Winter Supply Outlook 2014/15

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 2014 to March 2015). The analysis focuses on the possible evolution of UGS inventory along the season and the ability of the gas system to face High Daily Demand situations. It assesses the potential of gas infrastructures under a given demand and supply situation.
ENTSOG has used a similar approach as for its support to European Commission Stress Test but with a complementary perspective focusing on the impact of harsh climatic conditions rather than long lasting disruptions. 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 high level of UGS on 1 October 2014 facilitates the balance of demand across Europe**
- **The possibility to ensure sustained physical flow toward Ukraine along the winter**
- **A disruption of transit through Ukraine under peak situations still strongly impacts South-East Europe[1]**
- **The balance of Scandinavian market under peak situation after a cold winter still depends on the availability of interruptible capacity[2].**
- **Luxembourg still lacks of entry capacity to face peak situations[3]**

Sensitivity studies have been carried out to further illustrate:

- The impact of a change in winter demand on UGS stock level (volume perspective)
- The ability to face a disruption of Russian gas supply through Ukraine under High Daily Demand situations (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 a forecast.

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[1] New infrastructures Greece/Bulgaria and Slovakia/Hungary improve the situation compared to last winter

[2] New firm capacity from market area GASPOOL to Denmark improves the situation compared to last winter. Danish situation will be completely mitigated end of 2015 early 2016 with the commissioning of the second step of the project at Ellund.

[3] The market integration BeLux project in autumn 2015 will completely mitigate this situation

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 2014/2015. 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 the whole winter including 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. As a difference with recent winters the actual levels of underground gas storages are very high on 1 October 2014.

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 to enlarge the geographical scope of the study beyond its own perimeter. Winter Supply Outlook 2014/2015 covers the EU-28 (less Cyprus and Malta) plus Switzerland, Bosnia, Serbia, FYROM as well as exports to Ukraine, Moldova, Turkey and Kaliningrad.

Winter movie and snapshots

As for previous reports Winter Supply Outlook 2014/2015 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.

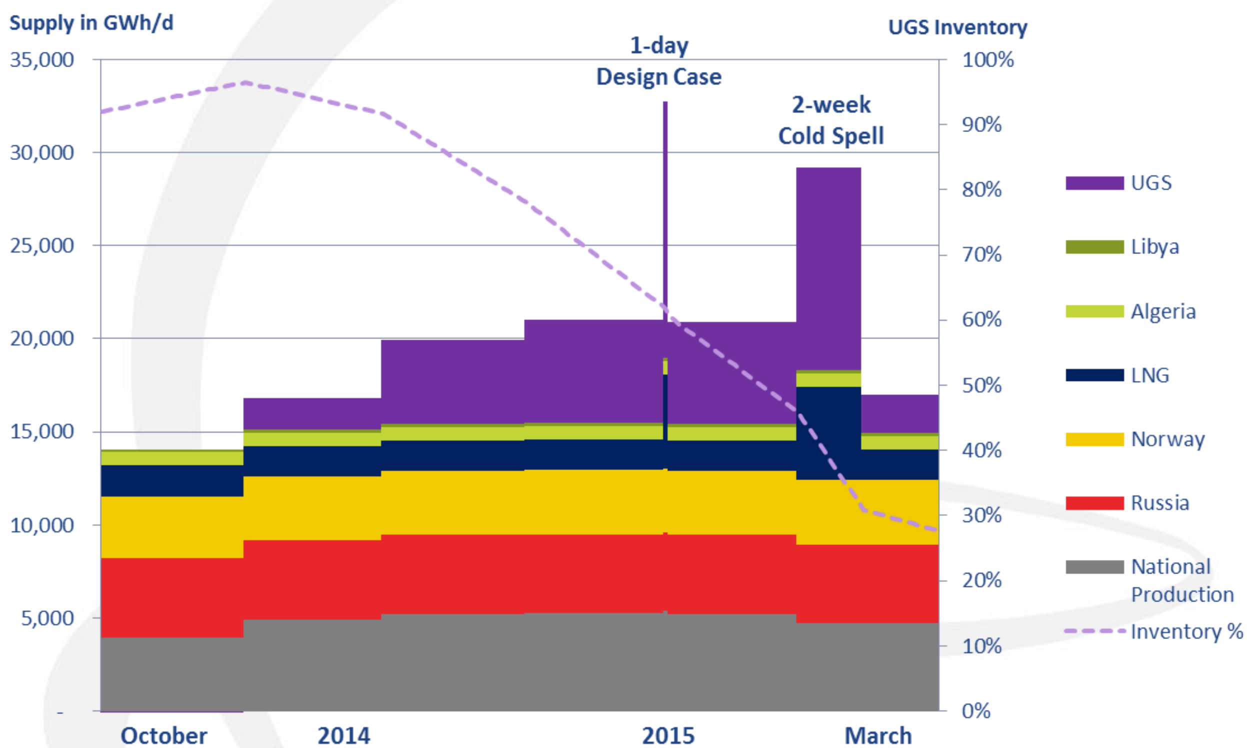


Figure 1 – The quantitative and capacity visions

These two visions are linked through the extraction curves of UGS facility (see Annex A). These curves define the reduction of withdrawal deliverability with the decrease of inventory. A limited deliverability in the middle or the end of the winter may hamper the ability to face High Daily Demand situation especially in March after a Cold Winter.

