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european network
of transmission system operators
for gas

2nd ENTSOG Methodology for Cost-Benefit Analysis of Gas Infrastructure Projects

Compliance of 2nd CBA Methodology with Regulation 347

2018

ENTSOG – A FAIR PARTNER TO ALL!

Compliance of 2nd CBA Methodology with Regulation (EU) 347/2013

1. Introduction

The 2nd CBA methodology has been developed under Regulation (EU) 347/2013 on "guidelines for trans-European energy infrastructure" (hereinafter "the Regulation"), which sets forth the process for the development and update of the CBA methodology, and indicates the different fields of its application.

The present document describes how ENTSOG took into account the different requirements of the Regulation in the 2nd CBA methodology, as set forth by the following articles:

- Article 4 – "Criteria for projects of common interest"
- Article 11 – "Energy system wide cost-benefit analysis"
- Article 12 – "Enabling investments with cross-border impacts"
- Article 14 – "Eligibility of projects for Union financial assistance"
- Annex III – "Regional list of projects of common interest"
- Annex IV – "Rules and indicators concerning criteria for projects of common interest"
- Annex V – "Energy system-wide cost-benefit analysis"

2. Process and role of ENTSOG in developing the CBA Methodology

Article 11.1 of the Regulation entrusts both ENTSOs with the task to develop and publish a Cost-Benefit Analysis methodology and sets forth the scope of its application and the process of its development. More precisely, it defines that the CBA Methodology shall be "*on network and market modelling, for a harmonised energy system-wide cost-benefit analysis at Union level for projects of common interest falling under the categories set out in Annex II.1(a) to (d) and Annex II.2"* and *"shall be applied for the preparation of each subsequent 10-year network development plan developed by the ENTSO for Electricity or the ENTSO for Gas pursuant to Article 8 of Regulation (EC) No 714/2009 and Article 8 of Regulation (EC) No 715/2009. The methodologies shall be drawn up in line with the principles laid down in Annex V and be consistent with the rules and indicators set out in Annex IV*".

In accordance with the Regulation the CBA Methodology shall be used for the preparation of each subsequent Ten-Year Development Plan (TYNDP), which represents the primary filed of application of the CBA Methodology, as well as for the selection of projects of common interest.

The following analysis indicates how the 2nd CBA Methodology takes account of the abovementioned rules on its scope and fields of its application, the principles, rules and

indicators as laid down by Annexes IV and V as well as the criteria set by the Regulation on the selection of PCI projects.

Article 11.1 states that *"Prior to submitting [its] methodolog[y], […] the ENTSO for Gas shall conduct an extensive consultation process […]"*. Following **article 11.1**, in early 2017 ENTSOG organised meetings with "Prime Movers" (composed by relevant stakeholders and institutions) to identify what were the most expected improvements for ENTSOG CBA methodology. Following the feedback received from "Prime Movers" ENTSOG took these proposals into consideration in the preparation of an extensive public consultation held from 19 May to 16 June 2017. In the public consultation stakeholders were asked to provide their views on the main elements the update of the CBA methodology should take into account. The feedback received was published on the ENTSOG website. The public consultation was also complemented by a webinar, held on the31st of May 2017.

Consistently with **article 11.2-4,** ENTSOG published the draft 2nd CBA Methodology and submitted it to ACER and the Commission for their opinions, on the 24th of July 2017. The draft 2nd CBA Methodology also took into account the recommendations stemming from the Gas CBA study[1] carried out for the Commission by FSR and Deloitte published on 10 March 2017. In the second part of 2017 and beginning of 2018, ENTSOG worked further in view of the preparation of the Adapted version of the CBA Methodology, based in particular on ACER's opinion received on the 24th of October 2017, and Commission opinion received on 17th October 2018.

