Winter Supply Outlook 2013/14
Winter Review 2012/13
SO006-13
28 November 2013

Winter Supply Outlook 2013/14

Executive Summary

As part of its obligation under Art. 8(3)(f) of Regulation (EC) 715/2009, ENTSOG has undertaken an assessment of the European gas network for the upcoming winter (October 2013 to March 2014). The analysis focuses on both the possible evolution of UGS inventory along the season and the ability of the gas system to face High Daily Demand situations. Considering the low level of storage at the beginning of the winter the ENTSOG analysis has assumed the maximum saving of lowest UGS (e.g. France and Hungary) by the market in the first part of the season. Under such assumptions, conclusions are:

> **European gas infrastructures offer sufficient flexibility across the season in most parts of Europe provided that gas is available**
> **The low level of UGS at the beginning of the Winter may endanger the ability of South-East Europe to face the end of the winter with sufficient flexibility and in lesser extent in the rest of Europe**
> **The balance of Danish and Swedish demand and supply across the winter depends on the availability of interruptible capacity from Germany especially in case of interruption of domestic production. In case of simultaneous unavailability the Danish Emergency plan will have to be activated[1].**

Sensitivity studies have been carried out to further illustrate:

> The impact of a change in winter demand on UGS stock level (volume perspective)
> The adaptability of the European gas system to a significant change in the supply mix across the season (capacity perspective)
> The ability to face some disruption events under High Daily Demand situations (capacity perspective)
> The ability to face a disruption of Russian supply through Ukraine for 14 days of High Daily Demand. (capacity perspective)

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

[1] **the commissioning of new infrastructure will create additional firm capacity for next winter 2014/15**

Introduction

As part of ENTSOG continuous effort to ensure greater transparency and knowledge regarding the development and operation of the European gas transmission network, ENTSOG presents this Winter Supply Outlook 2013/2014. This Outlook aims to provide an overview of the ability of both the European gas network and potential supply to face winter demand. This ability has been tested along both the whole winter and potential High Daily Demand periods.

The winter months require storage withdrawal to cover both short peak periods and the overall winter demand. The level of withdrawal by shippers varies from one country to the other and from time to time due to climatic, price and legal parameters. The current trend of lower stock levels at the beginning of the winter over last few years is a concern for some stakeholders and institutions. The possible consequences are captured through the following methodological improvements:

- The evolution of UGS inventory for each country is now based on network modelling in order to capture possible local scarcity (previously the aggregated inventory decreased day by day by the European aggregated demand without "modelling exercise")
- The 14-day High Daily Demand situation has been moved from end of January to March to capture the impact of low storage availability

ENTSOG has used a sensitivity analysis around a Reference case to check if the European gas infrastructures are able to:

- cover the full winter demand under different supply and demand conditions
- enable shippers to meet different High Daily Demand situations in each country
- enable shippers to face disruption of Russian gas through Ukraine under High Daily Demand situations

When assessing the supply adequacy at European level both through TYNDP and Outlooks, ENTSOG aims at enlarge the geographical scope of the study beyond its own perimeter. Winter Supply Outlook 2013/2014 covers the EU-28 (less Cyprus and Malta) plus Switzerland, Bosnia, Serbia, FYROM as well as exports to Turkey and Kaliningrad.

Winter movie and snapshots

As for previous reports Winter Supply Outlook 2013/2014 captures two different but still linked visions of the season. The first one is an outlook of demand and supply evolution along the winter and the resulting evolution of UGS inventory. The second one is the analysis of one-time pictures of specific and hypothetical events being High Daily Demand situations and transit disruptions.

These two visions are linked as the level of stock in UGS facilities has some influence on withdrawal deliverability. This may impact UGS ability to cover High Daily Demand situation especially in March.

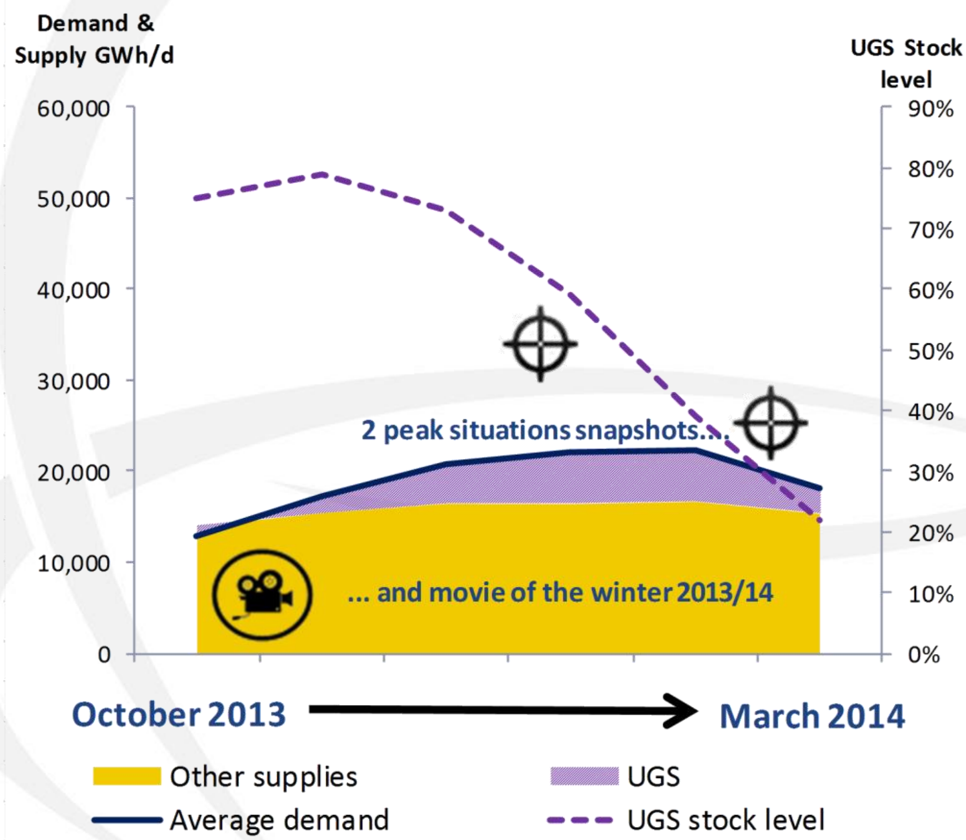


Figure 1 - Description of the assessment

In order to improve the robustness of the report a sensitivity-analysis has been carried out on both visions.

Methodology for Winter Supply vs. Demand balance analysis (volume perspective)

Reference Case

The demand of the Reference Case is built as the sum of the national monthly average demand as it occurs statistically every 2 years and provided by TSOs. A flat daily demand has been considered within each month.

For each supply source (being Algeria, Libya, LNG, National Production, Norway and Russia), the average level of the last 2 winters has been considered month by month.

UGS is then used to balance demand (and LNG has been treated analogously to pipeline supplies, being its short term storage component considered as neutral on a 6-month duration).

In previous reports the evolution of the UGS inventory was analysed as a pure European aggregate without the use of modelling. For this edition the use of the NeMo Tool has been introduced in order to model the evolution of UGS inventory in each country on the 182 days of the season as it was already done as part of the Summer Supply Outlooks. This approach enables the identification of possible local constraints in some countries that could not be captured before.
The influence of stock level on withdrawal deliverability has been considered using a single European curve as published by GSE (see Annex A). The initial storage level on 1 October 2013 for each country comes from AGSI platform[2] (an average stock of 75% has been used for UGS facilities not being covered by GSE for which stock level is not publicly available).

Analysis of the sensitivity of UGS inventory to the level of demand

This part of the sensitivity study investigates successively the impact of a cold winter (higher demand) and a warm winter (lower demand) on the evolution of UGS stock level.

> Cold Winter

Demand is increased by 6% in average across the Winter (see annex B for the detail per country, the 6% representing a weighted average increase for Europe based on the demand of each country). Imports are set at 105% of the Reference Case level and the rest is faced by a further increase of UGS withdrawal.

[2] Storage level observed on AGSI platform on the 12 November 2013

> Warm Winter
  Demand is decreased by 8% in average across the Winter (see annex B for the detail per country, the 8% representing a weighted average decrease for Europe based on the demand of each country). Imports are set at 95% of the Reference Case level and the rest is faced by lower withdrawal from UGS

Analysis of the sensitivity of UGS inventory to supply mix

This part of the sensitivity study investigates the impact of a successive decrease of each import source by 30%[3] compared to their level in the Reference Case.

Methodology for High Daily Demand analysis (capacity perspective)

As last year's report, the Winter Supply Outlook 2013/14 has checked the capacity of the European gas network to cover High Daily Demand situations in each country. Based on the experience of last reports, concerns about low UGS level at the end of the winter and Gas Coordination Group request, the following cases have been modelled:

Moment	Occurrence	Supply situation
January	1-day Design Case	Reference
		Disruption of Russian gas transit through Ukraine
March	14-day Uniform Risk*	Reference
		Disruption of Russian gas transit through Ukraine

(*) *as demand is considered flat on the 14 days, only the last one is modelled as being the most stressful.*

Figure 2 – High daily demand analysis

For the High Daily Demand cases, supply has been defined based on TYNDP 2013-2022 approach:

> Import sources and routes set at their maximum deliverability as observed last 3 winters
> UGS and storage component of LNG terminals are used to balance demand and supply
> UGS deliverability has been limited according to the level of inventory identified within the analysis of "Supply vs. Demand balance over the Winter" (See Annex A - figure 6).

[3] *Arbitrary parameter, to be redefined in the future if considered appropriate.*

Results of Supply vs. Demand balance over the Winter (volume perspective)

<u>Evolution of UGS stock inventory</u>

The below graph shows the evolution of the UGS inventory based on the methodology defined in the previous chapter:

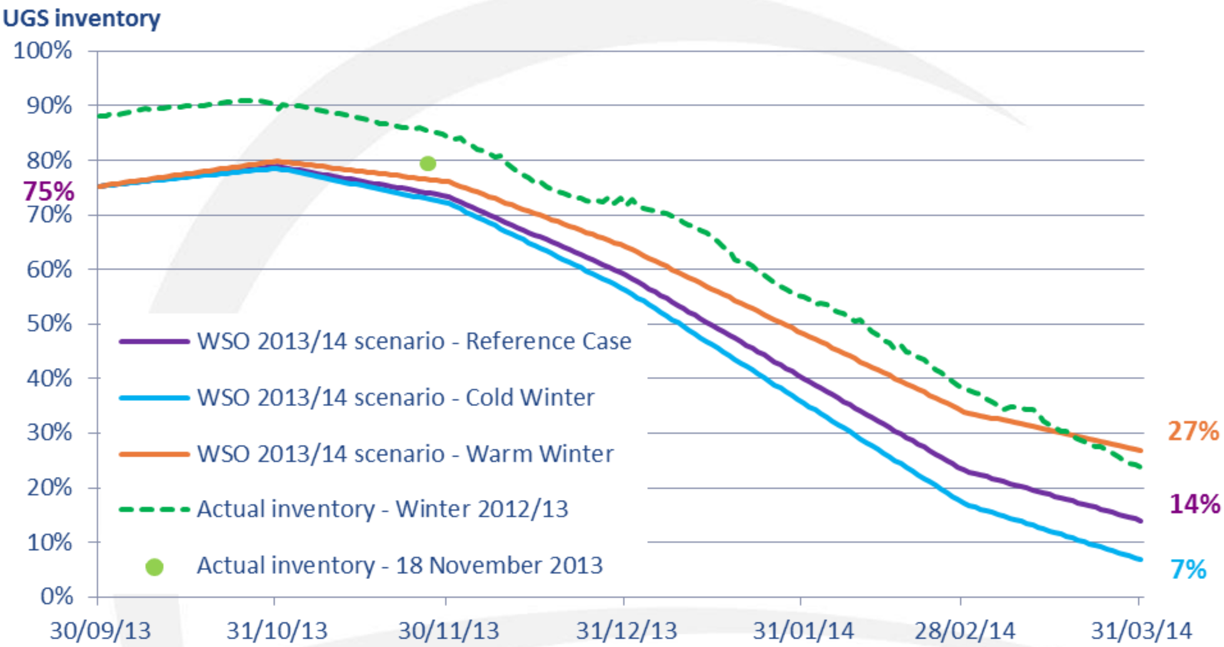


Figure 3 - Winter evolution of UGS stock level

Actual inventory on 27 November 2013 is 8% higher than the Reference Case of this outlook. The main reason is a recent update of storage level on 1 October 2013 on AGSI platform having occurred after the drafting of the present report.

<u>Results for the Reference Case</u>

The modelling of the Reference Case has also enabled the identification of the 2 below findings:

- winter demand in Denmark and Sweden can be met with the use of interruptible capacity from Germany for an average daily amount of around 20 GWh/d (this amount would increase in case of unavailability of domestic production which is the main supply for Denmark)
- winter demand in Hungary, Romania, Serbia and Bosnia can be only met if the average delivery of Russian gas from Ukraine to Romania and Hungary are in average 14% (around 50 GWh/d) higher than last 2 winters. Considering the interconnection between these 2 countries, the need of additional flow toward is at least 10 GWh/d toward Romania and at least 30 GWh/d toward Romania related to the last 2 winters.

This last finding has to be analysed in the context of low level of Hungarian UGS at the beginning of the winter (46%), which contains strategic storage volume as well. The strategic storage volume can be withdrawn only in crisis situation, and the current strategic volume is around 6 TWh for this winter.

For comparison purpose, Winter Supply Outlook 2013/2014 Reference Case demand is:

- 3.6% higher than Winter 2011/2012 actual demand
- 0.2% higher than Winter 2012/2013 actual demand

Results for the Cold Winter

In addition to the stress situations identified under the Reference Case, a cold winter would imply:

> the use of around 50 GWh/d of interruptible capacity from Germany to Denmark (this amount would increase in case of unavailability of domestic production which is the main supply for Denmark)

> The need of additional flow toward Romania and Hungary reached approximately 100 GWh/d compared to last 2 winters. Considering the interconnection between these 2 countries, the need of additional flow toward is at least 20 GWh/d toward Romania and at least 60 GWh/d toward Romania related to the last 2 winters.

According to the Cold Winter scenario (with imports at 105% of the Reference Case) and the average UGS deliverability curve (see Annex A), aggregated European stock level of UGS and associated deliverability is given by the following table:

Date	UGS inventory	Associated withdrawal deliverability
31/01/14	36%	88% (used as a limit for the 1day Design Case)
21/03/14*	6%	48% (used as a limit for the 14-day Uniform Risk in March)

(*): the 13 days before are considered as Uniform Risk instead of cold winter day as the assessment is made on the last day of a 14-day Uniform Risk period. This would result in a lower UGS inventory on 31 March 2014 compared to the one of Figure 3.

Figure 4 – Aggregated UGS stock level and associated withdrawal deliverability

Results for the Warm Winter

With a lower demand, and despite lower imports, both stressed situations in Denmark/Sweden and South-East Europe are mitigated.

