ENTSOG Summer Supply Outlook 2011

Executive Summary

ENTSOG has undertaken an assessment of the European gas network to analyse whether the grid is able to meet both demand and injection needs during Summer 2011 (April to September). The conclusions are:

The European gas network is sufficiently robust in all parts of Europe to enable both:

- **Maintenance in order to ensure infrastructure safety and reliability**
- **Injection program consistent with storage operators' forecasts**

A sensitivity study has been carried out to further illustrate the ability of the network to enable a shorter injection season and to face a wide range of supply patterns, including a complete disruption of Libyan gas during the whole summer.

The integrated flow patterns used in the analysis are developed specifically for this Summer Supply Outlook. They should not be considered as forecast not withstanding they result from TSOs experience and ENTSOG modelling and supply assumptions.

Introduction

As part of ENTSOGs continuous efforts to ensure greater transparency and knowledge regarding the development and operation of the European gas transmission network, ENTSOG presents this Summer Supply Outlook 2011. This Outlook aims to assess the ability of the European gas network to provide sufficient flexibility to shippers during their injection season.

The summer months provide shippers the opportunity to refill storage capacities in anticipation of the winter months ahead. The level of injection targeted by shippers varies from one country to the other and from time to time due to climatic, price and legal parameters.

Modelling has been used to confirm the ability of the European gas network to both:

- enable shippers to meet demand and injection (according SSOs' targets) per country and per month
- provide additional flexibility for injection under different supply scenarios.

Objective

As last year's report, the Summer Supply Outlook 2011 has checked if the capacity of the European gas network is sufficient to face demand and to achieve the SSOs' injection targets for each month and country (see paragraph "Results of modelling of SSOs' injection targets").

In order to encompass the range of possible injection targets and supply patterns, an additional sensitivity study has been carried out around a Reference Case (see paragraph "Results of the sensitivity study"). This case is defined by a flat supply the level of which is defined by total summer demand plus the difference between the European Working Gas Volume as an aggregate and stock level on 1 April 2011.

This analysis aims to indicate how fast certain injection levels (ranging from 85% to 100%) can be reached under:

- different supply patterns (increase of import source by 10% in comparison Average Daily Supply as defined under TYNDP 2011-2020),
- different supply level (100 to 110% in comparison with demand and injection reference needs).

This sensitivity study measures the shortest time to fulfil the European Working Gas Volume as an aggregate.

Results of modelling of SSOs' injection targets

Six monthly simulations of the European network based on rules and assumptions (as defined in Annex A) have been carried out and a realistic solution has been found for each country and month. The integrated flow pattern shows there is sufficient available transmission capacity to ensure balance between supply and demand and targeted injection in each country with considerable flexibility in most of them.

The below table provided the targeted monthly stock level as provided per SSOs through GSE in April 2011* for Summer 2011:

Country	Working Gas Volume** (GWh)	Stock level at the end of the month						
		March	April	May	June	July	August	Sept.
AT	39,105	40%	52%	62%	71%	81%	90%	98%
BE	7,425	16%	35%	63%	85%	93%	100%	100%
BG	3,850	16%	29%	41%	54%	67%	80%	92%
CZ	28,061	38%	56%	63%	70%	76%	82%	86%
DE	213,315	43%	54%	67%	78%	87%	91%	92%
DK	11,363	59%	67%	75%	84%	92%	97%	100%
ES	26,026	44%	54%	63%	72%	80%	90%	96%
FRn***	75,020	18%	34%	41%	53%	62%	71%	74%
FRs***	34,045	24%	34%	42%	50%	60%	70%	74%
FRt***	29,300	32%	37%	47%	60%	77%	93%	98%
HR	7,119	16%	29%	41%	54%	67%	79%	92%
HU	67,430	48%	55%	62%	70%	77%	85%	92%
IE	2,398	16%	29%	41%	54%	67%	80%	92%
IT	170,510	47%	55%	65%	74%	80%	90%	97%
LV	25,520	16%	29%	41%	54%	67%	79%	92%
NL	11,231	54%	61%	67%	73%	79%	86%	92%
PL	7,732	38%	47%	56%	65%	74%	83%	92%
PT	2,155	77%	80%	82%	85%	87%	90%	92%
RO	29,634	25%	36%	47%	59%	70%	81%	92%
RS	3,300	16%	29%	41%	54%	67%	79%	92%
SE	112	16%	29%	41%	54%	67%	79%	92%
SK	37,378	45%	45%	60%	74%	87%	95%	97%
UK	52,316	33%	41%	54%	67%	81%	89%	91%
Total	**884,345**	**38%**	**49%**	**59%**	**69%**	**78%**	**87%**	**92%**