3. Compliance of the CBA Methodology with the Regulation

3.1 The CBA Methodology is developed within the scope set by the Regulation

Article 11.1 sets that the methodology should be *"including on network and market modelling"*. Following this article, chapter 1.2 of the CBA Methodology lists the elements required to build a comprehensive network and market modelling. This chapter includes a detailed indication of the network and market assumptions (e.g. infrastructure tariffs) that should be considered for the system and project assessment.

The same article sets that the cost-benefit analysis should be applied *"for projects of common interest falling under the categories set out in […]* ***Annex II.2****"*. In this respect chapter 3 of the

[1] The draft recommendations are available here: http://fsr.eui.eu/event/gas-cba-2-0-online-consultation/

CBA Methodology indicates that project-specific CBA should be performed as part of the TYNDP process for the projects having signalled their intention to participate in the upcoming PCI selection process and grouped in accordance with the project grouping guidelines defined in chapter 3.1. To do so the CBA Methodology describes common metrics for the analysis of socio-economic benefits to be used in the TYNDP for both system and project assessment (chapter 3.2).

Furthermore, to ensure as much transparency as possible towards all concerned stakeholders, the Methodology recommends that the cost-benefit analysis of projects would be presented in the form of a standard template and published as part of the TYNDP Report.

3.2 Compliance with provisions of the Regulation setting the fields of application

The Regulation defines the different fields of application of the CBA Methodology.

Application to the TYNDP

As indicated by Article 11.1, the TYNDP has to be applied to TYNDP. The 2nd CBA Methodology therefore provides clear guidelines in terms of its application to TYNDP and more precisely in terms of input requirement as well as system assessment, including infrastructure gaps identification, and project assessment.
This also includes the main process to be followed when the CBA is to be used at project level (project-specific CBA) for PCI candidates, in accordance with **Annex III.2 (1)**. The CBA Methodology describes common metrics to be used in the TYNDP, and the output to be published in the TYNDP Report.

Application in the PCI process

Annex III.2 (1) indicates that projects "*wanting to obtain the status of project of common interest"* and *"having reached a sufficient degree of maturity"* shall provide *"a project-specific cost-benefit analysis […]based on the methodolog[y] developed by […] the ENTSOG for gas pursuant to Article 11"*. Furthermore, **Annex III.2 (4)** defines that all projects intending to apply for the PCI label *"shall be part of the latest available 10-Year Network Development Plan"*.
The CBA methodology proposes a project assessment scope as part of the TYNDP that covers all projects intending to apply in the upcoming PCI selection process, whatever their degree of maturity. This goes beyond the actual regulatory requirements with regard to PS-CBA as part of the PCI selection process, which only refer to sufficiently mature projects.
The proposed approach is intended to provide a relevant contribution to the PCI process, for all projects able to provide the necessary project data, in line with the practice of the 2nd and 3rd PCI processes.

Regarding the assessed projects, the CBA Methodology ensures transparency and comparability by recommending to present the CBA results in a uniform way (in terms of a project fiche) and based on the same common elements (including the information on project cost).
Additionally, the Methodology also proposes to assess the European gas system under the prevailing PCI list (PCI Infrastructure Level) which provides a feedback loop on what the projects which are part of the list overall achieve in term of market integration, competition, security of supply and sustainability.

Application in investment requests and requests for grants

Article 12[2] states that project promoters whose PCI projects have *"reached sufficient maturity"* shall *"submit an investment request [which] shall include a request for cross-border cost allocation [and shall] be accompanied by […]a project-specific cost-benefit analysis consistent with the methodology drawn up pursuant to Article 11"*.
According to **article 14**[3] this project-specific CBA is also required for mature enough projects that *"[have] received a cross-border cot allocation decision pursuant to Article 12"* and that are willing to apply *"for Union financial assistance in the form of grants for works"*.