Assumptions

Demand

A Reference Winter has been defined on the basis of average climatic condition but with the inclusion of two High Daily Demand situations. Each period of winter is defined in the below table:

Period	Number of days	Occurrence of the demand provided by each TSO
October	31	1-in-2 year
November	30	1-in-2 year
December	31	1-in-2 year
January	30	1-in-2 year
1-day Design Case[4]	1	National design standard for non-power generation gas demand
February	28	1-in-2 year
2-week Uniform Risk in March[5]	14	European aggregated gas demand at the level of the February 2012 Cold Spell with the share of each country according to their 2-week yearly peak
March	17	1-in-2 year

A flat daily demand has been considered within each period.

For the purpose of the sensitivity analysis, two additional winter profiles have been defined as below:

- 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). This increase does not apply to the two peak periods.
- 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). This increase does not apply to the two peak periods.

[4] The definition of the Design Case has changed compared to previous ENTSOG Winter Supply Outlooks. Gas demand for power generation now results from the power generation approach resulting from ENTSOG R&D Plan and developed for the CBA methodology under the New TEN-E Regulation.

[5] Same as for the Design Case

<u>Export from Europe</u>

The analysis considers the following transit from Europe to other regions: Kaliningrad from Lithuania, Saint-Petersburg from Latvia, Ukraine from Slovakia and Turkey from Bulgaria. The levels of the different transits are indicated in the Annex B.

<u>Supply</u>
For each of the Winter profiles a specific gas supply mix has been defined as below:

<table>
<tr><th></th><th>Cold Winter</th><th>Reference Winter</th><th>Warm Winter</th><th>High Daily Demand</th></tr>
<tr><td>National production</td><td colspan="4">TSO forecast</td></tr>
<tr><td>Norway
Libya
Russia[6]</td><td>Limited to Dec. 2012 – Feb. 2013 average[7]</td><td rowspan="3">Limit reduced by 5%</td><td rowspan="3">Limit reduced by 10%</td><td rowspan="2">Limited to the highest level reached on 1 day and 2 weeks over last 4 years[8]</td></tr>
<tr><td>Algeria</td><td>Limited to Dec. 2013 – Feb. 2014 average[9]</td></tr>
<tr><td>LNG</td><td>Limited to Dec. 2012 – Feb. 2013 average</td><td>DC: Terminal send-out capacity
2-week: 80% of terminal send-out capacity</td></tr>
<tr><td>UGS</td><td colspan="4">Limited for each zone by the deliverability associated with the inventory level</td></tr>
</table>

The influence of UGS inventory on withdrawal deliverability has been considered using extraction curves provided by GSE (see Annex A). The initial storage level on 1 October 2014 for each country comes from AGSI platform and SSO websites.

<u>Modelling approach</u>
On the basis of the above assumptions ENTSOG has run an overall simulation of the whole winter using the approach developed for the Cost-Benefit Analysis under Regulation (EC)

[6] All simulations are carried out with full availability of OPAL
[7] Winter 2013/2014 was too mild as a reference for gas supply source deliverability
[8] Level is adapted to the evolution of the yearly supply from each source
[9] Deliverability of Algerian pipe supply was very high during Winter 2012/2013 and this level is likely not to be reachable in the near future

347/2013. It enables to check the demand and supply balance for each zone and each period of the winter.

The modelling is done on the basis of an Optimal crisis management under High Daily Demand situations and disruptions defined as:

- Price-reactive gas flow
- Perfect cooperation between Member States

As a result any demand curtailment is spread as much as possible given the level of interconnection capacity in order to minimize the relative impact on each country.

Additional modelling assumptions are:

- A 30% aggregated UGS inventory at the end of the Reference Winter if it does not prevent countries to be balanced
- LNG is use as a last resort supply given its current price level compared to other sources

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

Demand balance along the winter

The high level of UGS inventory at the beginning of the season and the commissioning of new infrastructure projects[10] enable the supply and demand balance in each country along a Reference, Cold and Warm Winter. The only exceptions are related to High Daily Demand situations as indicated below:

- 1-day Design Case: Luxembourg, Sweden, Serbia and Bosnia
- 2-week cold spell: same plus Denmark

The demand curtailment in Denmark and Sweden can be fully mitigated under the condition of interruptible capacity from Germany to Denmark and Denmark to Sweden.