(*): Such targets may be subjected to change during the summer season

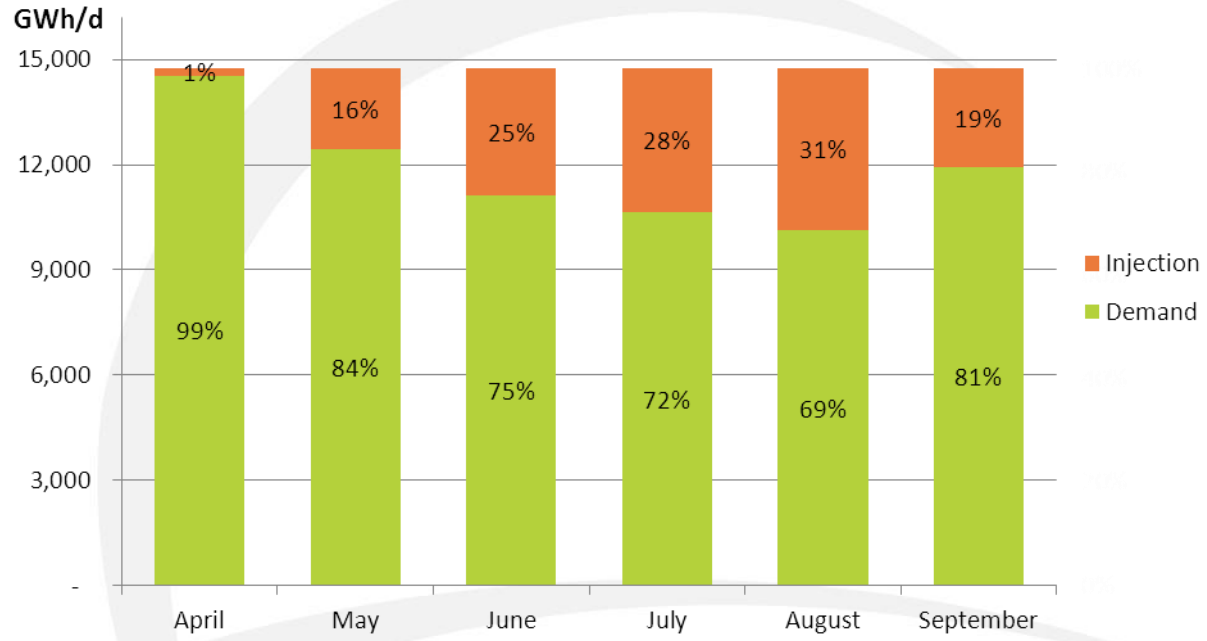
(**): Working Gas Volume is defined by the AGSI value using a uniform GCV of 11 kWh/m^3

(***): France split into 3 blocks: GRTgaz North (FRn), GRTgaz South (FRs) and TIGF (FRt) balancing zones

Results of the sensitivity study

Reference Case

Definition of a fictitious flat supply for the whole summer has been selected in order to ease comparison between scenarios which is the purpose of the sensitivity study. Then the gas available for injection will depend on demand level as shown in the following graph (average daily values for each month):



Modelling has been used in order to check if any physical congestion may limit the injection of this amount of gas.