Results for the evolution of supply mix

There is no additional constraint at source or import route level when decreasing them by 30%. The overall amount of Russian gas can be decreased by 30% by reorienting most of the transit toward Romania and Hungary.

Results of High Daily Demand analysis (capacity perspective)

For each High Daily Demand situation, modelling has been used in order to identify the use of UGS and the Remaining Flexibility of each country (see below formula):

$$1 - \frac{\sum Entering\ flows}{\sum Entry\ capacity}$$

Experience acquired by ENTSOG in the use of this indicator shows that it may give an optimistic vision of reality under certain situations as it considers possible to use all entry points of all systems at their maximum simultaneously. ENTSOG will work with stakeholders on the improvement of this indicator during TYNDP 2015 consultation process.

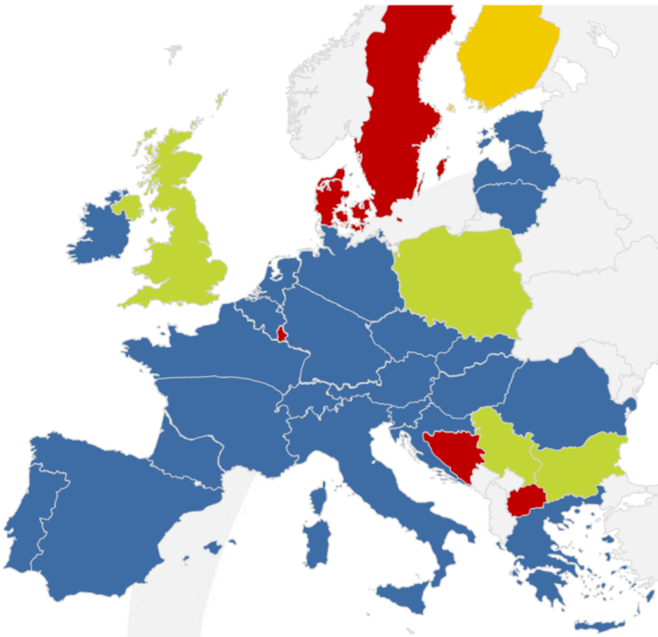
When calculating the indicator for each balancing zone under High Daily Demand situations, the UGS deliverability has been set at the European average deriving from the analysis of the “Supply vs. Demand balance over a Cold Winter” (see previous section). This average value has been used as the evolution of stock from one country to the other will in fact depend on the flow patterns deriving from network users’ decisions.

When facing a peak situation, actual UGS inventory of each country is likely to differ from this average value according to decisions taken by the market in the first part of the winter. Therefore countries like Hungary and France, having started the winter with particularly low inventory, may be in difficult situation when facing a peak demand if market has not preserved UGS stock until then[4].

The Remaining Flexibility formula also shows that resilience will depend on the flow exiting each system the day it is calculated. ENTSOG and TSOs may only make assumptions in this regards. Such assumptions may differ as for ENTSOG they result from a top-down modelling exercise when they derive from national analysis for TSOs.

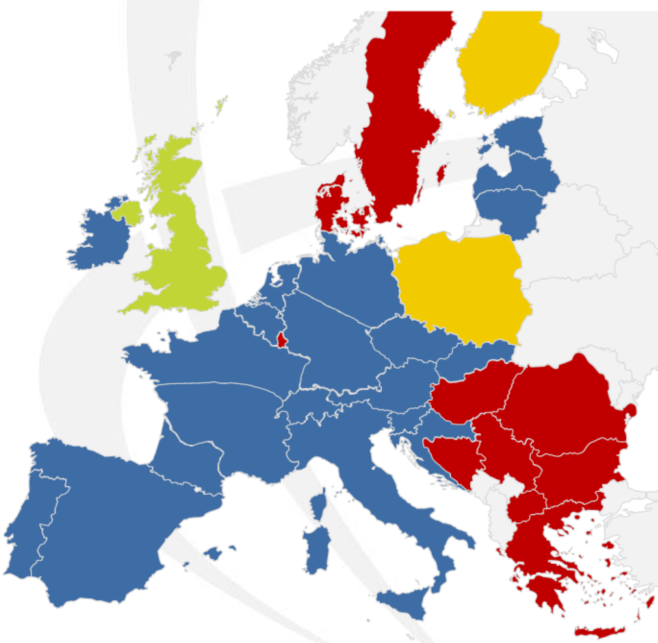
[4] for detailed view on French market situation see GRTgaz website:
http://www.grtgaz.com/fileadmin/newsletter/shiponline/shiponline_75_site.html

Results for 1-day Design Case



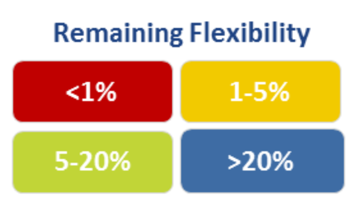
Reference

The lack of Remaining Flexibility for Bosnia, Luxembourg and Sweden are consistent with TYNDP 2013-2022.
The same with Finland where a large part of national demand can switch to a back-up fuel.
Compared to the first year of TYNDP 2013-2022, FYROM is not able to meet demand because of a much higher demand.

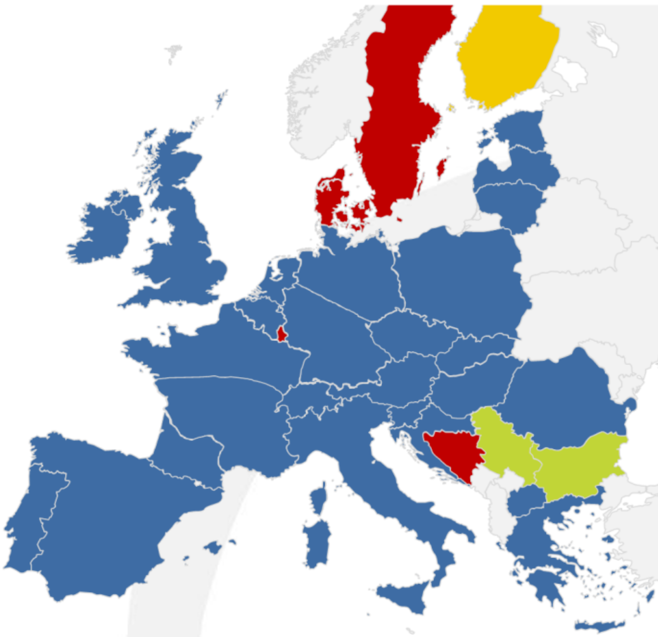


Disruption of Russian gas transit through Ukraine

Compared to the Reference Case, the whole South-East Europe will lack of Remaining Flexibility.
Results differ from TYNDP 2013-2022 for Croatia and Poland due to some update in demand forecast.

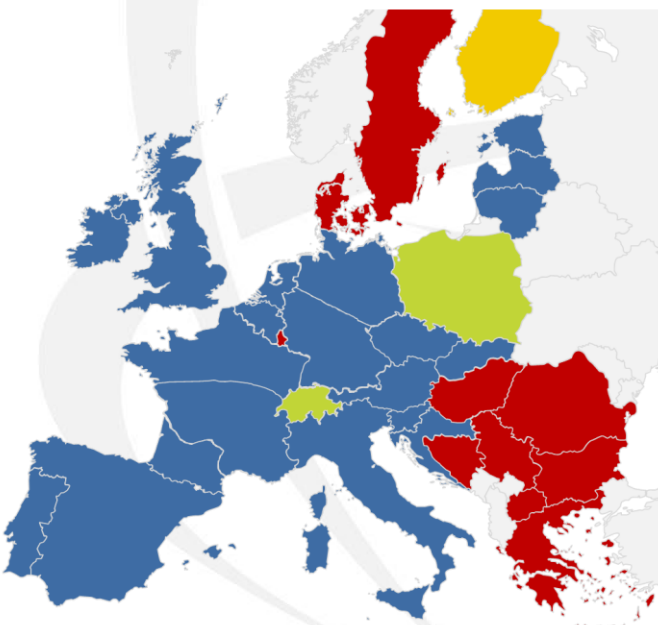


Results for 14-day Uniform Risk in March



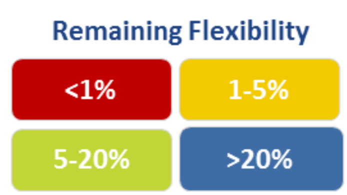
Reference

Remaining Flexibility is higher than for the Design Case as the decrease in demand is larger than the decrease of UGS deliverability



Disruption of Russian gas transit through Ukraine

The impacted area is the same than during the same disruption occurring on the Design Case.
The decrease of Remaining Flexibility in Switzerland comes from the high use of "transit" through this country.



Conclusion

According to the ENTSOG modelling and supply assumptions, this Winter Supply Outlook confirms the ability of the European gas infrastructures to face Winter 2013/14 with sufficient flexibility in most parts of Europe. This assessment is valid both along the season and under High Daily Demand situations under the condition of maximum saving of gas storage during the first part of the season.

The report also highlights the importance of interruptible capacity between Germany and Denmark in order to ensure the balance of Danish and Swedish demand across the winter. This result is perfectly in line with TYNDP 2013-2022 assessment. A new infrastructure solving this issue will be commissioned before Winter 2014/15.

Moreover the continuous decrease of UGS stock level at the beginning of the season could be of a concern especially in the South-East of Europe. This situation could be compensated with additional imports through Ukraine.

As for TYNDP 2013-2022, the different disruption cases considered in this report confirm the lack of infrastructure resilience of South-East Europe in case of an interruption of Russian gas transit through Ukraine. The deliverability of UGS is a mitigating factor but its availability depends on storage level.

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

Legal Notice

ENTSOG has prepared this Winter 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 - Under Ground Storages assumptions and outputs

UGS deliverability curve

In order to capture the influence of UGS stock level on the withdrawal capacity, ENTSOG has used the average deliverability curve established by GSE:

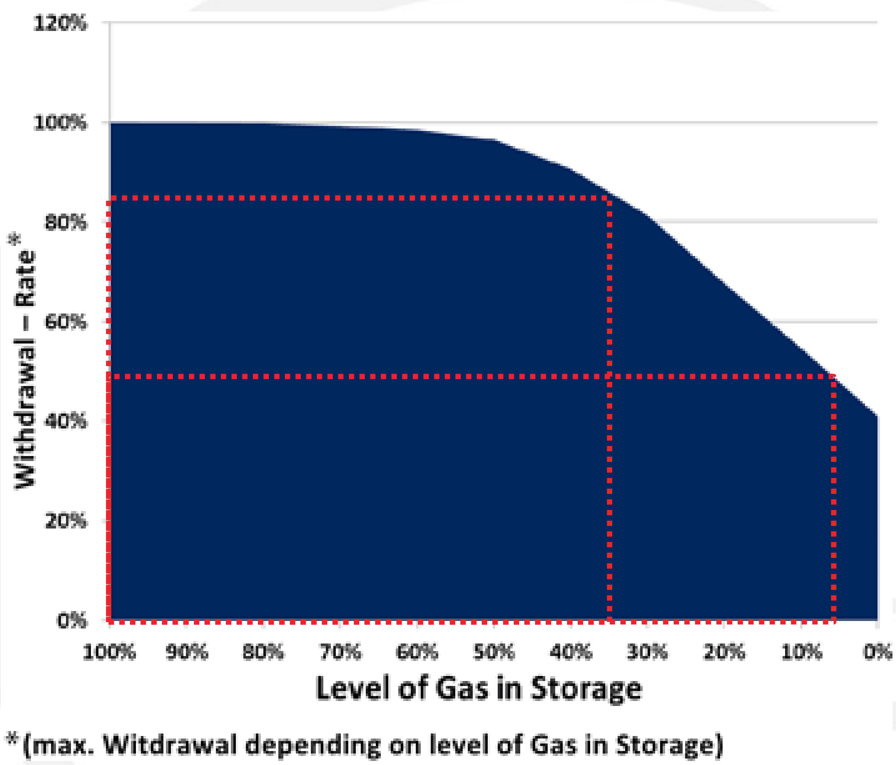


Figure 5 - UGS deliverability curve

Winter 2013/2014 stock evolution according modelled scenarios

Below table provides the picture of UGS stock evolution under Results of Supply vs. Demand balance over the Winter 2013/2014 (volume perspective):

Stock level at the end of each month	Sept. 2013	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014
Reference CA	75%	79%	73%	59%	40%	23%	14%
Cold Winter (105% imports)		79%	72%	56%	36%	17%	7%
Warm Winter (95% imports)		80%	76%	64%	48%	34%	27%

Figure 6 – Evolution of UGS stock level

Annex B - Data for Winter Supply Outlook 2013/2014

Demand forecast

GWh/d	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	1-day Design C.	14-day Mar
AT	265	352	389	411	449	319	733	733
BA	10	14	17	18	18	13	19	19
BE	594	722	795	819	849	733	1,435	1139
BG	65	80	115	124	122	102	175	120
CH	80	111	132	140	146	101	220	200
CZ	241	317	408	412	450	324	790	407
DEg*	986	1,317	1,590	1,616	1,781	1,612	2,170	1732
DEn*	1,179	1,605	2,005	2,027	2,262	1,941	2,897	2202
DK	105	142	172	192	192	172	257	213
EE	16	21	39	38	31	36	61	39
ES	889	1,062	1,129	1,219	1,177	999	2,078	1595
FI	107	127	137	154	164	131	244	244
FRn*	816	1,223	1,509	1,691	1,539	1,257	2,936	1239
FRs*	319	479	590	662	602	492	1,149	494
FRt*	120	169	183	203	189	156	340	232
MK	2	5	9	16	20	17	40	14
GR	102	109	153	171	172	131	218	151
HR	78	94	123	108	125	112	74	55
HU	315	420	725	871	784	420	871	524
IE	120	130	166	163	172	144	282	150
IT	1,673	2,424	3,044	3,456	3,329	2,502	5,034	3484
LT	66	80	99	106	113	93	177	177
LU	30	42	41	49	51	42	72	72
LV	35	48	66	75	87	63	120	120
NL	1,080	1,398	1,678	1,679	1,764	1,390	4,244	2970
PL	419	491	552	590	618	502	855	629
PT	146	133	143	155	147	142	299	205
RO	329	464	638	598	690	492	756	505
RS	81	112	133	142	147	102	140	140
SE	38	56	64	66	66	57	94	75
SI	23	29	35	37	37	33	66	36

SK	165	211	259	265	225	170	400	356
UK	2,022	2,716	3,167	3,343	3,302	2,867	5,375	3024
TK**	261	330	377	345	350	331	467	436
KAL**	45	58	67	65	65	62	95	81
Total	**12,822**	**17,091**	**20,749**	**22,026**	**22,235**	**18,060**	**35,183**	**23,812**

(*): Germany and France split in different zones (DEg: Gaspool, DEn: NCG, FRn: GRTgaz Nord, FRs: GRTgaz Sud and FRt: TIGF)
(**): Net exports to Turkey and Kaliningrad

Figure 7 – Demand forecast

Cold and warm winter demand

The sensitivity on the climatic winter has been estimated as the positive and negative maximum deviation of the winter gas demand of the last four winters from its average by country. These relative seasonal deviations were applied to the monthly average demand of the respective countries.