For comparison purpose, the European aggregated demand for the Reference Winter is:

- 5% lower than Winter 2012/2013 actual demand
- 11% higher than Winter 2013/2014 actual demand

These values differ from one country to the others.

[10] In particular the new exit capacity at Ellund from market area GASPOOL to Denmark, the interconnection between Slovakia and Hungary and the reverse flow from Greece to Bulgaria

Evolution of UGS stock inventory

The graph below shows the evolution of the aggregated UGS inventory resulting from the methodology defined in the previous chapter:

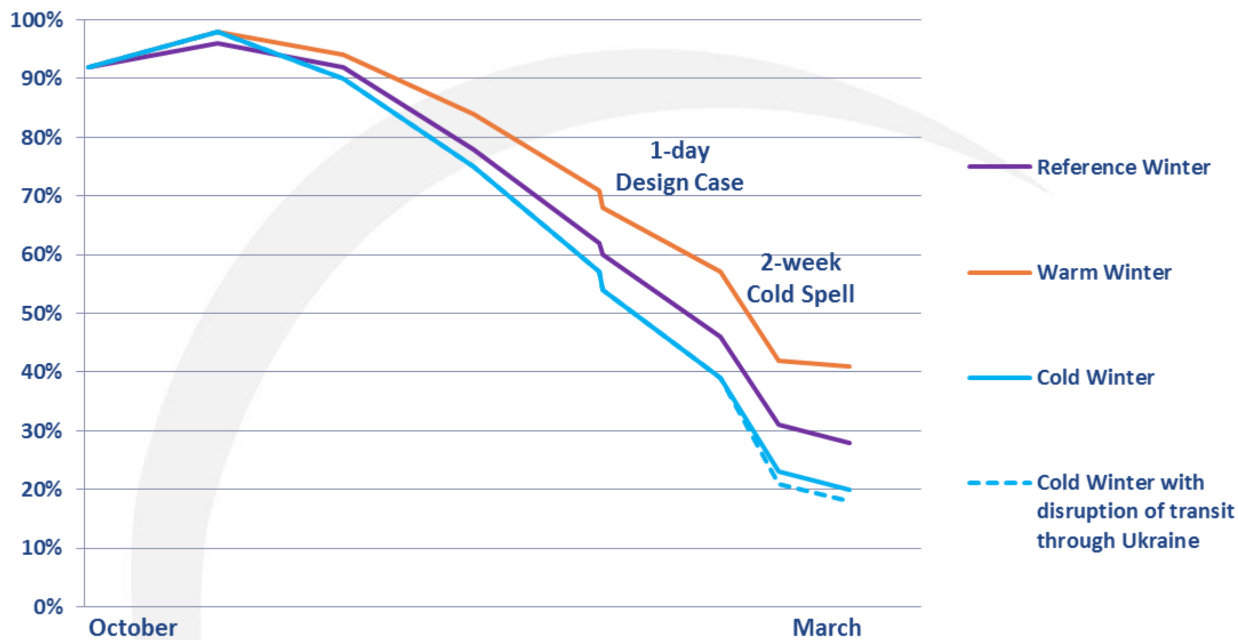


Figure 2 - Winter evolution of the aggregated UGS stock level

Actual inventory on 25 October 2014 on AGSI perimeter is only one percent lower than the modelling results of the Reference Winter carried out based on 1 October 2014 UGS level. This difference is too low to impact the conclusions of the Winter Supply Outlook.

Results of High Daily Demand analysis (capacity perspective)

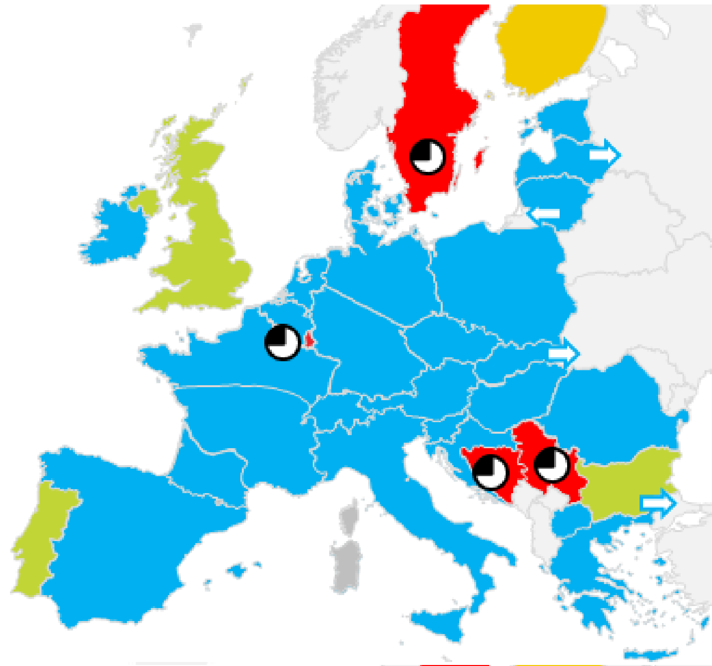
For each High Daily Demand situation and each zone, modelling results consist in the calculation of:

- The Remaining Flexibility[11] as the maximum demand increase of a country before facing curtailment (see Annex C for detailed calculation process)
- The potential level of demand curtailment

These calculations consider the UGS deliverability resulting from the evolution of inventory according to the modelling of previous periods.

[11] As a follow-up of Winter Supply Outlook 2013/14 the calculation process of this indicator has been improved within the framework of the CBA methodology developed by ENTSOG under the New TEN-E Regulation.

Results for 1-day Design Case

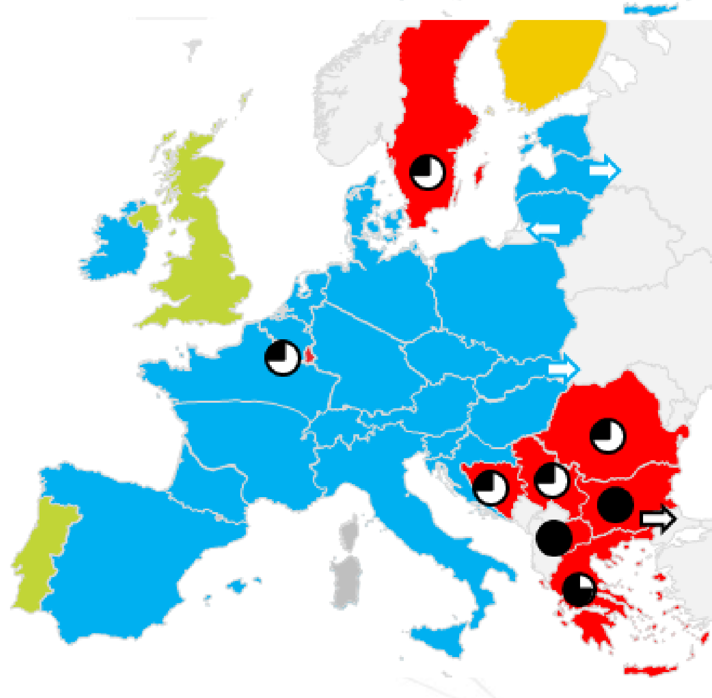


During a Cold Winter

The lack of Remaining Flexibility (below 5%) for Bosnia, Finland, Luxembourg[12] and Sweden is consistent with the previous Winter Supply Outlook.

Demand-side measures such like in Finland can help to mitigate the curtailment.

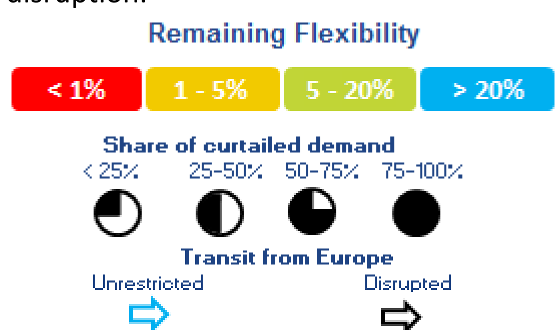
Compared to the previous Winter Supply Outlook changes for Serbia and FYROM result from an update of High Daily Demand figures. Change for Denmark result from an enhanced connection with Germany



During a Cold Winter with disruption of transit through Ukraine

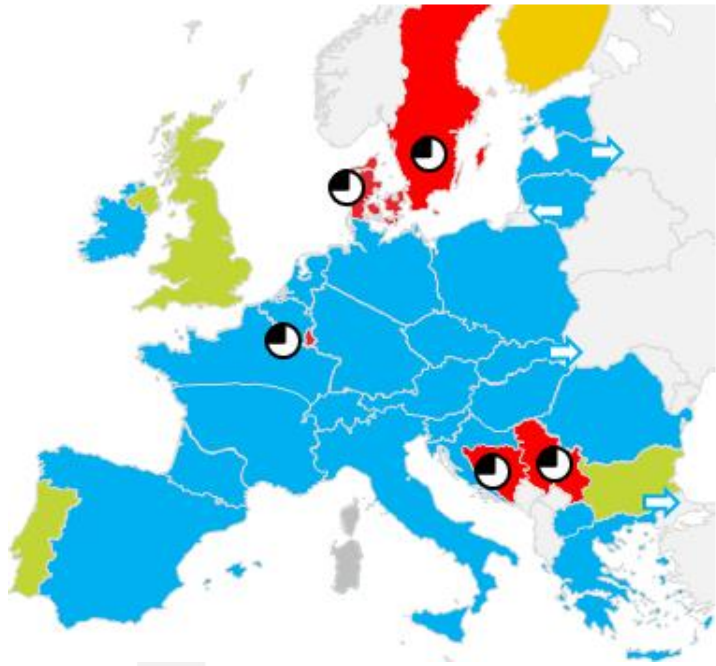
The disruption will induce additional curtailment in South-East Europe.