The CBA methodology, and its application in the TYNDP, will support projects selected as PCI and intending to perform a CBA for investment request:

- By providing a publicly available input data set (in terms of scenarios on demand and supply, infrastructure data, etc.) that could be completed with additional data if duly reasoned;
- By providing, as part of TYNDP, a PS-CBA with country-level outputs focusing on the socio-economic assessment and indicating the possible cross-border impact of the projects in terms of benefits;

With regard to the business plan and the proposal for cross-border cost allocation that promoters are also expected to submit with the investment request, the CBA Methodology does not provide guidelines as they are entirely under the responsibility of the concerned promoters.

3.3 Compliance of the CBA Methodology with Annex V of the Regulation

Annex V of the Regulation defines the principles that the Energy-System wide cost-benefit analysis for projects of common interest shall satisfy. The relevant sections (for gas projects)

[2] Article 12 on "Enabling investments with cross-border impacts".
[3] Article 14 on "Eligibility of projects for Union financial assistance".

of the Annex are listed below with the description of how they are reflected in the ENTSOG CBA Methodology.

- **Annex V.1 (b)** states that *"the methodology shall be based on a common input data set representing the Union's electricity and gas systems in the years n+5, n+10, n+15, and n+20, where n is the year in which the analysis is performed [and that] this data set shall comprise at least* in gas: *scenarios for demand, imports, fuel prices (including coal, gas and oil), carbon dioxide prices, the composition of the transmission network and its evolution*[4]".

The 2nd CBA Methodology recommends considering an assessment framework (chapter 1 and relative sub-chapters) based on a time horizon covering years n+5, n+10, n+15, and n+20. The Methodology furthermore recommends to define the input data set and to perform the CBA assessment for 5-year-rounded years, in line with the recent TYNDP and PCI process practice and with ACER opinion, as this supports assessing the system and projects against the targets set by the European policies. Additionally, in line with **Annex V.1 (b)**, the Methodology indicates that the data to be considered in the assessment framework should be at least the following: commodity and CO_2 prices, demand scenarios, imports and indigenous production represented through supply potentials and a network topology comprising the existing infrastructures and projects. With regard to the latter, the Methodology recommends considering as reference grid a credible minimum set of infrastructures (chapter 2), composed of the existing infrastructure and projects having already obtained the FID status. The Methodology defines this reference grid as the basis for assessing the infrastructure gaps and subsequently as the main counterfactual situation against which to perform project-specific assessment.

- **Annex V.2** states that *"the data sets used for electricity and gas respectively shall be compatible, notably with regard to assumptions on prices and volumes in each market. The data set shall be elaborated after formally consulting Member States and the organisations representing all relevant stakeholders. The Commission and the Agency shall ensure access to the required commercial data from third parties when applicable*".

Still in chapter 1 the CBA Methodology indicates that the demand and supply scenarios and underlying assumptions should be defined subject to a regular update process for each TYNDP edition that should ensure extensive stakeholder involvement and consultation. Additionally, the draft version of the ENTSOs *"consistent and interlinked model"* (the Interlinked Model), applied since TYNDP 2018 already sets the scenario development process as a joint electricity

[4] *"[…] taking into account all new projects for which a final investment decision has been taken and that are due to be commissioned by the end of year n+5".*

and gas process that ensures consistency among the assumptions used. The adapted version of the Interlinked Model will form part of the CBA Methodology in force once approved by the Commission.

- **Annex V.3** states that the Methodology shall give guidance for the development and use of network and market modelling necessary for the cost-benefit analysis.

Consistently with this Annex, the Methodology gives clear indication in chapter 1.2 on the network and market modelling assumptions that can be considered when applying the CBA Methodology (e.g. infrastructure tariffs). The chapter also indicates the type of infrastructures to be taken into account to define the network topology.

- **Annex V.4** states that *"the cost-benefit analysis shall be based on a harmonised evaluation of costs and benefits for the different categories of projects analysed and cover at least the period of time referred to in point (1)"*.

In chapter 3, the CBA Methodology defines the frame for the project-specific assessment, including metrics (indicators) to evaluate project costs (chapter 3.3) and benefits (chapter 3.2). Chapter 3.4 recommends considering a 25-year economic life for calculating the economic performance indicators for all projects assessed, in line with ACER and the Commission opinions.