GWh/d	Demand deviation (%) from the reference case	
	Cold winter (+)	Warm Winter (-)
AT	3.3	4.6
BA	4.9	5.6
BE	5.6	7.8
BG	4.6	4.9
CH	11.3	17.1
CZ	2.8	2.9
DE	3.7	5.9
DK	11.6	14.0
EE	5.9	10.7
ES	4.9	7.1
FI	16.2	16.2

GWh/d	Demand deviation (%) from the reference case	
	Cold winter (+)	Warm Winter (-)
FR	4.4	5.1
MK	10.5	10
GR	18.1	9
HR	2.2	2.6
HU	7.1	11.9
IE	7.3	8.7
IT	4.6	7.2
LT	8.9	6.3
LU	7.1	7.3
LV	9.4	9.1
NL	5.7	7.2

GWh/d	Demand deviation (%) from the reference case	
	Cold winter (+)	Warm Winter (-)
PL	5.8	4.4
PT	11.8	11.1
RO	2.5	3.8
RS	4.9	5.6
SE	16.2	17.9
SI	13.9	7.9
SK	4.2	4.4
UK	12.5	13.6
Total*	**6.3**	**7.8**

(*): average weighted by the demand of each country

Figure 8 – Weather sensitivity – winter demand

Supply assumption

GWh/d	Average Supply (GWh/d)						High Daily Supply (GWh/d)	
	Oct. 2013	Nov. 2013	Dec. 2013	Jan. 2014	Feb. 2014	Mar. 2014	1-day	14-day March
NP	4,386	4,985	5,257	5,319	5,379	5,030	5,985	5,985
DZ	806	889	1,017	1,240	1,263	1,106	1,548	1,478
LY	223	203	188	177	179	151	354	354
LNG	1,700	1,779	1,824	1,692	1,692	1,402	6,308	4,117
NO	3,007	3,390	3,533	3,645	3,666	3,496	4,028	3,978
RU	3,774	4,140	4,600	4,311	4,461	4,122	5,616	5,375
Total	**13,896**	**15,386**	**16,419**	**16,384**	**16,640**	**15,307**	**23,839**	**21,287**

Figure 9 – Supply assumptions

Winter 2012/13 Review

Executive Summary

ENTSOG has completed the review of the European gas supply and demand picture for Winter 2012/13 (October to March). The seasonal Reviews aim at a deeper comprehension of the development of the demand and supply in the previous seasons and the identification of trends that cannot be captured at national or regional level. They also help to build experience and a solid background for the assumptions considered in the Winter Outlook. Such knowledge is also factored in the recurrent TYNDP process in order to ensure consistence and continuous improvement of ENTSOG reports, and will be factored in the ongoing R&D plan.

Seasonal Gas demand in Europe was 3% over the one from previous winter, while the peak consumptions were significantly lower.

The high withdrawal of UGS in March caused significantly low stock levels in the UGS at the end of the winter.

There has been a significant decrease in LNG supplies and indigenous production.

The review also includes a summary of the cross-border flows during the season.

Stakeholders' comments on this seasonal analysis are welcomed and would enable ENTSOG to improve its knowledge of seasonal and market dynamics influencing the use of infrastructure. Comments would serve as basis for the R&D plan and be beneficial to the quality of further reports.

Introduction

This review, as part of the ENTSOG Annual Work Program 2013, is published on a voluntary basis and aims at providing an overview of the demand and supply balance during Winter 2012/13. The report brings transparency on the internal analysis carried out by ENTSOG for the purpose of developing the seasonal Supply Outlooks and the Union-wide TYNDP, as well as for the ongoing R&D plan.

The report aims to provide an overview of European trends that could not be captured at national level and to build experience for future reports. This report should not be seen as a direct review of previous Seasonal Outlooks as outlooks do not aim to provide a forecast but to better explore infrastructure resilience.

Regarding European dynamics, the report highlights the wide heterogeneity of national demand profiles and supply sources. These differences are linked among others to physical rationales such as climate, demand breakdown or producing field flexibility for example.

Seasonal Overview

Some occurrences on the European gas market caused fluctuations in the supply and demand balance during the period between October 2012 and April 2013, the major ones being:

- Norway: Troll Field Outage, Snohvit LNG output down (Nov 12)
- Norway: Troll A reduced capacity (Jan-Feb 13)
- Algerian facilities suffered an attack (Jan-Feb 13)
- Algeria imports fall (Jan 13)
- cold weather in most of Europe (Feb-Mar 13)
- consequences of the UK North Sea Elgin gas platform leak inFeb 12
- “Early Warning” Level in Denmark and Sweden (Mar 13)
- Halted Libya gas flows (Mar 13)

Demand

> **European seasonal gas demand**

Winter 2012/13 gas demand was 3,318 TWh, slightly higher (+3%) than in previous winter.

The average demand levels between October and January were very close to those from the previous winter while significant differences were experienced in February and March: The average demand level in February was 10% lower than in February 2012 (cold snap Feb-12) whereas in March 2013 gas demand was 32% higher than the previous year.

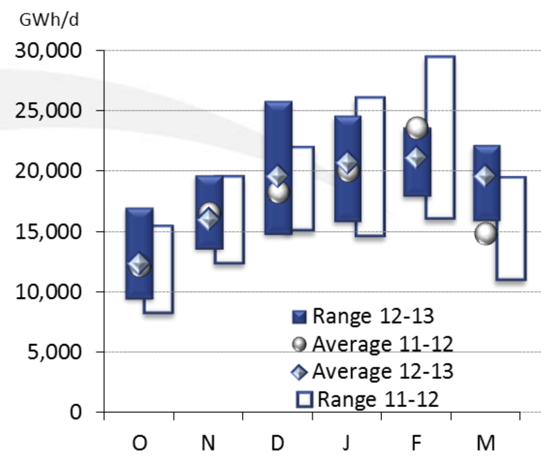


Figure 10 - Total gas demand

As shown in the graphs below, for the countries where the demand breakdown is available, the Residential, Commercial and Industrial sector represented 84% out of 2,500 TWh, showing an increase of +6% in comparison with previous winter. The reduction followed by the power generation sector (-14%) limited the growth of the overall demand to a 3%.

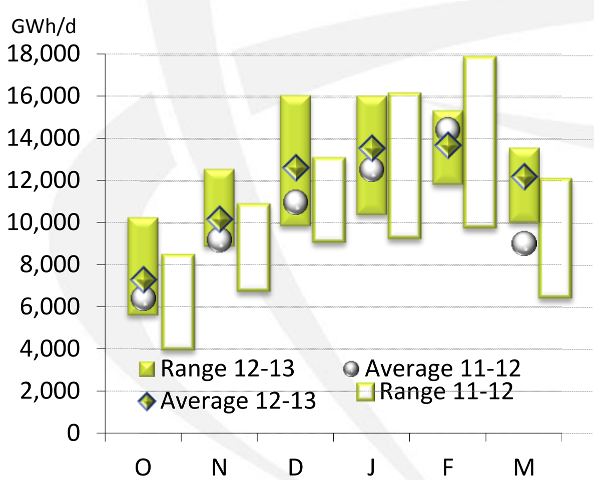


Figure 11 - Residential, commercial and industrial (*)

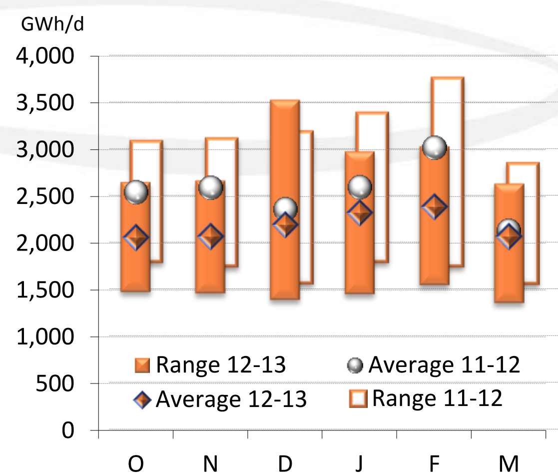


Figure 12 - Power generation

(*) These graphs refer to the countries for which demand breakdown is available (Belgium, Croatia, Czech Republic, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, and United-Kingdom)

The following two graphs show the evolution of gas prices in Europe during Winter 2012/13:

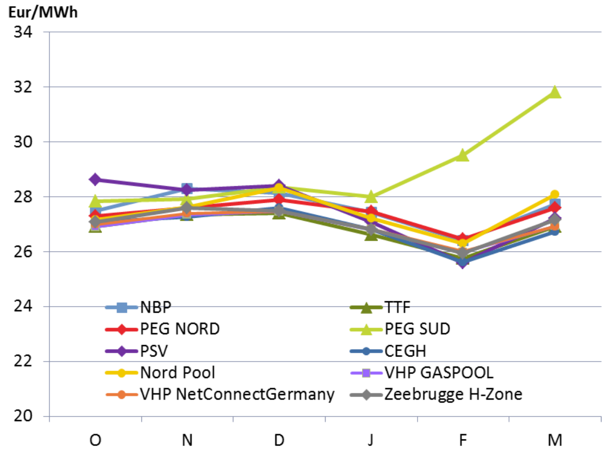


Figure 13 - Month-ahead average price by hub

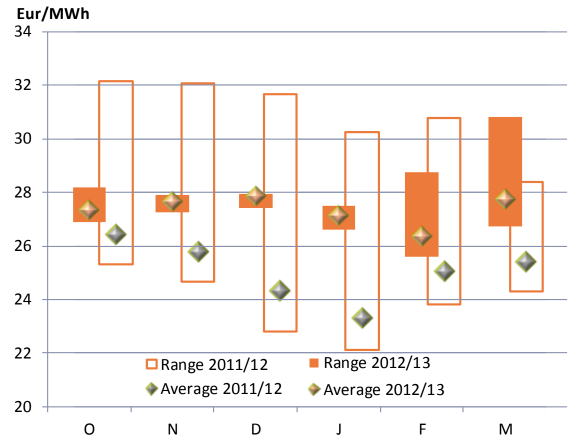


Figure 14 - Month-ahead average price (*)

(*) Average price calculated as non-prorated average of the hubs detailed in figure 13

Figure 12 compares the month-ahead winter average prices of the main gas hubs and figure 13 shows the maximum range described by the month-ahead average price for the different hubs in Europe (source Platts) for the last two winters. The average gas price in winter 2012/13 was slightly higher than in previous winter, while price convergence has significantly improved.

- **Power generation from gas**

The generation of electricity from gas has followed a continuous decrease since winter 2010/11. In Winter 2011/12 the decrease was mainly due to the switch between gas and coal. In Winter 2012/13 the electricity generation from coal remained stable, inducing that the production increase from other sources lead to a decrease of gas-fired power generation.

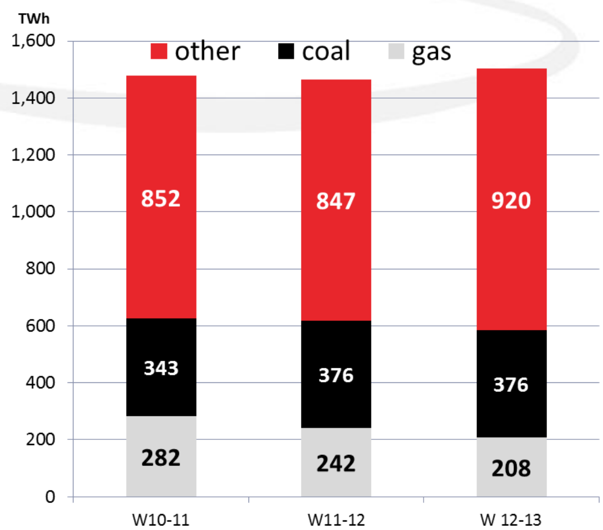


Figure 15 – Gas and coal in the electricity mix Winters 2010-2013

Source: Own elaboration based on data provided by ENTSO-E

In absolute terms, the electricity produced from gas was 208 TWh in Winter 2012/13, representing 14% of the generation mix. This figure implies a significant decrease compared to the values of previous winter 2011/12, when total electricity produced was similar and gas represented 17%.

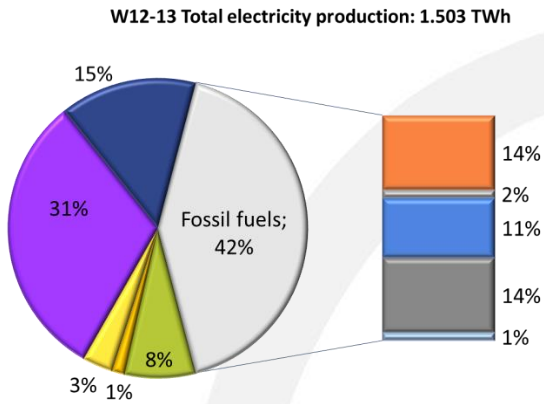


Figure 16 - Winter 2012/13 Electricity generation mix

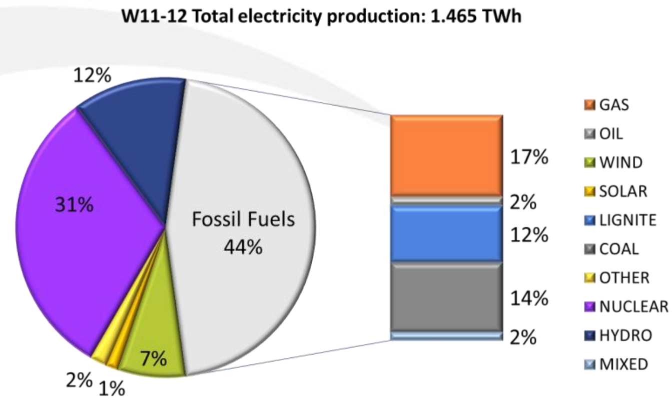


Figure 17 - Winter 2011/12 Electricity generation mix

Source: Own elaboration based on data provided by ENTSO-E

As shown in the graphs above, the reduction in the electricity shares of gas-fired power generation was mainly due to the increase of RES sources (predominantly Hydro, Wind and Others), reducing the segment of fossil fuels. While coal shares remained in the levels of previous winter, gas has seen reduced by 3% its segment in the electricity mix.

- **Winter demand evolution 2009-2013**

After 2 years of consecutive decrease, the winter gas demand followed an upward trend last winter. Despite this growth, gas demand in Winter 2012/13 was still a 7% lower than the one from Winter 2009/10.