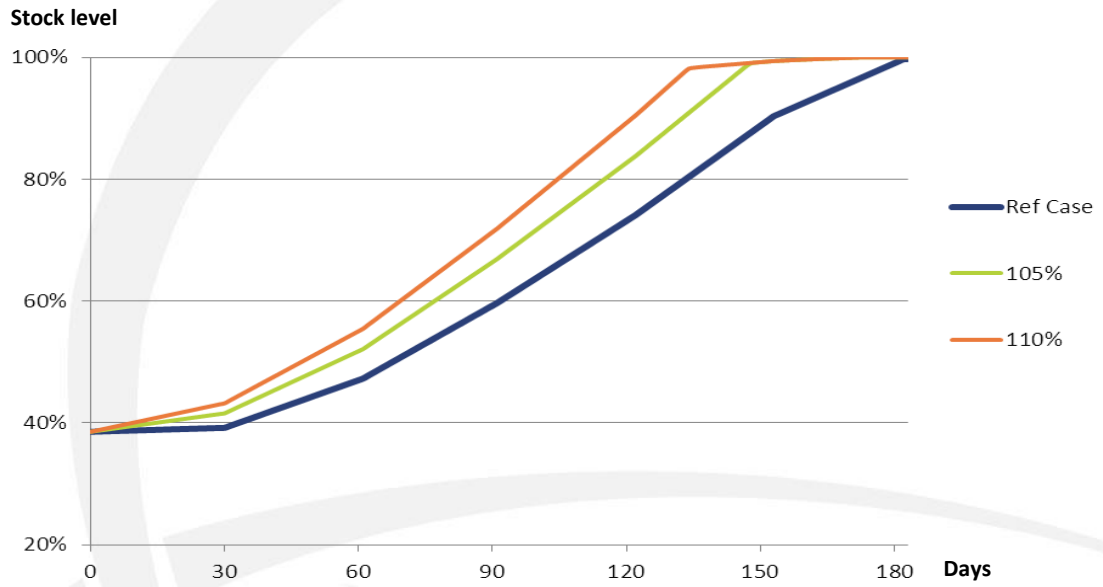
The 183 daily simulations based on rules and assumptions (as defined in Annex A) show that a 100% aggregated European stock level may be achieved by 30 September 2011 with narrow exception of storages within GRTgaz South and TIGF zones in France where a 96% filling is reached.

This difference is due to low injection in April considering the flat supply and the fact that most of the gas will be dedicated to demand. Then from May to September a physical congestion of firm entry capacity into these zones (GRTgaz North to South link, Spain to TIGF cross-border capacity and Fos LNG terminal) will make impossible to catch up low April injection. This situation is exacerbated with the reduction induced by the maintenance of the North to South link in France.
Additional interruptible capacity is available on GRTgaz North to South link and Fos LNG terminal that could be used to reach a 100% filling.
Nevertheless such levels (96%) are already very high in comparison with the level achieved through Europe in the previous years (see table providing targeted levels provided by GSE) and injection could also occur early October depending on climatic conditions.

Sensitivity to oversupply

Additional gas brought to Europe enables faster injection seasons. This is particularly efficient for the first part of the season when demand is still high impacting the availability of gas for injection. This additional gas enables a higher use of the GRTgaz North to South link in April which is necessary to achieve a 100% filling of storage in GRTgaz South and TIGF zones.
Nevertheless the decreased injection capacity at the end of injection season (when storage is nearly full) reduced the added-value of additional gas when storages are close to complete injection.

Below chart provides a comparison of injection curves between oversupply scenarios and Reference Case:



This oversupply case shows that additional supply will enable shippers to take benefit of the flexibility offered by the European gas network when fulfilling injection.

Sensitivity to supply pattern

The different supply shares do not impact the length of the injection phase to achieve 80% to 95% filling. This source interchangeability is due to a lower load factor in summer in comparison with cold period of the winter season.
The concomitant reduction of LNG supply (induced by North Africa, Norway and Russia predominance scenarios) and setting of a minimum send out of 15% for each LNG terminal over Europe, lead to a reduced availability of LNG for Iberian Peninsula in comparison with the Reference Case. This reduction impacts the ability to complete a full injection of Portuguese and Spanish storages while maximising flow to France (see Reference Case).
A complete injection could be easily solved with a summer LNG share slightly higher. The commissioning of Medgaz will also mitigate this situation. Additional available capacity on the GRTgaz North to South link will also help while decreasing the need of Spain to France flows.