- **Annex V.5** states that *"the cost-benefit analysis shall at least take into account the following costs: capital expenditure, operational and maintenance expenditure over the technical lifecycle of the project and decommissioning and waste management costs, where relevant. The methodology shall give guidance on discount rates to be used for the calculations*".

In chapter 3.3 the CBA Methodology details all the project costs to be considered. Chapter 3.4 provides guidance on the social discount rate and recommends to use a harmonised rate in order to ensure consistency in the project assessment.

- **Annex V.10** states that *"the methodology shall define the analysis to be carried out, based on the relevant input data set, by determining the impacts with and without each project. The area for the analysis of an individual project shall cover all Member States and third countries, on whose territory the project shall be built, all directly neighbouring Member States and all other Member States significantly impacted by the project*".

In chapter 3.1, the CBA Methodology provides guidelines for the implementation of the incremental approach, which is based on a counterfactual situation, and evaluates the benefits of a project by comparing the situation with and without the project. The chapter describes the methods to be used (PINT and TOOT) depending on the level of advancement of the project in regard to the counterfactual situation.
Additionally, chapter 1.2 provides general guidelines on the geographical perimeter. Further details on the geographical perimeter are left to each ENTSOG TYNDP Practical Implementation Document[5], developed in support to Annex III.2(5).

- **Annex V.11** states that *"the analysis shall identify the Member States on which the project has net positive impacts (beneficiaries) and those Member States on which the project has a net negative impact (cost bearers). Each cost-benefit analysis shall include sensitivity analyses concerning the input data set, the commissioning date of different projects in the same area of analysis and other relevant parameters*".

The indicators defined in the CBA Methodology are calculated at country-level (except in very specific cases). The CBA analysis therefore allows to identify the Member States on which the project has a positive impact and Member States on which the project has a negative impact. The Methodology also provides concrete examples in chapter 3.1.
The CBA Methodology recommends (chapter 3.5) considering sensitivity analyses on different relevant parameters concerning gas market factors (e.g. demand evolutions), project-specific data (commissioning year) and monetary or financial data (e.g. social discount rate).

Additionally, with reference to **Annex V.13**, and as explained earlier in this document, the "consistent and interlinked model" developed by the ENTSOs was submitted as a draft version to ACER and the Commission for their opinion in December 2016. Once adapted and approved by the Commission it will be included in the CBA Methodology in force.

5 https://www.entsog.eu/public/uploads/files/publications/TYNDP/2018/TYNDP062_180119_Practical_Implementation_Document_FINAL.pdf

3.4 The CBA Methodology takes into account the criteria for projects of common interest as defined by Article 4 and Annex IV of the Regulation

To properly support the PCI selection process, the metrics which are developed in the CBA Methodology and explained in chapter 3 comply with **article 4**[6] and **Annex IV**[7] of the Regulation.
These article and Annex describe the general and specific criteria that projects of common interest shall meet.
In particular, **article 4.2 (b)** indicates that gas projects falling under the categories set out in **Annex II.2** have to contribute significantly to at least one of the following specific criteria:

- Market integration
- Security of supply
- Competition
- Sustainability

Annex IV.2 provides additional indications on how the criteria listed in Article 4 shall be evaluated.

The CBA methodology combines monetary elements pertaining to the CBA approach, as well as non-monetary and/or qualitative elements referring to the Multi-Criteria Analysis approach (chapter 3.1).

As shown in the table below, chapter 3.2 of the 2nd CBA methodology provides guidelines to evaluate the benefits along these criteria through the quantification and/or monetisation of specific indicators. Taking into consideration the broad definition in the Regulation of these criteria, some of the indicators allow to capture different dimensions of the impact of a project.

[6] Article 4 on "Criteria for projects of common interest".
[7] Annex IV on "Rules and indicators concerning criteria for projects of common interest".