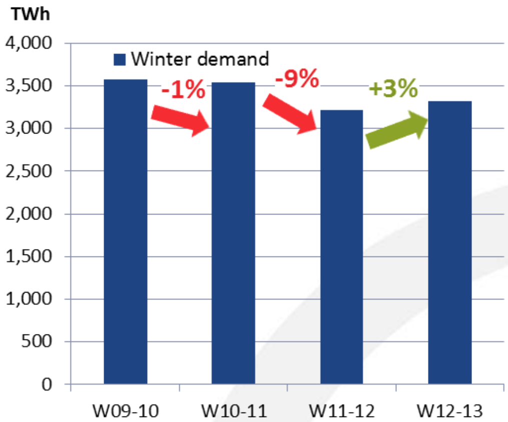


Figure 18 - Total consumption Winter 2009-2013

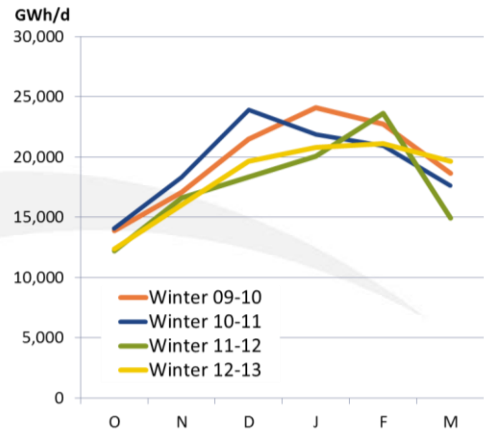


Figure 19 - Demand. Monthly average. Winters 2009-2013

By sector, for those countries where the demand breakdown is available, while the Residential, Commercial and Industrial consumptions have swing around the economic downturn as a result of the different climatic specificities of each winter, the gas demand for power generation has followed a continuous fall due to the increasing shares of RES in the yearly electricity mix and the preferred use of cheaper coal to fill the thermal gap.

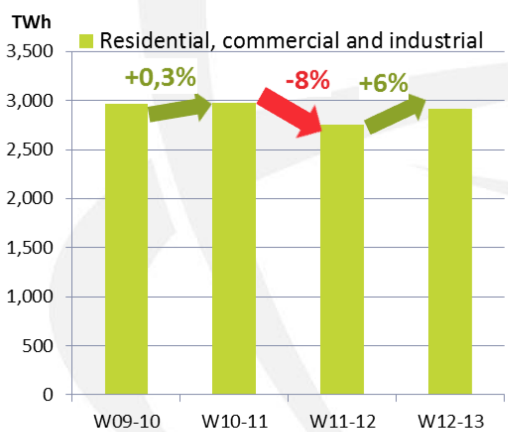


Figure 20 - Residential, commercial and Industrial consumption. Winter 2009-2013 (*)

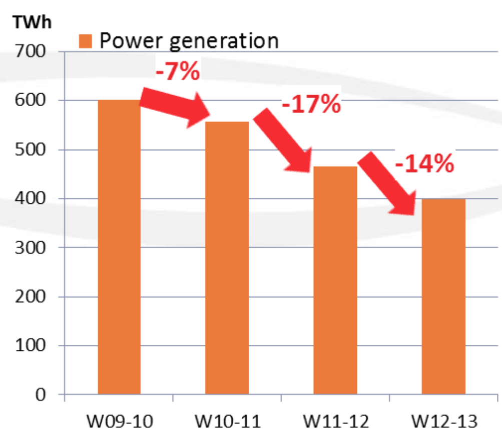


Figure 21 - Gas consumption for power generation. Winter 2009-2013 (*)

(*) These graphs refer to the countries for which demand breakdown is available (Belgium, Croatia, Czech Republic, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, and United-Kingdom)

- ***Country detail***

The evolution of gas demand compared to previous winter was geographically heterogeneous with significant variations in both directions.

The most significant variations were as follows:

Variation (+/- %)	*Total*	*Res&Com&Ind*	*Power generation*
Greece	*-22%*	*-22%*	*-22%*
Portugal	*-11%*	*+10%*	*-63%*
Hungary	*-10%*	*-6%*	*-37%*
Bulgaria	*-9%*	*n.a.*	*n.a.*
Estonia	*+19%*	*n.a.*	*n.a.*
FYROM	*+14%*	*n.a.*	*n.a.*
Germany	*+14%*	*n.a.*	*n.a.*
Sweden	*+12%*	*+8%*	*+17%*
UK	*+9%*	*+16%*	*-14%*

Figure 22 - Demand variation (Winter 12/13 ref. 11/12)

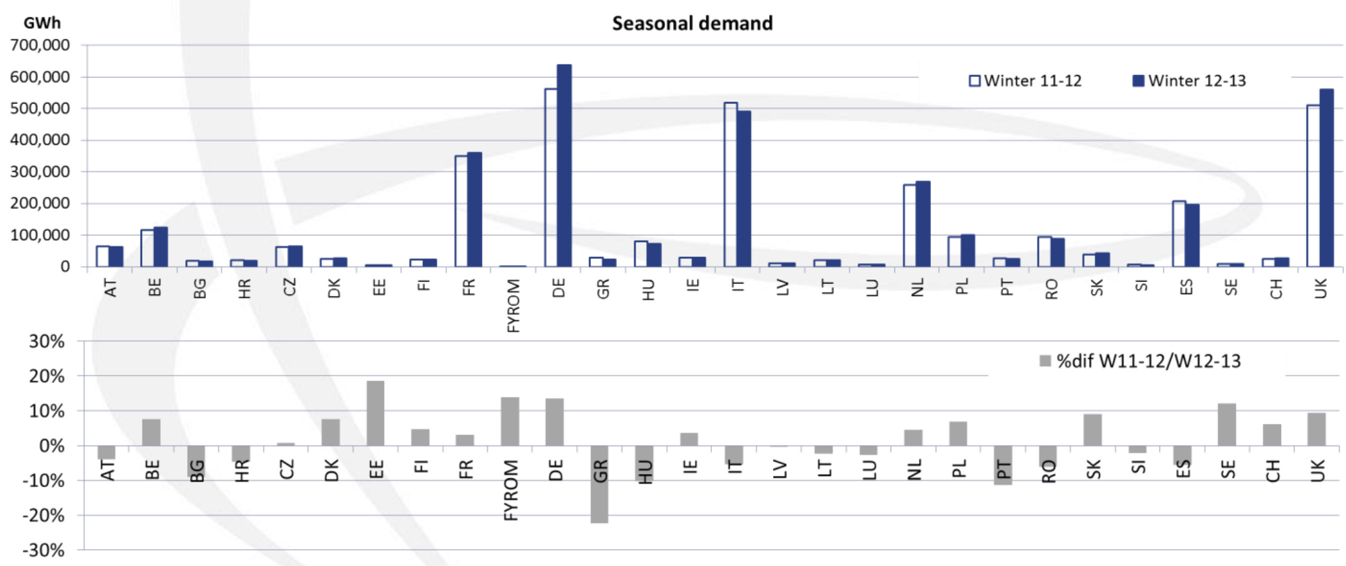
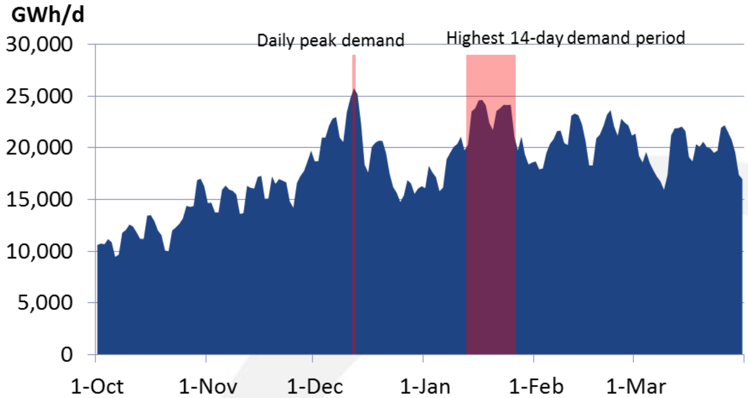


Figure 23 - Winter demand. Country detail

> European peak demand



14-day Peak period	*13/01/2013 – 26/01/2013*
Average 14-day consumption	*23,294 GWh/d*
Peak day	*12/12/2012*
Peak consumption	*25,775 GWh/d*

Figure 24 - Winter 2012/13 demand profile

From December to March gas demand did not show any monthly pattern and stayed in average on a flat level. With the exception of the second half of December when mild climatic conditions combined with the holiday period brought down the demand to the 15,000 GWh/d level, demand was mostly fluctuating around the 22,000 GWh/ from December until end of March. The lack of a particularly cold period resulted in the highest daily demand being reached on a day not belonging to the 14-day period of highest consumption.

Observed by sector in the graphs below, the main variation in the gas demand between the peak day, on the 12th of December and the 14-day peak period in the second half of January came from the power generation sector.

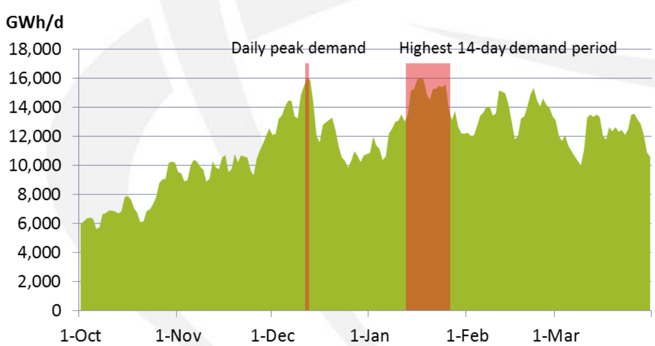


Figure 25 - Winter 12/13 demand profile (RES&COM&IND) (*)

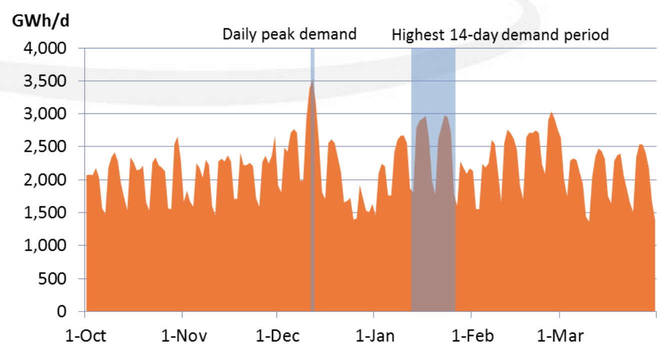


Figure 26 - Winter 12/13 demand profile (Power generation) (*)

(*) These graphs refer to the countries for which demand breakdown is available (Belgium, Croatia, Czech Republic, Denmark, Finland, France, Greece, Hungary, Ireland, Italy, Lithuania, Netherlands, Portugal, Slovakia, Slovenia, Spain, Sweden, and United-Kingdom) – as consequence, the sum of the demands in figures 25 and 26 is lower than he total demand shown in figure 24.

The peculiarity of the gas consumption for power generation sector on the peak day was due to several factors, like the higher electricity consumption or the different availability of other electricity generation technologies. Of remarkable significance was the low availability of wind on the peak day (12 December) affecting substantially the generation mix in Spain where the installed capacities of wind power are most significant, as shown in the Figure 27. Even with a lower relative weight, the lower availability of wind was also noticeable in Great Britain, as seen in Figure 28.

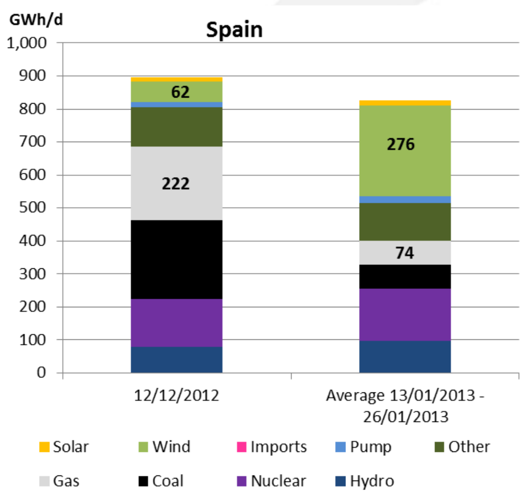


Figure 27 - ES: detail of Electricity mix (source REE)

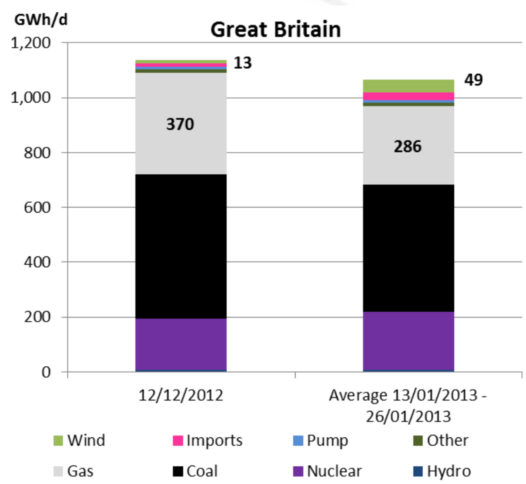


Figure 28 - GB: detail of Electricity mix (source National Grid)

- **Peak demand evolution 2009-2013**

The high demand levels during winter 2012/13, either daily or on a 14-days basis, were significantly lower than the ones reached during winter 2011/12 that were exceptionally high. When comparing the peak levels with those of Winters 2009/10 or 2010/11 – both less extraordinary winters – the high demand levels of winter 2012/2013 were still lower, moving around the 3% decrease.

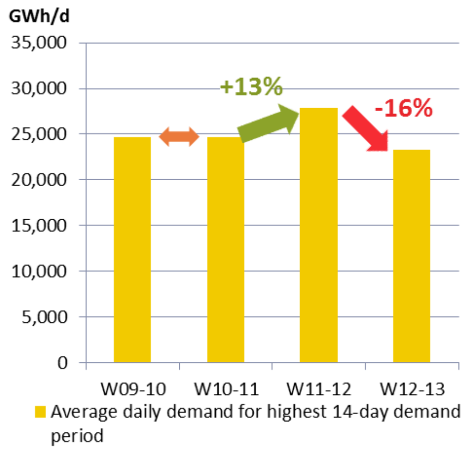


Figure 29 – Average daily demand for highest 14-day demand period. Winters 2009-2013

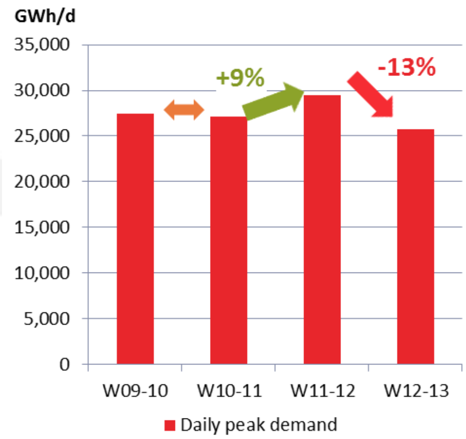


Figure 30 – Daily peak demand. Winters 2009-2013

- **<u>Seasonal modulation</u>**

The pattern followed by winter demand is strongly linked to the climatic conditions, like the presence of cold snaps or particularly mild conditions in one or several months along the winter, determines the modulation pattern followed by gas demand.