Sensitivity to Libyan disruption

Italian gas network and European supply offer sufficient flexibility to avoid any impact on the ability to achieve a 100% filling by the end of the injection season.

Summary of the sensitivity analysis

The below chart provides a summary of the date at which injection can be completed depending of the supply scenario. These dates are only indicative and served for comparison purpose between scenarios as an average demand has been used for each day of a given month.

Scenario	Date of x% filling achievement				Remarks
	85%	90%	95%	100%	
Reference case	21 Aug.	30 Aug.	14 Sept.	30 Sept.	GRTgaz South & TIGF: 96%
Oversupply 105%	02 Aug.	10 Aug.	19 Aug.	08 Sept.	
Oversupply 110%	22 July	30 July	06 Aug.	08 Sept.	
LNG predominance	Same as Reference Case				Same as Reference Case
North Africa predominance	Same as Reference Case				GRTgaz South & TIGF: 92% Portugal & Spain: 99%
Norway predominance	Same as Reference Case (99% of European overall stock on 30 Sept.)				GRTgaz South & TIGF: 92% Portugal & Spain: 97%
Russia predominance	Same as Reference Case (99% of European overall stock on 30 Sept.)				GRTgaz South & TIGF: 92% Portugal & Spain: 95%
Libyan disruption	Same as Reference Case				Same as Reference Case

Conclusion

According to the ENTSOG modelling and supply assumptions, this Summer Supply Outlook confirms the ability of the European gas network to complete injection as forecasted by storage operators while ensuring the proper maintenance of the system. Higher and faster injections are even possible depending on the European supply.

The sensitivity study also highlights some local specifics in the South of France and Iberian Peninsula requiring specific supply level or pattern to enable a 100% injection if targeted by shippers.

Please note that the integrated flow patterns used in this report is a hypothetical case just for the purposes of this Summer Supply Outlook.

ENTSOG plans to review the results of this report on the basis of actual flows in autumn 2011.

Legal Notice

ENTSOG has prepared this Summer Outlook in good faith and has endeavoured to prepare this document in a manner which is, as far as reasonably possible, objective, using information collected and compiled by ENTSOG from its members and from stakeholders together with its own assumptions on the usage of the gas transmission system. While ENTSOG has not sought to mislead any person as to the contents of this document, readers should rely on their own information (and not on the information contained in this document) when determining their respective commercial positions. ENTSOG accepts no liability for any loss or damage incurred as a result of relying upon or using the information contained in this document.

Annex A

Methodology

Modelling tool

Modelling has been carried out with an enhanced tool using linear programming of flows. Then priority has been given to the slowest storages daily ranked according the remaining amount of gas to be injected and the available injection capacity.

Simulation used country basic blocks except for:

- France: separate blocks for GRTgaz North, GRTgaz South and TIGF zones
- Poland: separate blocks for Gaz-System zone and Yamal Europe
- Romania: separate blocks for Transgaz zone and the pipe between Isaccea (UA/RO border) and Negru Voda (RO/BG border)

SSOs scenario

Modelling is based on 6 monthly simulations taking into account the decrease of injection capacity with storage filling.

For each of the six summer months, a simulation has been run using for each country the targeted level of stock provided by the relevant SSOs. Monthly overall supply is defined by the sum of the demand and injection forecasts.

Supply share per source on the overall Summer 2011 is equal to the one used for 2011 in ENTSOG TYNDP 2011-2020 (maximum monthly variation of 9% in comparison with TYNDP).

Reference Case

Modelling is based on 183 daily simulations taking into account the decrease of injection capacity with storage filling.

