64.1	5.4	170.9	72.1	196.6	61.3	131.9	40.9
Supply Maximization	289.1	0.0	402.5	0.0	539.6	257.7	181.7	83.9
Mitigation in Disrupted Demand (MEUR/y)								
Peak Day	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2 Weeks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Fuel & CO_2 Savings (MEUR/y)								
CO_2 Savings	38.5	25.8	38.5	25.8	63.1	39.9	38.5	25.8
Fuel Switch savings	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

D. Environmental Impact

Any gas infrastructure has an impact on its surroundings. This impact is of particular relevance when crossing some environmentally sensitive areas. Mitigation measures are taken by the promoters to reduce this impact and comply with the EU and National regulations. The Tables have been filled in by the promoters.

TYNDP Code	Type of infrastructure	Surface of impact	Environmentally sensitive area
LNG-N-0376	LNG liquefaction and regasification terminal	Not known	There are no protected areas in close proximity and construction of terminals can be completed by implementing suitable environmental mitigation
TRA-F-1138	Transmission pipeline and compressor station	93 km 48 inch diameter	N/A
TRA-N-0339	Pipeline (onshore and offshore) Above ground installations	300 km 32inch diameter meter (onshore and offshore) Total area of the compressor stations, block valve stations and pipeline receiving station	The project activities undertaken in Turkmenistan and Azerbaijan will comply with good international practice. The project will be planned, constructed and operated in compliance with the laws of Turkmenistan and Azerbaijan, which require an environmental impact assessment (EIA). In addition to meeting national EIA requirements, the project will be undertaken in accordance with EIA/ESIA requirements of the World Bank Group, EU legislation and other major European finance institutions, and the requirements of relevant regional and international conventions

Potential impact	Mitigation measures	Related costs included in project CAPEX and OPEX	Additional expected costs
LNG-N-0376	NA	NA	NA
TRA-F-1138	NA	NA	NA
TRA-N-0339	Construction and operation of the project will be supported by environmental and social management procedures which will be developed as part of the EIA/ESIA process.	CAPEX and OPEX not confirmed yet but estimates included in CAPEX and OPEX provided to ENTSOG	Not expected

Environmental Impact explained [Promoter]

Of interest to the TCP, SCP-FX and AGRI projects are 'safeguard policies', which include environmental assessments and policies designed to prevent unintended adverse effects on third parties, social and the environmental structures. The SCP(F)X Project ESIA has been undertaken by consulting company RSK Environment Limited (RSK). The objective of the ESIA process is to identify and, where possible, eliminate or minimise through early recognition any adverse environmental or socio-economic impacts arising from Project activities and to incorporate mitigations into front-end engineering, construction and operation. Construction and operation of the project will be supported by environmental and social management procedures. The procedures will include a series of specific environmental and social management plans and project standards and contractors' implementation plans. The environmental and social risks and impacts of the project will be managed through implementation of the procedures which will include the plans, including monitoring, to ensure that the identified environmental and social risks and impacts of the project are addressed. Regarding LNG liquefaction and regasification terminal the construction of the terminals will happen in non-protected areas (no protected areas in close proximity to terminals). Suitable environmental mitigation will be implemented.

E. Other Benefits

Missing benefits are all benefits of a project which may be not captured by the current application in TYNDP 2018 of the 2nd CBA Methodology.
As a necessary condition a missing benefit cannot have discrepancies with the benefits already covered by the assessment run by ENTSOG and this condition needs to be proved and justified.

Other benefits explained [Promoter]

The project group SGC_08, consisting of TCP - SCP-FX and AGRI LNG is a project within the SGC which, as branch off of the SCP-FX, will be heading towards the Black Sea coast. At the liquefaction terminal at the Black Sea Coast in Georgia the gas will be liquefied and transported via LNG vessels to the Black Sea coast in Romania in order to be regasified there. Subsequently the project will provide additional competition through new entry points in the EU natural gas markets through the opening of a new southern gas corridor. AGRI LNG project will introduce new supply routes that diversify gas transportation system of EU.
The branch off of the SCP-FX allows for a (further) gasification of the region along the pipeline towards the Black Sea coast and of the Black Sea coast as such in Georgia.
Natural gas can be supportive to the development of tourism at the Black Sea coast since tourist usually demand for comfort, which can be provided by natural gas (warm water/eventually heating.
The SCP(F)X Project allows to expand the capacity of the existing SCP system to accommodate additional gas throughput from the Shah Deniz Stage 2 (SD2) expansion development in the Caspian. The Project base-case design is to facilitate an increase in gas transmission capacity in the existing SCP pipeline system by an additional 16 bcma and future expansion capacity up to additional 5 bcma.

F. Useful Links

AGRI LNG: www.agrilng.com
TCP: http://www.w-stream-transcaspian.com/
SCPFX: www.socarmidstream.az