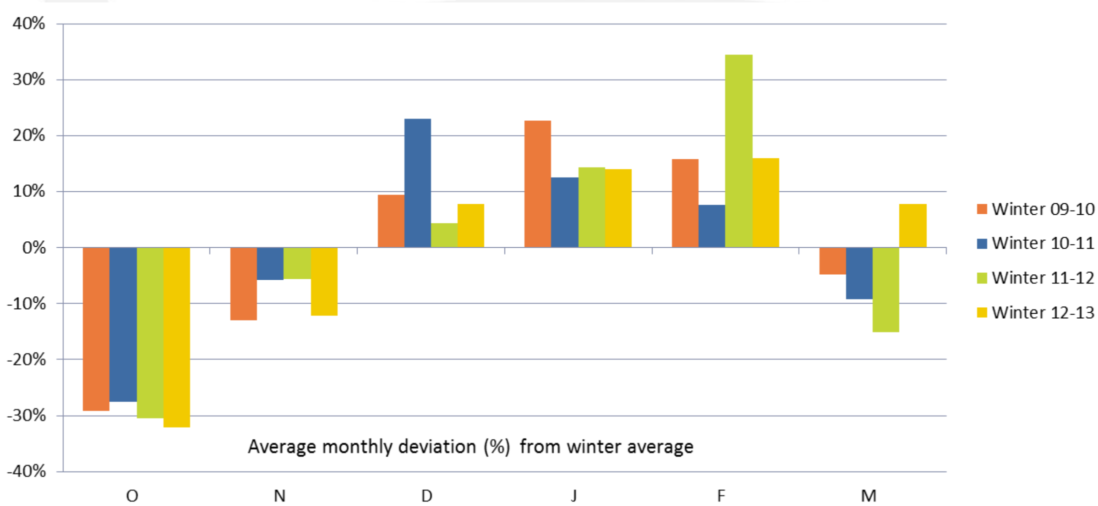


Figure 31 - Winter modulation 2009-2013

The graph above shows the deviation of the monthly average demand from the winter average for each of the last four winters:

- October has been regularly the month with the lowest demand
- The gas demand in November has been systematically lower than the average

> The month of highest average consumption has varied between December (W2010/11), January (W2009/10) and February (W2011/12 and W2012/13)
> Winter 2012/13 has been the only year where March average was above the winter average.

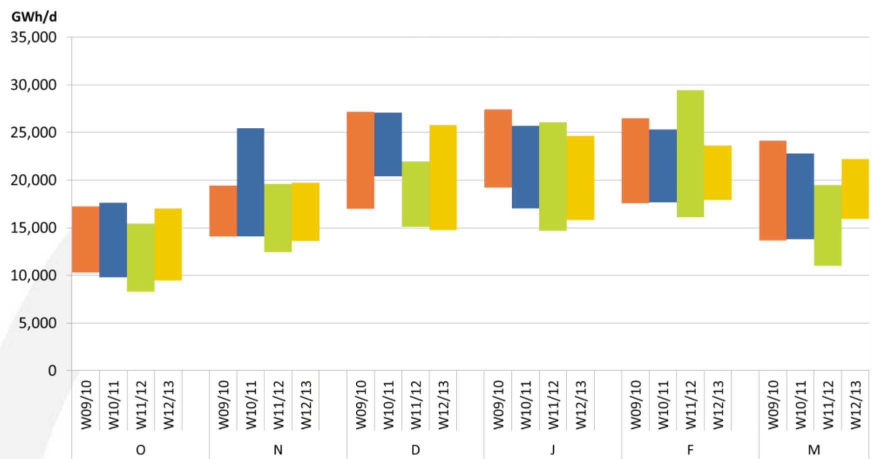


Figure 32 - Monthly demand ranges

The figure 32 shows the monthly variation between the maximum and minimum daily demand.

The maximum daily demand was reached in December during Winters 2010/11 and 2012/13; in January for Winter 2009/10, and in February for Winter 2011/12.

The minimum daily demand reached its maximums in December during winter 2010/11, in January in Winter 2009/10, and in February for Winters 2011/12 and 2012/13.

- **Country detail**

The decrease of the peak demand compared to winter 2011/12 was almost generalized all across Europe, with most of the countries oscillating between -10% and -20% of the gas demand from the previous winter. Significant exceptions were Sweden and Ireland registering increases in the peak demands, and Hungary and the Czech Republic, with decreases over 20%.

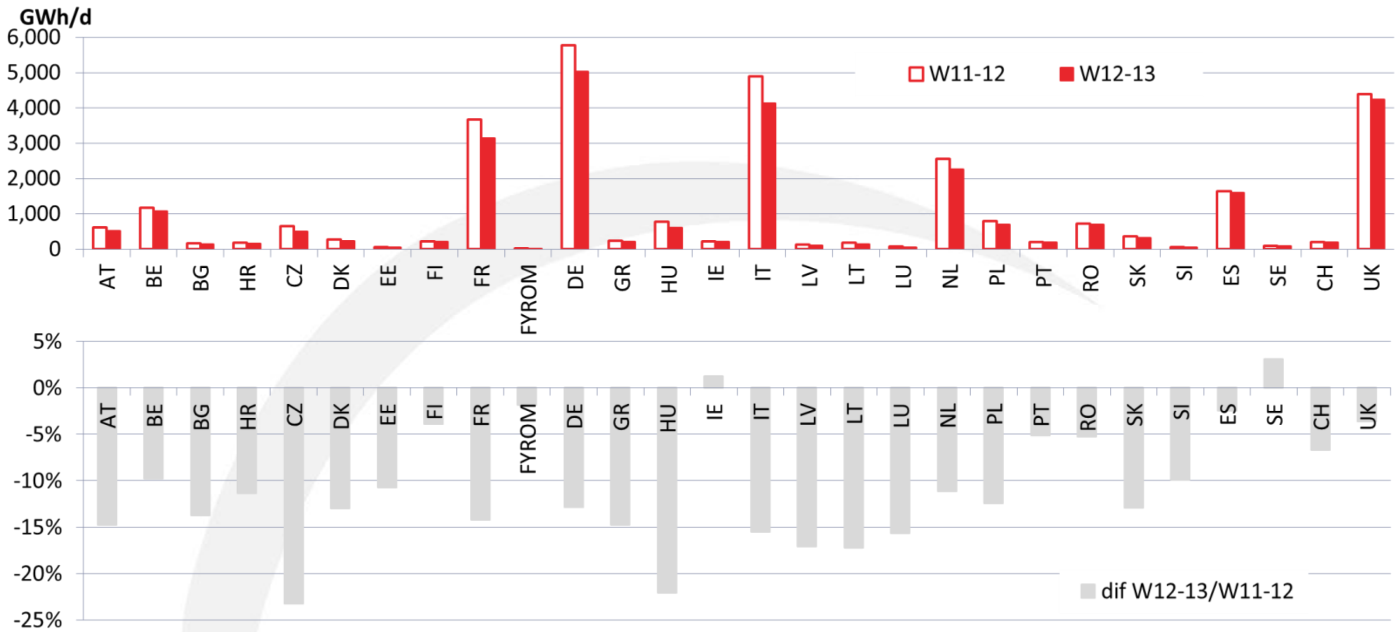


Figure 33 - Daily peak demand

Similar behavior is observed in the distribution of the 14-day peak demand:

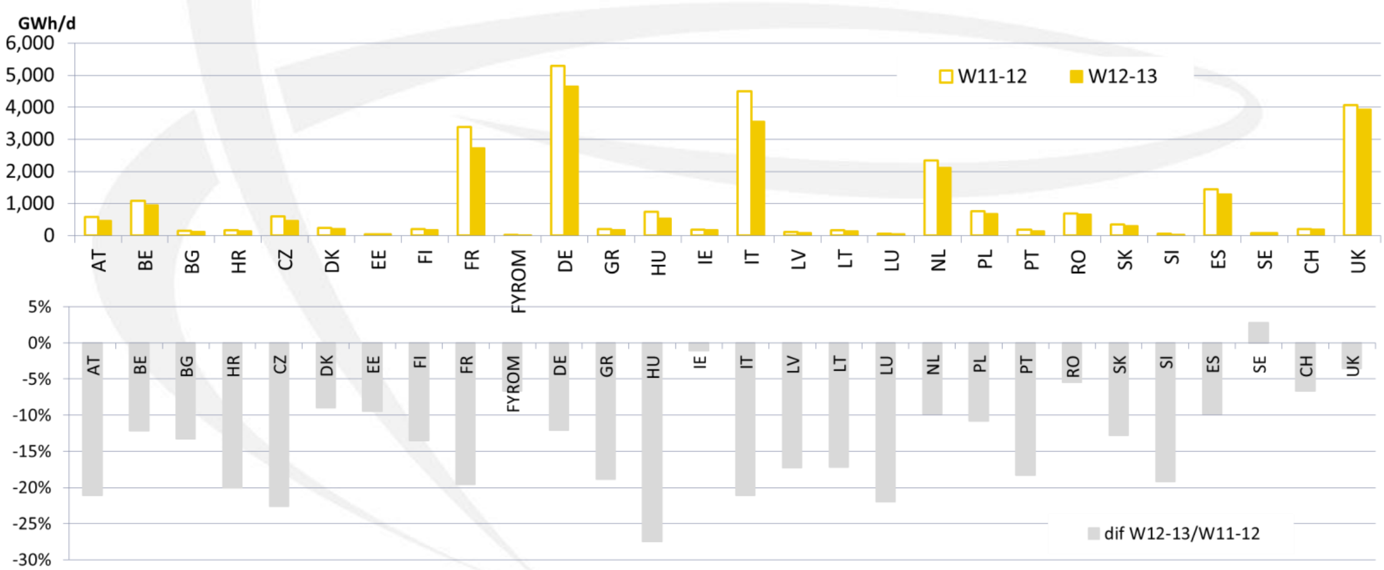


Figure 34 - Highest 14-day demand

These variations are very much influenced by the distribution of the cold snap the previous year.

The following graph shows the minimum, maximum and average daily demand during winter 2012/13, as well as the daily maximum and minimum of the last four winters per country:

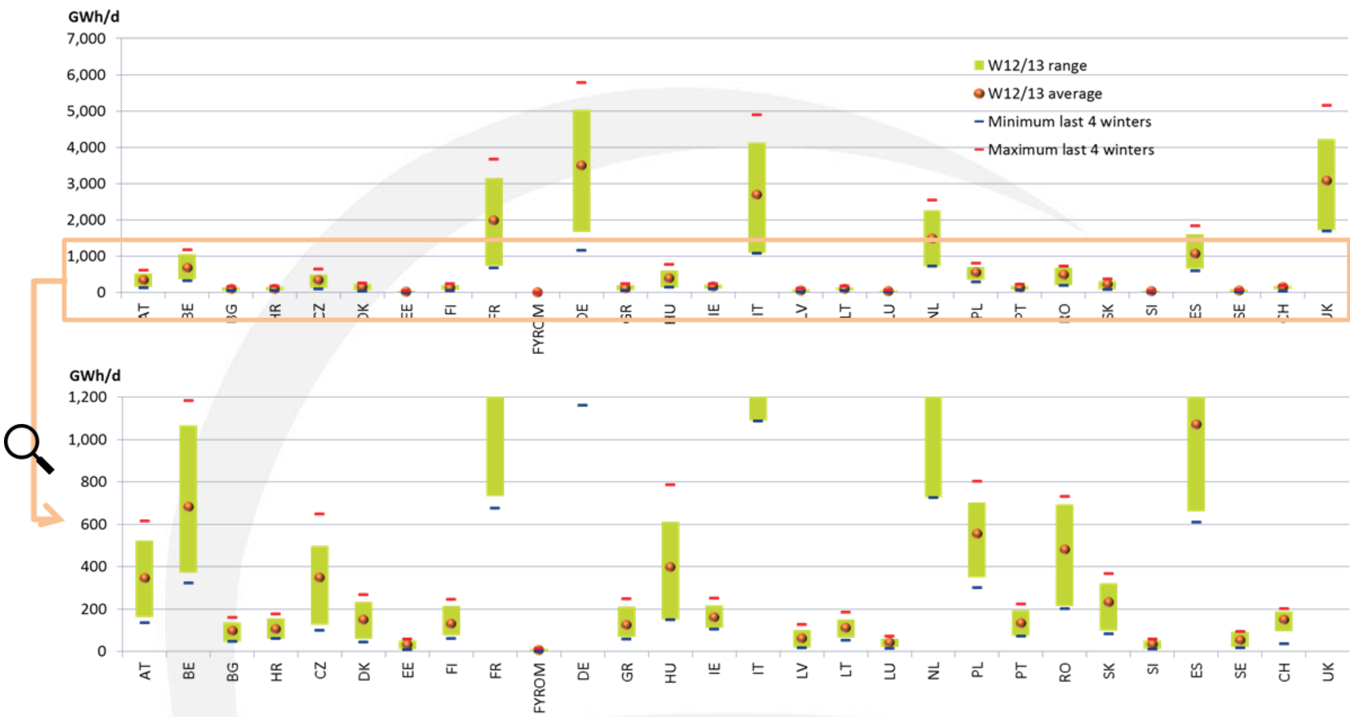


Figure 35 - Winter maximum and minimum

- **Simultaneity**

In order to measure the simultaneity between the peak days in different countries, the "Un-simultaneous Peak" is described as the sum of the peak day demands of the individual countries having occurred un-simultaneously, defining:

- The European peak simultaneity (EPS)
    - EPS = European Peak Demand / Un-simultaneous Peak (%)
- The simultaneity of an individual country in the European peak day (CPS)
    - CPS = Country demand on the European peak day/Country peak demand (%)

So defined, the European peak simultaneity during the peak day on 12 December 2012, was 95,7%, a value slightly lower than the simultaneity during the peak day of Winter 11/12, but higher than the simultaneity values for winters 2009/10 and 2010/11.

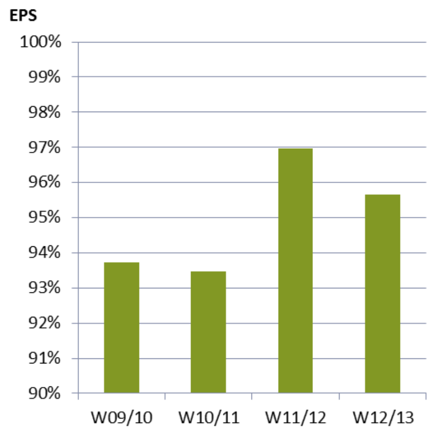


Figure 36 - European peak simultaneity.