The commissioning of the Slovakia-Hungary expected on 1 January 2015 will enable this last country to mitigate the disruption.



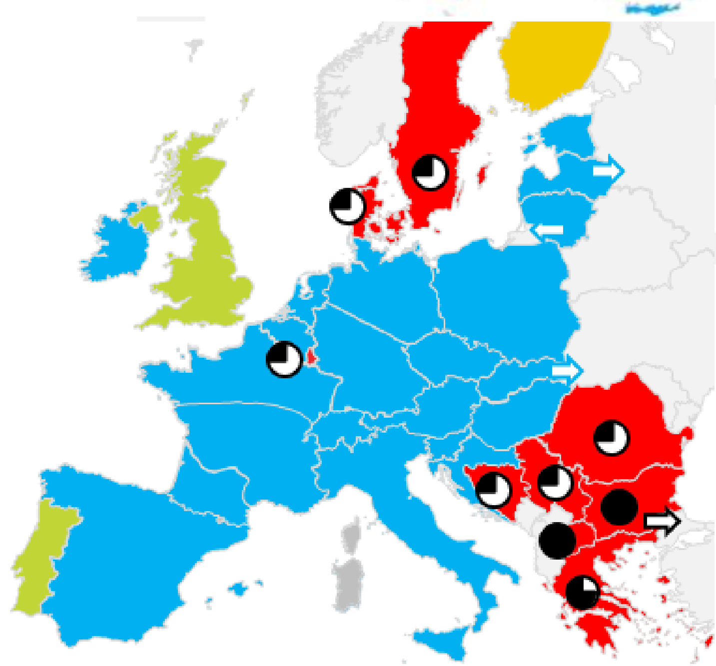
12 The physical capacity from Belgium towards Luxembourg will increase as from Q4 2015 in the integrated market area of Belgium and Luxembourg, thanks to a higher redelivery pressure by Fluxys Belgium at the interconnection.

Results for 14-day Uniform Risk in March



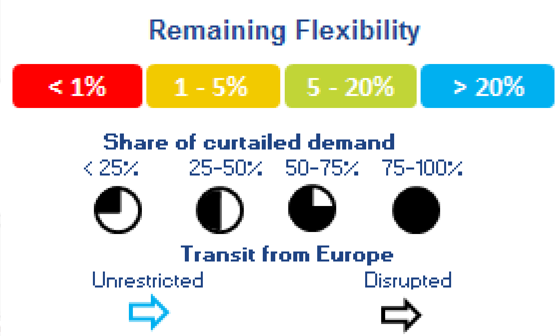
During a Cold Winter

Situation is similar to the Design Case except for Denmark where the decrease in storage deliverability at the end of the winter prevents the balance of demand without the use of interruptible capacity from Germany[13].



During a Cold Winter with disruption of transit through Ukraine

Impact of the disruption is similar to the one under the Design Case.



[13] The commissioning of the second step of the Ellund project end of 2015 beginning of 2016 will ensure sufficient firm capacity to completely mitigate the situation for Denmark.

Conclusion

According to the ENTSOG modelling and supply assumptions, this Winter Supply Outlook confirms the ability of the European gas infrastructures to face a Cold Winter 2014/15 with sufficient flexibility in most parts of Europe. This assessment is valid along the season and under High Daily Demand situations.

As for TYNDP 2013-2022 and previous Winter Supply Outlooks, the assessment of High Daily Demand situation confirms:

- the lack of infrastructure resilience of South-East Europe in case of an interruption of Russian gas transit through Ukraine
- the importance of interruptible capacity between Germany, Denmark and Sweden under High Daily Demand situations
- the lack of entry capacity of Luxembourg compared with its peak demand.

It has to be noticed that for both above specific cases the situation improves for Hungary and Denmark with the commissioning of new infrastructure projects compared to previous winter. It is also true to a lower extent for Bulgaria where the new reverse flow from Greece enables a better spread of the impact of a disruption of transit through Ukraine.
The expected commissioning of additional projects in the next 18 months will continue to improve the resilience of Denmark and Luxembourg.