The overall summer supply for the whole summer is defined as the sum of:

- demand forecast
- gas to be injected during the season (100% of working volume – stock on 1 April 2011)

The daily supply is defined as the overall summer supply divided by 183. Supply share per source is equal to the one used for 2011 in ENTSOG TYNDP 2011-2020.

If no physical congestion prevents injection, the overall summer supply definition will induce a 100% filling of each storage on 30 September. Dates of intermediate filing (85%, 90% and 95% of European stock) are also provided by the modelling.

Oversupply

Same as Reference Case with an increase of 5% and 10% of the overall summer supply.

Alternative supply

Same as Reference case with each import source share increased by 10% while decreasing the other according to their share.

Libyan disruption

Same as Reference Case with no flow between Libya and Italy, missing supply being replaced up by other import sources.

Data for Summer Supply Outlook 2011

Following tables show the assumptions used by ENTSOG

	SSOs scenario	Reference Case	Oversupply	Supply predominance	Libyan disruption
Demand	Average monthly demand forecast provided by TSOs				
Monthly injection	GSE/SSOs forecast	*Output**			
Overall supply	*Output**	100%	105 & 110%	100%	100%
Supply shares	TYNDP 2011			+10% for each import source	Libya: 0%
Minimum supply	30% for each import pipe and 15% for each LNG terminal				
Cross-border capacity	Firm technical capacity as provided by TSOs taking into account reduction due to maintenance				

(*): result of the modelling

Average monthly demand forecast

GWh/d	April	May	June	July	August	September
AT	215	168	152	143	130	180
BE	509	457	391	367	372	434
BG	95	65	61	65	65	75
HR	101	87	70	93	96	103
CZ	239	150	123	105	108	153
DK	105	87	71	47	54	71
EE	43	26	16	12	16	12
FI	72	109	99	94	106	129
FRn*	799	616	462	419	379	519
FRs*	293	210	167	151	128	187
FRt*	213	152	121	110	93	136
FY	13	13	13	13	13	13
DE	2,420	2,183	1,680	1,333	1,413	1,663
GR	92	103	105	120	118	112
HU	295	231	189	179	179	210
IE	175	173	161	155	150	160
IT	2,099	1,630	1,609	1,776	1,344	1,815
LV	34	23	24	20	27	26
LT	82	64	47	45	49	58
LU	43	39	34	36	33	40
NL	1,110	1,010	770	720	730	890
PL	425	388	386	327	321	341

PT	155	173	174	188	171	198
RO	310	205	195	195	195	200
RS	81	70	64	64	62	82
SK	148	75	63	63	68	82
SI	26	25	24	21	21	27
ES	976	941	1,050	1,100	1,012	1,154
SE	31	24	22	22	15	20
CH	86	75	68	69	66	88
UK	3,022	2,590	2,404	2,287	2,282	2,417
Total	**14,309**	**12,161**	**10,814**	**10,339**	**9,814**	**11,597**

(*): France split into 3 blocks: GRTgaz North (FRn), GRTgaz South (FRs) and TIGF (FRt) balancing zones

Supply share by source

	SSOs scenario	Ref. Case	Over supply	LNG +10%	N.Africa +10%	Norway +10%	Russia +10%	Libyan disrupt.
National Production		34%	34%	34%	34%	34%	34%	34%
LNG		12%	12%	13%	12%	11%	11%	12%
Algeria		7%	7%	7%	8%	7%	7%	7%
Libya		2%	2%	2%	2%	2%	2%	0%
Norway		20%	20%	19%	19%	22%	18%	21%
Russia		25%	25%	23%	23%	24%	28%	26%

Replacement values

When exact data were not received or available, ENTSOG has used some replacement data as following:

- Demand: annual figure from TYNDP 2011-2020 applying monthly ratio derived from 2009 & 2010 summers
- Stock levels on end of March: minimum relative stock observed (16%)
- Targeted stock levels on end of September (SSOs scenario): average targeted stock level provided by SSOs (92%)
- Monthly injections (SSOs scenario): flat injections between 1 April stock level and 92% stock level on 30 September