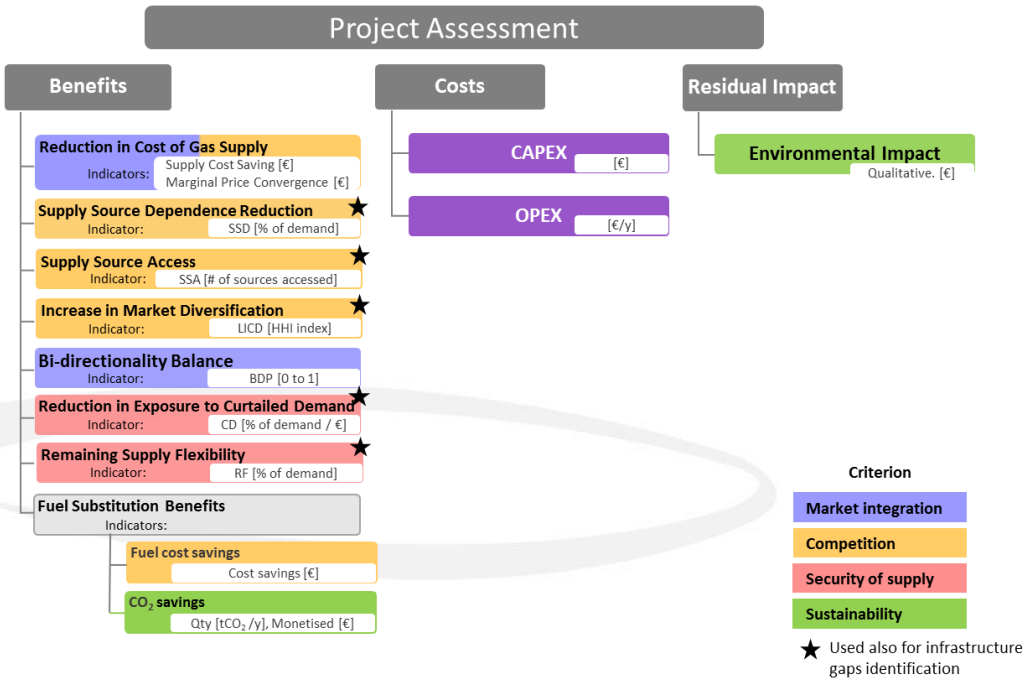

Figure 1 - CBA metrics and Regulation criteria (chapter 3.2 of the CBA Methodology)

Market integration

Art. 4.2 (b)(i) defines that a project contributes to market integration *"through lifting the isolation of at least one Member State and reducing energy infrastructure bottlenecks; interoperability and system flexibility"*.

Additionally, **Annex IV.3 (a)** provides further indication explaining that *"market integration and interoperability shall be measured by calculating the additional value of the project to the integration of market areas and price convergence, to the overall flexibility of the system, including the capacity level offered for reverse flows under various scenarios"*.

Market integration benefits stemming from the realisation of a project can be measured in the CBA Methodology by the following metrics:

- Bi-Directionality indicator (BDP);
- Reduction in gas supply cost (as part of the project socio-economic welfare), which mainly informs the impact of the project in terms of competition, but additionally in terms of market integration[8].

Competition

Art. 4.2 (b)(iii) defines that a project contributes to competition *"through diversification of supply sources, supplying counterparts and routes"*.
Additionally, **Annex IV.3 (b)** provides further indication explaining that *"competition shall be measured on the basis of diversification, including the facilitation of access to indigenous sources of supply, taking into account, successively: diversification of sources; diversification of counterparts; diversification of routes; the impact of new capacity on the Herfindahl-Hirschmann index (HHI) calculated at capacity level for the area of analysis"*.