The high level of storages across Europe significantly contributes to the balance of demand across the season. It also contributes to the ability to physically send gas to Ukraine especially in case of disruption of transit through Ukraine.

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 curves made available by GSE. These curves represent a weighted average of the facilities (salt caverns, aquifers or depleted fields) of each area.

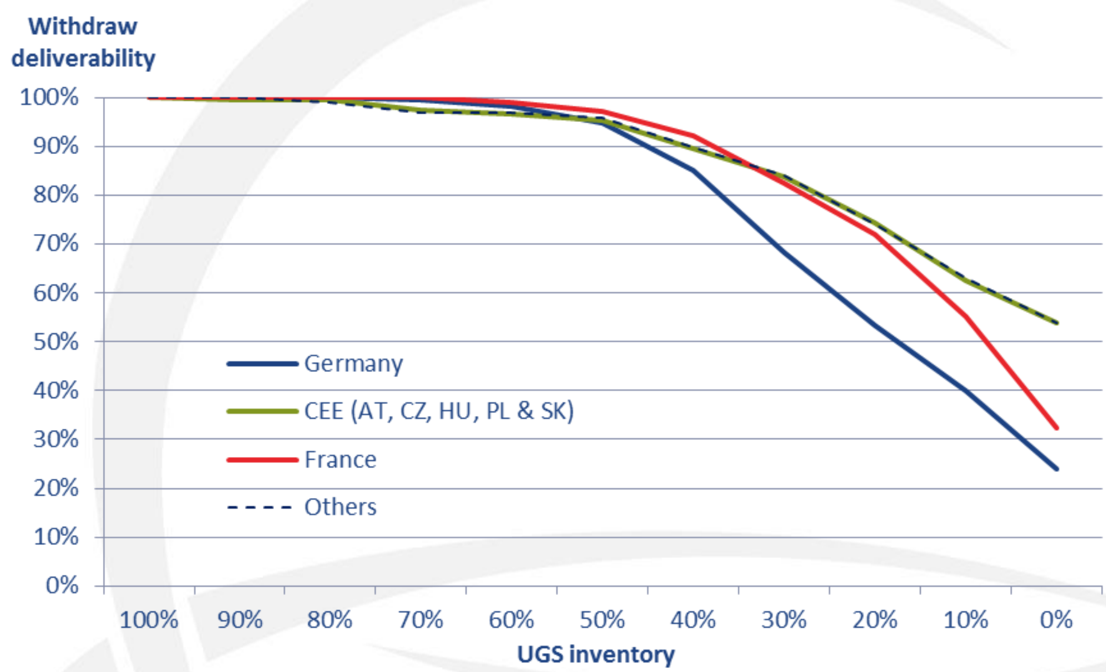


Figure 3 - UGS deliverability curve

Winter 2014/2015 stock evolution (volume perspective)

Below table provides the picture of UGS stock evolution as resulting from modelling:

UGS level at the beginning of each period	Oct.	Nov.	Dec.	Jan.	1-day DC	Feb.	Cold spell	2nd part March	Apr.
Reference Winter	92%	98%	93%	79%	63%	62%	47%	33%	29%
Warm Winter		98%	95%	85%	72%	70%	58%	44%	42%
Cold Winter		98%	91%	76%	58%	56%	40%	25%	21%
Cold Winter -UA		98%	91%	76%	58%	56%	40%	23%	19%

Figure 4 – Evolution of UGS stock level

Annex B - Data for Winter Supply Outlook 2014/2015

Demand and export forecast

GWh/d	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	1-day DC	2-week
AT	321	321	321	338	338	338	678	635
BA	8	10	13	13	12	11	14	15
BE	581	712	800	823	835	732	1,429	1,314
BG	61	89	113	123	121	100	196	167
CH	85	145	170	160	150	120	225	205
CZ	239	315	406	410	448	322	787	705
DEg	1,106	1,421	1,657	1,676	1,685	1,390	2,481	2,290
DEn	1,314	1,689	1,969	1,992	2,003	1,652	2,947	2,721
DK	89	114	151	166	161	131	275	241
EE	14	18	21	31	24	20	82	76
ES	841	1,021	1,117	1,147	1,098	911	1,992	1,800
FI	103	123	138	164	166	139	240	240
FRn*	739	1,170	1,406	1,533	1,549	1,174	2,698	2,264
FRs*	289	458	550	600	606	460	1,055	885
FRt*	111	161	175	180	165	132	304	255
GR	86	96	147	118	137	101	235	220
HR	72	92	111	101	99	74	85	85
HU	261	345	503	586	586	397	722	690
IE	131	140	175	167	182	151	293	266
IT	1,637	2,352	3,134	3,346	3,188	2,454	5,029	4,727
LT	58	79	92	107	108	85	153	141
LU	35	40	45	47	47	43	79	79
LV	32	47	62	64	63	44	163	164
MK	3	5	6	6	6	5	11	5
NL	987	1,316	1,460	1,562	1,654	1,271	4,120	3,482
PL	410	491	549	622	644	527	860	673
PT	128	130	141	155	147	142	343	322
RO	310	440	550	565	570	435	748	620
RS	65	99	108	105	128	76	250	230
SE	28	43	57	62	60	48	102	97
SI	21	28	32	31	33	26	70	61
SK	132	186	227	244	229	182	371	348
UK	1,747	2,423	2,789	3,055	2,903	2,502	5,679	5,358