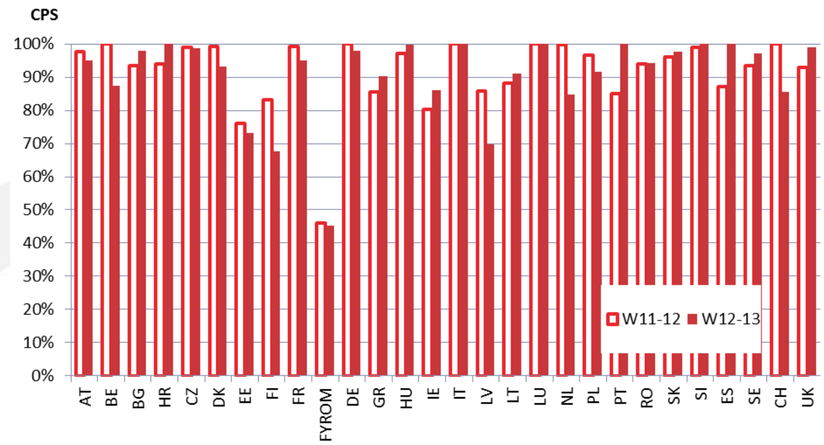


Figure 37 - Simultaneity of the highest single day between last 2 winters

Winter	day	Peak demand (GWh/d)	EU simultaneity (%)
W09/10	26/01/2010	27,431	94%
W10/11	17/12/2010	27,091	93%
W11/12	7/02/2012	29,460	97%
W12/13	12/12/2012	25,775	96%

Table 1 - 2009-2013: Peak demands and their simultaneity

Supply

> European seasonal gas supply

As seen in Figure 38, the evolution of the aggregated gas supply in Europe during the winter 2012/13 followed the relatively flat monthly averages.

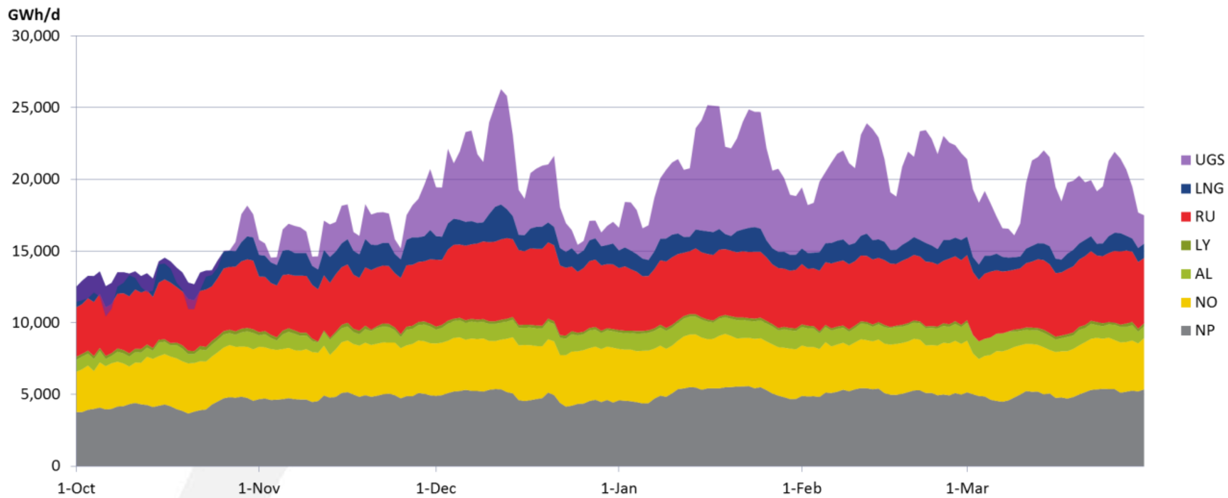


Figure 38 - Winter 2012/13 supply profile

The next graphs give an overview of Imports, National production and UGS supply shares during Winters 2012/13 and 2001/11 in both absolute and relative terms.

Total Winter Supply: 3,408 TWh

Figure 39 shows the seasonal supplies by source for the last two winters in absolute figures.

While the variation in the Norwegian, Algerian and Libyan supplies may not be significant, the important decrease in the LNG imports (-32%) and National production (-8%) was replaced with a relevant increase in the UGS withdraws (+40%) and of Russian imports (+7.5%).

These variations implied a significant change in the supply shares, as shown in the Figures 40 and 41.

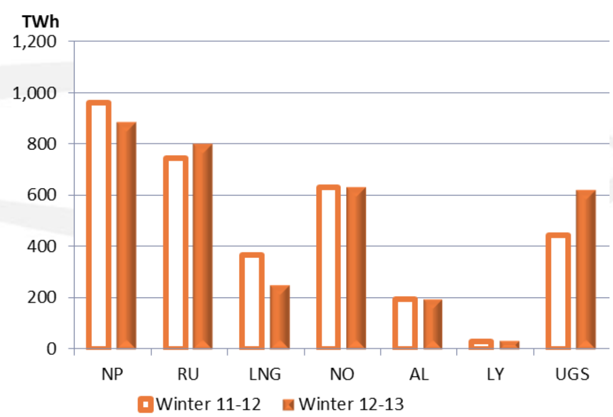


Figure 39 - Seasonal supply

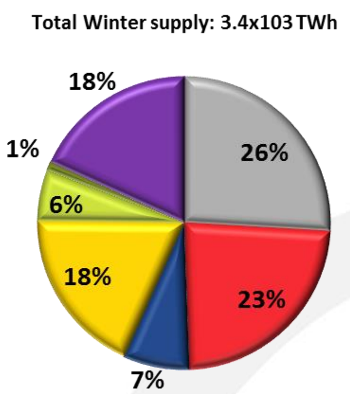


Figure 40 - Supply shares. Winter 12-13

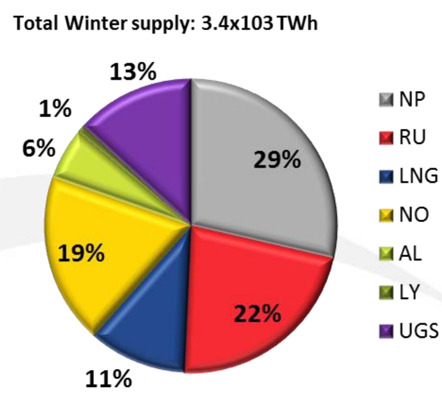


Figure 41 - Supply shares. Winter 11-12

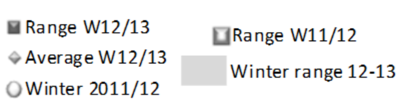
The LNG import has followed on its continuous decrease, following the divergence of gas prices between Europe and Asia, which fosters cargo redirection and limits the arrival of spot cargos.

In absolute terms, the decrease of national production (76.976 GWh) was mainly located in UK (60%), Denmark (13%) and Netherlands (9%), no other country's decrease contributed in more than 5%.

Nevertheless, in relative terms, the reduction in the indigenous production in Netherlands was limited to -1%, being much more significant in UK (-20%) and Denmark (-32%). Important decreases in national production were experienced in Austria (-22%) and Hungary (-27%), in these two last cases with low impact in the European indigenous production.

- **Supply modulation**

The following graphs illustrate for national production and each import supply source per month, the average flow and the monthly and seasonal range (between the lowest and highest daily flow of each month and for the whole winter).



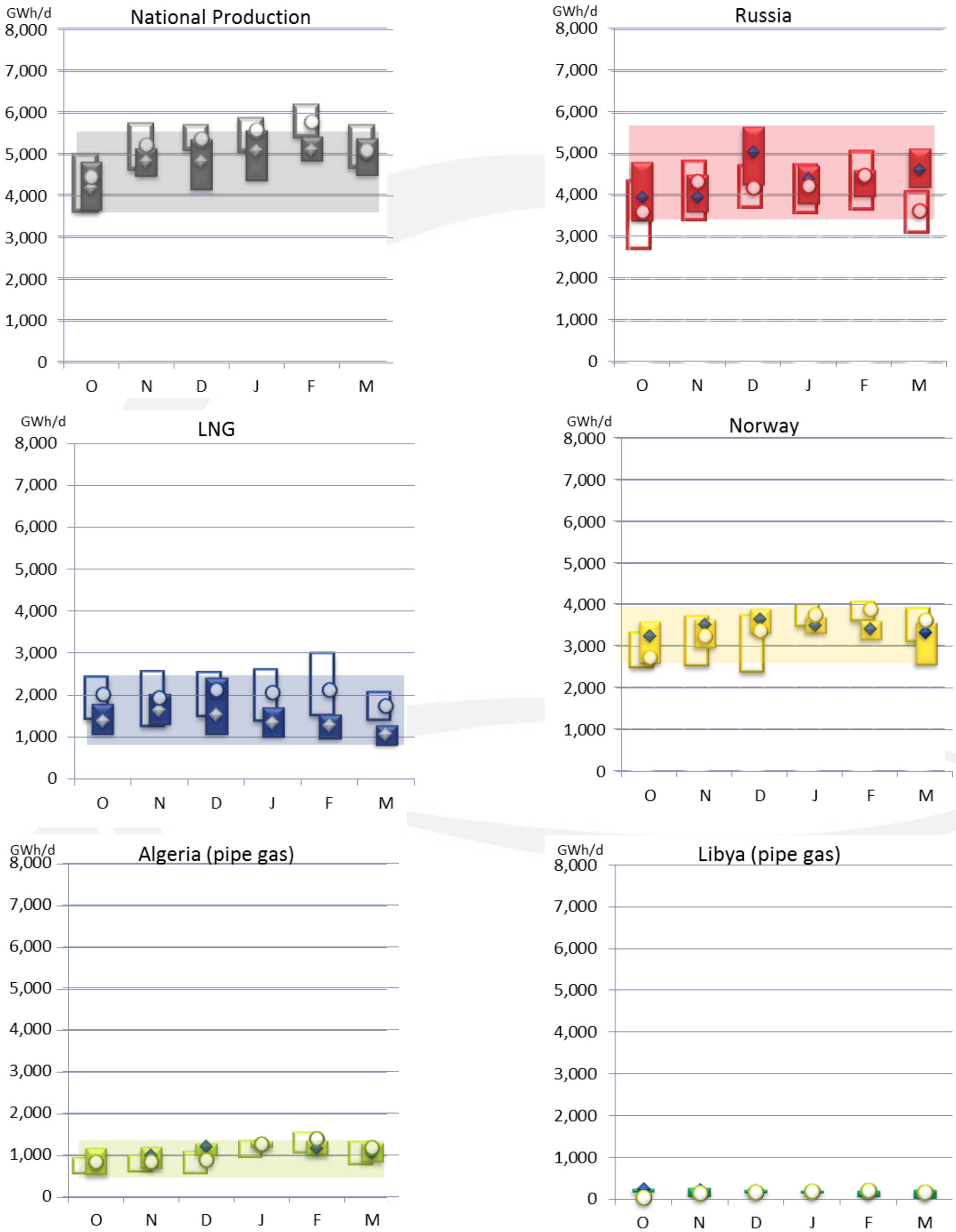


Figure 42 - Supply modulation

- **Underground storages**

The utilization of the Underground storages depends on many factors, linked to price signals such as summer-winter spread or climatic and economic considerations having impact on gas demand.

During Winter 2012/13 the high demand levels sustained until end of March motivated the extensive use of UGS during the second half of the Winter, as seen in the following two graphs.

The peak deliveries on the contrary, remained significantly lower than the ones reached in the previous winter, as a consequence of the lower peak demand.

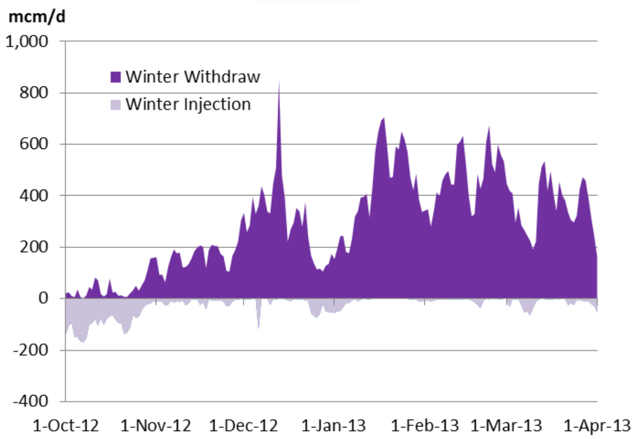


Figure 43 - UGS injection/withdraw profile. Source AGSI

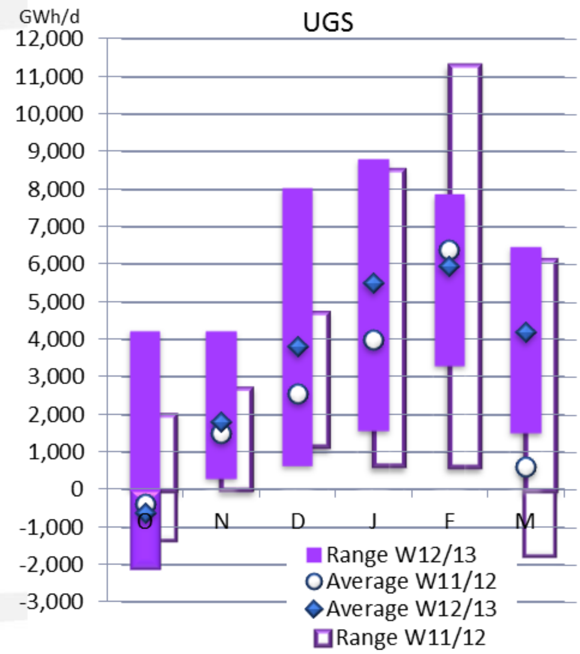


Figure 44 - Use of UGS during Winter 2012/13 and 2011/12

The UGS withdrawals follow the evolution of gas demand along the winter. Contrarily to Winter 2011/12 when demand and consequently UGS withdrawals were concentrated in February, UGS withdrawals were well spread along the last 4 months of Winter 2012/13, being significantly important the withdraw levels in March.

The next table provides the level of stock evolution during winter for GSE operator areas (source GSE AGSI platform):

Hub area*		1-Oct-12	1-Nov-12	1-Dec-12	1-Jan-13	1-Feb-13	1-Mar-13	31-Mar-13
Baumgarten	AT, CZ, HU, PL, SK	83.61	82.48	75.03	62.63	47.7	34.92	23.38
France		80.19	86.47	74.58	58.88	38.81	18.91	8.46
Germany		92.99	93.81	87.23	76.59	58.08	41.95	21.55
Iberian	PT, ES	93.94	96.29	92.04	74.26	65.27	61.81	62.32
NBP		94.05	98.17	94.79	85.58	56.96	21.49	5.13
PSV		90.34	94.17	92.63	82.73	67.24	48.86	37.37
TTF	DK, NL	86.34	80.24	80.03	69.12	57.96	44.74	29.38
ZEE		98.34	99.19	70.77	55.57	46.27	36.95	20.11

Figure 45 - Stock level (% WGV)

**: Areas as the ones defined under the AGSI platform*

Figure 47 compares the stock level evolution curve of the last three winters (source AGSI).

Having started from a slightly lower level than the previous two winters, the stock level by mid-February was similar to the one of the previous two winters.

By the end of the Winter, the stock level was 24%, significantly lower than the previous two years, due to the continuous withdrawals as consequence of the high consumptions during March.