Competition benefits stemming from the realisation of a project can be captured by measuring the ability of a project:

- To reduce gas supply costs (as part of the project socio-economic welfare)[9];
- To increase the number of sources a country has access (Supply Source Access indicator);
- To reduce supply dependence (Supply Dependence indicator);
- To increase LNG an interconnections diversification (LICD indicator), indicator that is recommended to be measured as a HHI index calculated at capacity level.

Security of supply

Art. 4.2 (b)(ii) defines that a project contributes to security supply *"through appropriate connections and diversification of supply sources, supplying counterparts and routes"*.
Additionally, **Annex IV.3 (c)** provides further indication explaining that *"security of supply shall be measured by calculating the additional value of the project to the short and long-term resilience of the Union's gas system and to enhancing the remaining flexibility of the system to cope with supply disruptions to Member States under various scenarios as well as the additional capacity provided by the project measured in relation to the infrastructure standard (N-1 rule) at regional level in accordance with Article 6(3) of Regulation (EU) No 994/2010"*.

Security of supply benefits stemming from the realisation of a project can be captured by measuring the ability of a project:

- To increase resilience of the system to security of supply events (SoS benefit in terms of avoided curtailed demand calculated under normal situation as well as under climatic, supply and infrastructure stress);
- To increase remaining flexibility.

With regard to the N-1 rule the benefit of a project in fulfilling the infrastructure standard is measured by the curtailed demand indicator measuring its ability to increase the resilience and the remaining flexibility of the European gas system, by mitigating or lifting infrastructure

[9] CBA Methodology Chapter 3.

constraints that create risk of demand curtailment in case of infrastructure stress related to the disruption of the main infrastructure. Additionally, the assessment will focus on the disruptions listed in the Union-wide simulation of gas supply and infrastructure scenarios carried out for the risk assessment defined in article 7, Regulation (EU) 2017/1938 concerning security of gas supply, as well as on the risk groups defined in Annex I of the same Regulation.

Sustainability

Art. 4.2 (b)(iv) defines that a project contributes to sustainability *"through reducing emissions, supporting intermittent renewable generation and enhancing deployment of renewable gas".* Additionally, **Annex IV.3 (b)** provides further indication explaining that *"sustainability shall be measured as the contribution of a project to reduce emissions, to support the back-up of renewable electricity generation or power-to-gas and biogas transportation, taking into account expected changes in climatic conditions"*.

Sustainability benefits stemming from the realisation of a project can be captured by measuring the ability of a project to reduce CO_2 emissions by replacing more polluting fuels in countries/areas/sectors not yet or not largely connected to gas.
Additionally, projects may also allow to replace more expensive alternative fuels with gas ensuring fuel cost savings and supporting market competition.

Furthermore, the 2nd CBA Methodology recommends running scenario-based sensitivities on the level of renewable energy penetration. This sensitivity will represent an input to the assessment and the calculation of indicators. Changes in the climatic conditions and their impact in terms of gas and renewable energy consumption are tackled directly in the scenarios and represent an input to the calculation of the impact of projects (included on avoided curtailed demand).

Annex IV.1 (c) and (d) of the Regulation indicate that:

- For gas transmission projects the project shall
  - concern investment in reverse flow or
  - change the capability to transmit gas across the borders of the Member States by at least 10% compared to the situation prior to the commissioning of the project
- Storages and LNG terminals shall
  - aim at supplying directly or indirectly at least two Member States or
  - aim at fulfilling the infrastructure standard (N-1 rule) at regional level[10]

[10] As of Annex I.5 of Regulation (EU) No 994/2010 of the European Parliament, "*The regional N – 1 calculation can only replace the national N – 1 calculation, where the single largest gas infrastructure of common interest is of major importance for the gas supply of all Member States concerned according to the joint risk assessment*".

The 2nd ENTSOG CBA Methodology recommends the collection of all project information essential for the allows system and project assessment. It also indicates that this information must be reported when the project is submitted to the TYNDP as part of the project data collection. The CBA Methodology, through its indicators, allows to identify whether a project fulfil the criteria defined in **Annex IV.1**.

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