MD**	4	4	4	4	4	4	4	4
TR**	261	330	377	345	350	331	468	468
UA**	297	297	297	297	297	297	297	297
RUk**	45	58	67	65	65	62	104	88
RUsp**	61	61	61	61	61	61	61	61
Total	**12,712**	**16,870**	**20,001**	**21,072**	**20,925**	**16,950**	**35,650**	**32,298**

(*): Germany and France split in different zones (DEg: market area GASPOOL, DEn: market area NCG, FRn: GRTgaz Nord, FRs: GRTgaz Sud and FRt: TIGF)
(**): Net exports to Moldova, Turkey and Russia (Kaliningrad and St-Petersburg regions)

Figure 5 – 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 average demand of the respective countries.

GWh/d	Demand deviation (%) from the reference case		GWh/d	Demand deviation (%) from the reference case		GWh/d	Demand deviation (%) from the reference case	
	Cold winter (+)	Warm Winter (-)		Cold winter (+)	Warm Winter (-)		Cold winter (+)	Warm Winter (-)
AT	3.3	4.6	**FR**	4.4	5.1	**PL**	5.8	4.4
BH	4.9	5.6	**MK**	10.5	10	**PT**	11.8	11.1
BE	5.6	7.8	**GR**	18.1	9	**RO**	2.5	3.8
BG	4.6	4.9	**HR**	2.2	2.6	**RS**	4.9	5.6
CH	11.3	17.1	**HU**	7.1	11.9	**SE**	16.2	17.9
CZ	2.8	2.9	**IE**	7.3	8.7	**SI**	13.9	7.9
DE	3.7	5.9	**IT**	4.6	7.2	**SK**	4.2	4.4
DK	11.6	14.0	**LT**	8.9	6.3	**UK**	12.5	13.6
EE	5.9	10.7	**LU**	7.1	7.3	**Total***	**6.3**	**7.8**
ES	4.9	7.1	**LV**	9.4	9.1			
FI	16.2	16.2	**NL**	5.7	7.2			

(*): average weighted by the demand of each country applied to export to Kaliningrad and Turkey

Figure 6 – Weather sensitivity of winter demand

Supply assumption (maximum per period)

GWh/d	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	1-day DC	2-week
DZ	756						1,652	1,588
LNG	1,649						6,296	5,037
LY	181						181	181
NO	3,615						3,900	3,719
NP	3,962	4,929	5,235	5,268	5,237	4,726	5,367	5,367
RU	4,457						5,590	5,438

Figure 7 – Supply assumptions

Annex C – Enhanced definition of the Remaining Flexibility indicator

This indicator measures the resilience of a Zone as the room before being no longer able to fulfil its demand and the exiting flows to adjacent systems. The value of the indicator is set as the possible increase in demand of the Zone before an infrastructure or supply limitation is reached somewhere in the European gas system.

The Remaining Flexibility of the Zone Z is calculated as follows (steps 2 and 3 are repeated independently for each Zone):

1. Modelling of the European gas system under a given climatic case
2. Increase of the demand of the Zone Z by 100%
3. Modelling of the European gas system in this new case

The Remaining Flexibility of the considered Zone is defined as 100% minus the percentage of disruption of the additional demand.

The higher the value, the better the resilience is. A zero value would indicate that the Zone is not able to fulfil its demand and a 100% value will indicate it is possible to supply a demand multiplied by a factor two.

Compared to the previous version of the indicator, the new approach enables the consideration of possible infrastructure or supply constraints beyond the entry into the Zone. It also focuses more on the demand of the country as in the calculation process transiting flow through the zone stays constant.

Winter 2013/14 Review

Executive summary

ENTSOG has completed the review of the European gas supply and demand picture for Winter 2013/14 (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.

Following the mild temperatures reached during winter 2013/14, seasonal gas demand in Europe was 14% lower than the one from previous winter. Peak consumptions decreased by 16%.

The use of UGS was the lowest of the last five winters.

Russian supply increased under an overall supply decrease. Russian shares increased from 22% to 28% of European supply.