Winter	*UGS utilization (% WGV)*
W10/11	***51%***
W11/12	***50%***
W12/13	***65%***

Figure 46 - UGS winter use

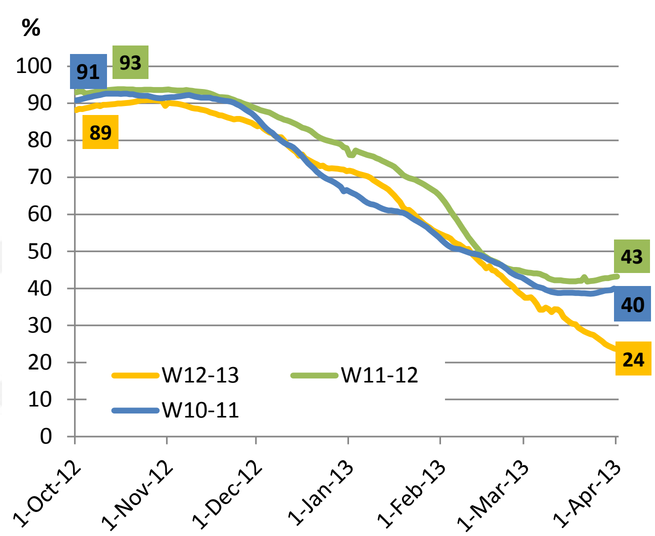


Figure 47 - Evolution of stock level. Winters 2010-2013 (Source AGSI)

The figure 46 shows the variation in the stock level from the beginning to the end of the withdraw season.

- **<u>Supply coverage of high daily demands</u>**

Due to the different ability of the different supply sources to increase or decrease the supply levels in response to demand, the supply mix varies significantly depending on the demand level. The following graphs compare the supply level of the different sources under different demand conditions.

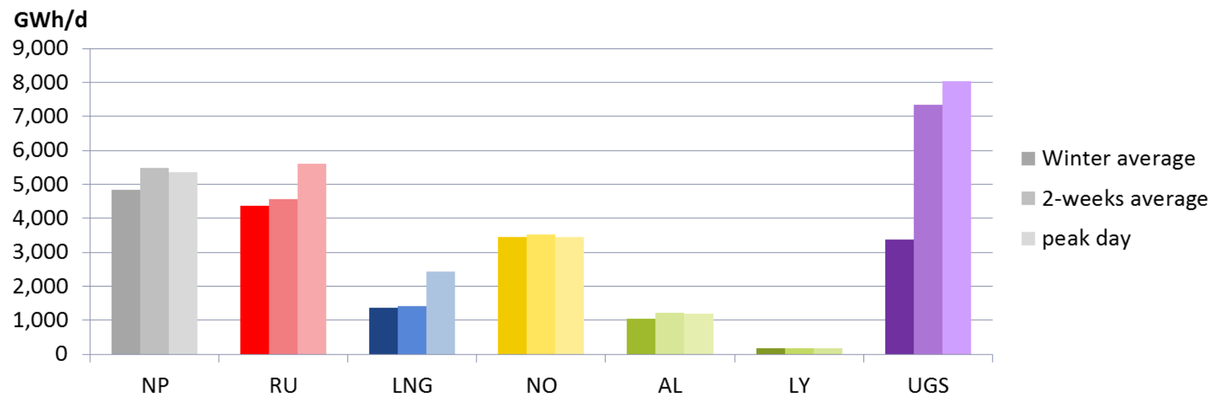


Figure 48 - Winter daily average supply / Average daily supply for highest 14-day demand period / Daily supply for the daily peak demand

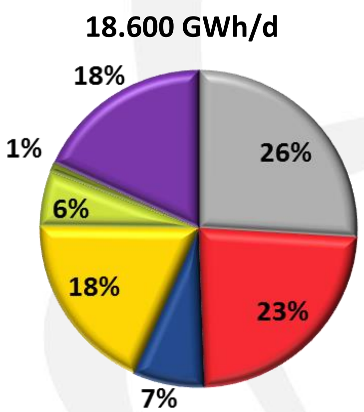


Figure 49 - Winter average

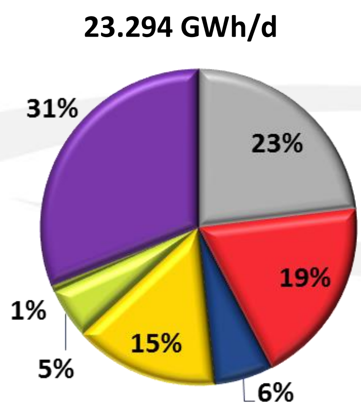


Figure 50 - 14-d high demand period (13 -26 January 2013)

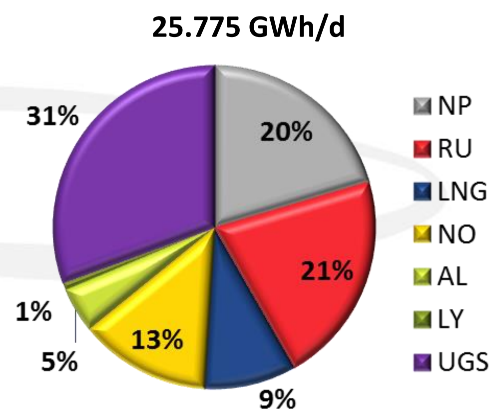


Figure 51 - 12 December 2012

- **<u>Winter supply evolution 2009-2013</u>**

The following graphs show the evolution of the different supply sources both in absolute and relative terms during the last four winters

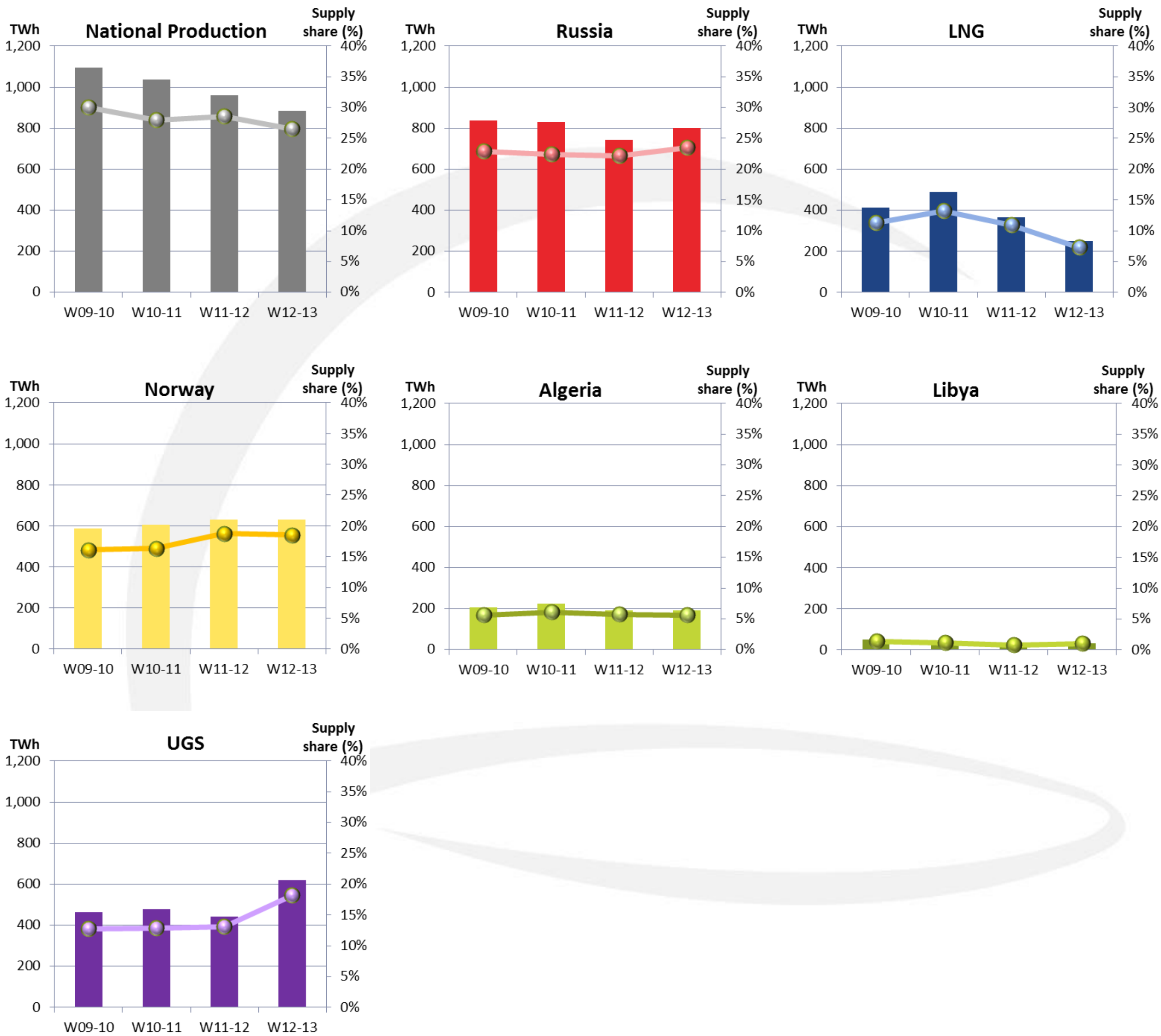


Figure 52 - Evolution of winter gas supplies 2009-2013

FLOWS

The following map summarizes the main net flows (daily winter average) entering Europe and through the European cross-borders during winter 2012/13. The tables below increase the detail, adding the monthly average and the maximum fluctuation within the winter. Commercial flows are not considered.

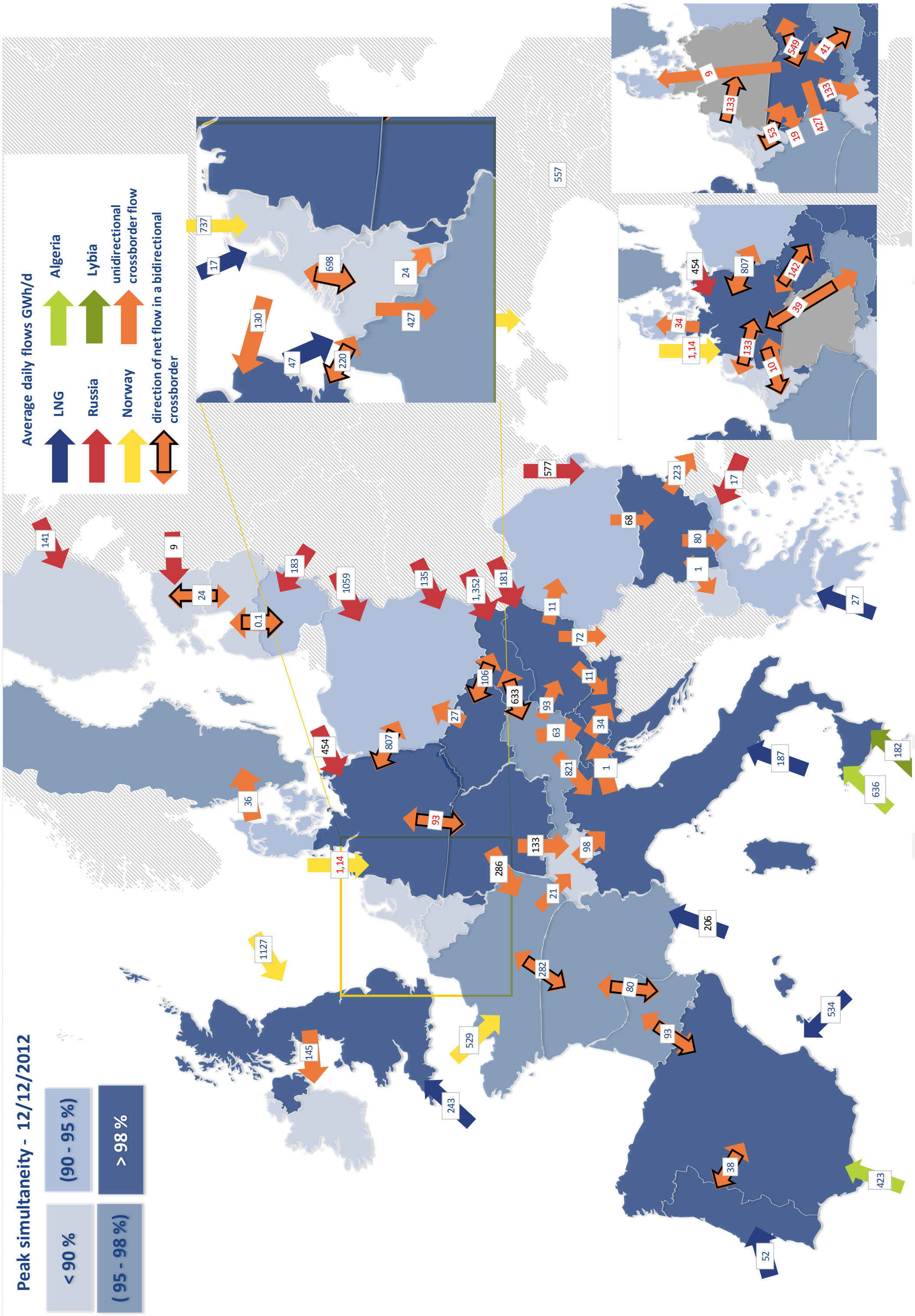


Figure 53 - Net flow pattern (Winter average)

Flows – tables

Legend:

CC: country

Direction: entry into CC; exit from CC

Adjacent InfraType: Hub, Supplier, Interconnector or LNG Terminal

CC	Region	Direction	Adjacent CC	Adjacent Region	Adjacent InfraType	O	N	D	J	F	M	Capacity	Avg	Max	Min
AT		entry	DE	GASPOOL	Hub	0	0	4	0	0	0	114	1	47	0
				NCG	Hub	93	28	46	73	89	113	295	74	141	16
			IT		Hub	0	0	0	0	0	0	191	0	0	0
			SI		Hub	0	0	0	0	0	0	0	0	0	0
			SK		Hub	986	1,040	1,254	1,093	1,096	1,139	1,565	1,102	1482	770
		exit	DE	GASPOOL	Hub	96	85	55	0	0	0	173	40	112	0
				NCG	Hub	1	9	7	50	111	200	158	63	231	0
			HU		Hub	89	107	118	89	100	51	129	92	121	13
			IT		Hub	678	680	926	883	874	883	1,137	821	1048	443
			SI		Hub	48	59	71	67	68	63	93	63	85	38
			SK		Hub	0	0	0	0	0	0	218	0	0	0
BA		entry	HR		Hub	0	0	0	0	0	0	0	0	0	0
			RS		Hub	0	0	0	0	0	0	18	0	0	0
BE		entry	NO		Supplier	417	418	465	433	460	441	464	439	493	299
			BE		LNG Terminals	79	61	35	34	41	31	461	47	193	17
			DE	GASPOOL	Hub	3	6	3	10	10	105	77	23	177	0
				NCG	Hub	37	50	114	96	126	288	342	119	344	0
			FR	PEG North	Hub	0	0	0	0	0	0	0	0	0	0
			NL		Hub	569	599	642	876	900	910	979	748	1095	382
			UK		Interconnector	17	0	11	11	0	0	630	7	166	0
		exit	DE	GASPOOL	Hub	9	10	17	22	20	0	136	13	89	0
				NCG	Hub	1	0	0	0	0	0	163	0	17	0
			FR	PEG North	Hub	458	361	417	452	443	428	800	427	572	242
			LU		Hub	20	26	25	26	25	25	30	24	33	15
			NL		Hub	48	46	60	47	52	41	339	49	148	34
			UK		Interconnector	109	194	149	145	195	583	808	230	801	0
BG		entry	RO		Pipeline	169	249	322	314	308	282	632	273	603	36
		exit	GR		Hub	68	48	115	91	86	69	131	79	127	19
			MK		Hub	1	3	5	10	11	4	33	5	14	0
			TR		Hub	223	390	433	439	434	408	468	387	465	111
CH		entry	DE	NCG	Hub	183	234	242	195	192	185	240	205	323	91
			FR	PEG North	Hub	5	0	29	38	32	23	223	21	83	0
		exit	DE	NCG	Hub	0	0	0	0	0	0	0	0	0	0
			FR	PEG North	Hub	0	0	0	0	0	0	0	0	0	0
			IT		Hub	108	128	146	85	51	65	633	98	193	0
CZ		entry	DE	GASPOOL	Hub	190	251	265	260	320	277	375	259	325	134
					Interconnector	257	407	449	502	521	733	960	478	856	0
				NCG	Hub	0	0	0	0	0	0	201	0	0	0
			PL		Hub	0	0	0	0	0	0	0	0	0	0
			SK		Hub	301	6	317	10	28	119	783	133	741	0
		exit	DE	GASPOOL	Hub	63	34	88	72	74	139	492	79	244	0
				NCG	Hub	493	411	703	438	535	708	1,072	549	856	90
			PL		Hub	27	27	27	27	27	28	28	27	28	25
			SK		Hub	0	69	0	63	5	20	389	26	149	0

CC	Region	Direction	Adjacent CC	Adjacent Region	Adjacent InfraType	O	N	D	J	F	M	Capacity	Avg	Max	Min
DE	GASPOOL	entry	NO		Supplier	756	857	748	727	732	626	1,026	741	950	489
			AT		Hub	96	85	55	0	0	0	173	40	112	0
			BE		Hub	9	10	17	22	20	0	136	13	89	0
			CZ		Hub	63	34	88	72	74	139	492	79	244	0
			DE	NCG	Hub	0	0	0	0	0	0	100	0	0	0
			DK		Hub	16	1	0	0	0	0	33	3	67	0
			NL		Hub	230	374	341	350	354	399	560	341	527	112
			PL		Interconnector	752	870	797	870	891	862	931	839	935	519
			RU		Interconnector	169	164	245	269	290	363	960	250	791	0
DE	GASPOOL	exit	AT		Hub	0	0	4	0	0	0	114	1	47	0
			BE		Hub	3	6	3	10	10	105	77	23	177	0
			CZ		Hub	223	329	357	381	421	505	960	369	856	0
			DE	NCG	Hub	0	0	0	0	0	0	100	0	0	0
			DK		Hub	0	0	0	0	0	0	11	0	0	0
			NL		Hub	0	2	28	106	103	149	325	64	205	0
			PL		Hub	18	21	39	37	41	37	48	32	48	17
	NCG	entry	NO		Supplier	237	240	255	209	166	142	280	209	466	5
			AT		Hub	1	9	7	50	111	200	158	63	231	0
			BE		Hub	1	0	0	0	0	0	163	0	17	0
			CH		Hub	0	0	0	0	0	0	0	0	0	0
			CZ		Hub	493	411	703	438	535	708	1,072	549	856	90
			DE	GASPOOL	Hub	0	0	0	0	0	0	100	0	0	0
			NL		Hub	517	668	732	846	870	731	955	725	1033	318
		exit	AT		Hub	93	28	46	73	89	113	295	74	141	16
			BE		Hub	37	50	114	96	126	288	342	119	344	0
			CH		Hub	183	234	242	195	192	185	240	205	323	91
			CZ		Hub	0	0	0	0	0	0	201	0	0	0
			DE	GASPOOL	Hub	0	0	0	0	0	0	100	0	0	0
			DK		Hub	1	4	19	14	13	14	17	11	32	0
			FR	PEG North	Hub	240	167	272	325	413	513	620	321	606	59
			LU		Hub	16	17	15	21	24	21	39	19	32	2
			NL		Hub	51	41	80	46	46	159	163	71	280	0
		entry	NO		Supplier	0	0	0	0	0	0	0	0	0	0
DK		entry	DE	GASPOOL	Hub	0	0	0	0	0	0	11	0	0	0
				NCG	Hub	1	4	19	14	13	14	17	11	32	0
			DK	Offshore	Cross-border area	138	4	0	126	120	128	396	86	179	0
		exit	DE	GASPOOL	Hub	16	1	0	0	0	0	33	3	67	0
			SE		Hub	29	1	0	65	63	60	93	36	90	0
EE		entry	LV		Hub	2	21	34	32	25	30	70	24	50	0
			RU	Mainland	Supplier	29	2	9	5	6	5	46	9	49	0
		exit	LV		Hub	2	21	34	0	0	0	0	10	50	0
ES		entry	DZ		Supplier	375	375	407	440	459	482	710	423	515	288
			ES		LNG Terminals	535	602	547	540	569	415	1,916	534	973	291
			FR	PEG TIGF	Hub	81	86	97	99	99	95	100	93	108	2
			PT		Hub	0	0	1	0	0	0	60	0	9	0
		exit	FR	PEG TIGF	Hub	0	0	0	0	0	0	105	0	0	0
			PT		Hub	18	10	5	68	64	65	164	38	85	0
FI		entry	RU	Mainland	Supplier	110	123	159	163	141	150	273	141	226	81

CC	Region	Direction	Adjacent CC	Adjacent Region	Adjacent InfraType	O	N	D	J	F	M	Capacity	Avg	Max	Min
FR	PEG North	entry	NO		Supplier	472	499	549	553	563	539	585	529	596	139
			BE		Hub	458	361	417	452	443	428	800	427	572	242
			CH		Hub	0	0	0	0	0	0	0	0	0	0
			DE	NCG	Hub	240	167	272	325	413	513	620	321	606	59
			FR	PEG North	LNG Terminals	78	78	70	59	40	0	370	54	137	0
				PEG South	Hub	0	0	0	0	0	0	230	0	0	0
		exit	BE		Hub	0	0	0	0	0	0	0	0	0	0
			CH		Hub	5	0	29	38	32	23	223	21	83	0
			FR	PEG South	Hub	303	184	311	311	328	251	230	281	413	20
			LU		Hub	0	0	0	0	0	0	0	0	0	0
	PEG South	entry	FR	PEG North	Hub	303	184	311	311	328	251	230	281	413	20
				PEG South	LNG Terminals	266	251	174	184	157	202	410	206	381	93
				PEG TIGF	Hub	0	0	0	0	0	9	80	1	46	0
		exit	FR	PEG North	Hub	0	0	0	0	0	0	230	0	0	0
				PEG TIGF	Hub	218	80	45	47	57	37	325	81	286	0
	PEG TIGF	entry	ES		Hub	0	0	0	0	0	0	105	0	0	0
			FR	PEG South	Hub	218	80	45	47	57	37	325	81	286	0
		exit	ES		Hub	81	86	97	99	99	95	100	93	108	2
			FR	PEG South	Hub	0	0	0	0	0	9	80	1	46	0
GR		entry	BG		Interconnector	68	48	115	91	86	69	131	79	127	19
			GR		LNG Terminals	14	50	18	31	28	21	139	27	73	0
			TR		Hub	22	14	23	16	17	12	58	17	26	3
HR		entry	HU		Hub	10	11	18	10	9	9	76	11	26	3
			SI		Hub	26	32	40	37	37	33	53	34	50	25
		exit	BA		Hub	0	0	0	0	0	0	0	0	0	0
			HU		Hub	0	0	0	0	0	0	0	0	0	0
HU		entry	AT		Hub	89	107	118	89	100	51	129	92	121	13
			HR		Hub	0	0	0	0	0	0	0	0	0	0
			UA		Transit	116	164	223	227	199	156	595	181	259	87
		exit	HR		Hub	10	11	18	10	9	9	76	11	26	3
			RO		Hub	13	11	11	11	16	5	51	11	17	3
			RS		Hub	55	66	95	94	72	45	270	71	114	27
IE		entry	UK		Hub	178	187	187	186	189	205	529	189	257	135
		exit	UK		Hub	41	43	43	45	45	47	89	44	72	25
IT		entry	DZ		Supplier	422	588	770	784	678	560	1,091	633	843	208
			LY		Supplier	223	203	188	177	153	151	354	183	266	0
			AT		Hub	678	680	926	883	874	883	1,137	821	1048	443
			CH		Hub	108	128	146	85	51	65	633	98	193	0
			IT		LNG Terminals	144	210	206	190	206	170	583	187	259	57
			SI		Hub	0	0	0	0	0	0	0	0	0	0
		exit	AT		Hub	0	0	0	0	0	0	191	0	0	0
			SI		Hub	1	2	3	5	5	2	28	3	5	0
LT		entry	BY		Transit	138	171	206	213	182	189	323	183	249	100
			LV		Hub	0	0	0	0	0	1	55	0	12	0
		exit	LV		Hub	0	0	0	0	0	0	55	0	0	0
			RU	Kaliningrad	Hub	53	73	82	82	68	74	109	72	93	37
LU		entry	BE		Hub	20	26	25	26	25	25	30	24	33	15
			DE	NCG	Hub	16	17	15	21	24	21	39	19	32	2
			FR	PEG North	Hub	0	0	0	0	0	0	0	0	0	0

CC	Region	Direction	Adjacent CC	Adjacent Region	Adjacent InfraType	O	N	D	J	F	M	Capacity	Avg	Max	Min
LV		entry	EE		Hub	2	21	34	0	0	0	0	10	50	0
			LT		Hub	0	0	0	0	0	0	55	0	0	0
			RU	Mainland	Supplier	103	0	0	0	0	0	200	18	173	0
		exit	EE		Hub	2	21	34	32	25	30	70	24	50	0
			LT		Hub	0	0	0	0	0	1	55	0	12	0
			RU	Mainland	Supplier	0	0	0	0	0	0	120	0	0	0
MK		entry	BG		Interconnector	1	3	5	10	11	4	33	5	14	0
NL		entry	NO		Supplier	432	463	443	387	329	439	989	417	510	258
			BE		Hub	48	46	60	47	52	41	339	49	148	34
			DE	GASPOOL	Hub	0	2	28	106	103	149	325	64	205	0
				NCG	Hub	51	41	80	46	46	159	163	71	280	0
			NL		Hub	195	251	323	338	361	331	574	299	482	116
					LNG Terminals	21	31	8	10	4	30	408	17	195	3
		exit	BE		Hub	569	599	642	876	900	910	979	748	1095	382
			DE	GASPOOL	Hub	230	374	341	350	354	399	560	341	527	112
				NCG	Hub	517	668	732	846	870	731	955	725	1033	318
			NL		Interconnector	195	251	323	338	361	331	574	299	482	116
			UK		Hub	197	252	324	343	368	339	494	303	497	111
PL		entry	BY		Transit	473	542	550	534	544	534	931	529	1049	26
			CZ		Hub	27	27	27	27	27	28	28	27	28	25
			DE	GASPOOL	Hub	18	21	39	37	41	37	48	32	48	17
			PL		Interconnector	90	108	148	139	123	148	165	126	167	63
					LNG Terminals	0	0	0	0	0	0	0	0	0	0
			UA		Transit	100	135	141	143	146	148	133	135	156	41
		exit	CZ		Hub	0	0	0	0	0	0	0	0	0	0
			DE	GASPOOL	Hub	752	870	797	870	891	862	931	839	935	519
			PL		Hub	90	108	148	139	123	148	165	126	167	63
PT		entry	ES		Hub	18	10	5	68	64	65	164	38	85	0
			PT		LNG Terminals	78	41	47	44	48	57	213	52	117	28
		exit	ES		Hub	0	0	1	0	0	0	60	0	9	0
RO		entry	HU		Hub	13	11	11	11	16	5	51	11	17	3
			UA		Transit	170	253	323	316	301	268	1,776	272	603	14
		exit	BG		Hub	43	53	81	79	76	77	210	68	105	36
					Interconnector	295	445	562	549	539	487	632	479	603	167
RS		entry	HU		Hub	55	66	95	94	72	45	270	71	114	27
		exit	BA		Hub	0	0	0	0	0	0	18	0	0	0
RU	Kaliningrad	entry	LT		Hub	53	73	82	82	68	74	109	72	93	37
		exit	DE	GASPOOL	Hub	0	0	0	90	94	87	686	45	125	0
					Interconnector	337	328	490	449	487	640	960	455	791	106
SE		entry	DK		Hub	29	1	0	65	63	60	93	36	90	0
SI		entry	AT		Hub	48	59	71	67	68	63	93	63	85	38
			IT		Hub	1	2	3	5	5	2	28	3	5	0
		exit	AT		Hub	0	0	0	0	0	0	0	0	0	0
			HR		Hub	26	32	40	37	37	33	53	34	50	25
			IT		Hub	0	0	0	0	0	0	0	0	0	0

CC	Region	Direction	Adjacent CC	Adjacent Region	Adjacent InfraType	O	N	D	J	F	M	Capacity	Avg	Max	Min
SK		entry	AT		Hub	0	0	0	0	0	0	218	0	0	0
			CZ		Hub	0	69	0	63	5	20	389	26	149	0
			UA		Transit	1,507	1,156	1,782	1,142	1,206	1,300	2,556	1,352	2174	828
		exit	AT		Hub	986	1,040	1,254	1,093	1,096	1,139	1,565	1,102	1482	770
			CZ		Hub	301	6	317	10	28	119	783	133	741	0
TR		entry	BG		Interconnector	223	390	433	439	434	408	468	387	465	111
		exit	GR		Hub	22	14	23	16	17	12	58	17	26	3
UK		entry	NO		Supplier	954	1,051	1,211	1,198	1,189	1,159	1,441	1,126	1422	410
			BE		Hub	109	194	149	145	195	583	808	230	801	0
			IE		Hub	41	43	43	45	45	47	89	44	72	25
			NL		Interconnector	197	252	324	343	368	339	494	303	497	111
			UK		Hub	18	0	12	11	0	0	624	7	163	0
					Interconnector	109	194	146	144	195	580	808	229	787	0
					LNG Terminals	162	308	431	239	170	139	1,727	242	813	89
		exit	BE		Hub	17	0	11	11	0	0	630	7	166	0
			IE		Hub	178	187	187	186	189	205	529	189	257	135
			UK		Hub	109	194	146	144	195	580	808	229	787	0
					Interconnector	18	0	12	11	0	0	624	7	163	0