Unlike previous reviews, this report does not include the summary of the cross/border flows during the season, being them now available in the transparency platform.

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 infrastructures. Comments would serve as a 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 2014, is published on a voluntary basis and aims to provide an overview of the demand and supply balance during Winter 2013/14. 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 2013 and April 2014, the major ones being:

- Norway: outage of Troll gas field (16-21 Oct.)
- Norway: power outage at the Kollsnes processing plant (mid Nov.)
- Libya: halted gas flows to Italy for 8 days (Nov.)
- Norway: outage of Nyhamna processing plant (28 Nov. – 4 Dec.)
- Algeria: flows to Italy down to 80% because of quality reasons (23 – 27 Jan.)
- Norway: twice an outage of Nyhamna processing plant (Mar.)

Demand

> European seasonal gas demand

Winter 2013/14 gas demand was 2,845 TWh. This value implies a 14.3% decrease with respect to the gas demand during winter 2012/13.
The average monthly demand was always lower compared to previous winter. While the difference was minimal in November (-2.1%), it reached its maximum in March (-29%).
It has to be noted that in contraposition to the very mild temperatures reached during Winter 2013/14, March 2013 had registered cold records for a late winter

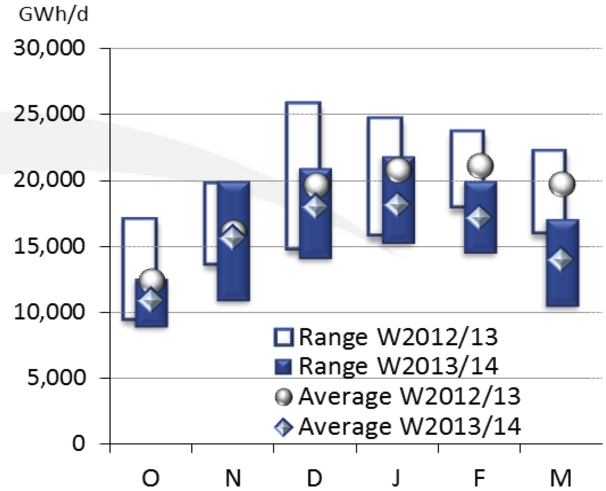


Figure 8 - Total gas demand

As shown in the graphs below, for the countries where the demand breakdown is available, the Residential, Commercial and Industrial sector represented 85.3% out of 2,252 TWh, showing an 14% decrease in comparison with previous winter. The reduction followed by the power generation sector (-17.5%) pronounced the global decrease of the overall demand to a 12%.

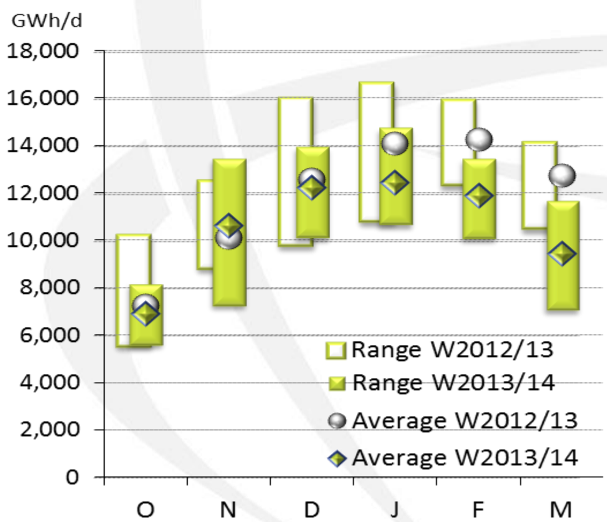


Figure 9 - Residential, commercial and industrial [14]

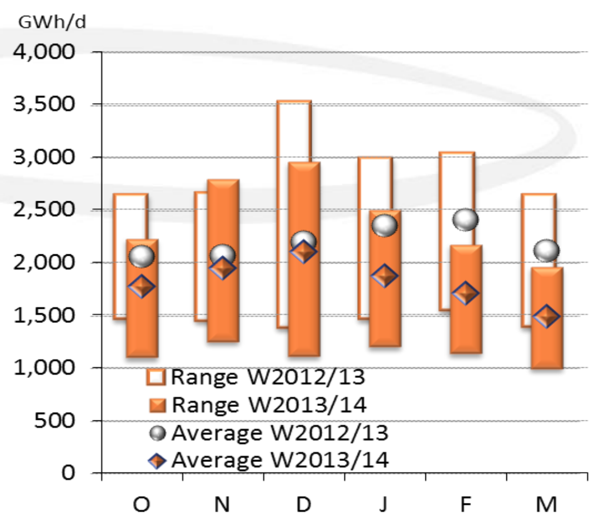


Figure 10 - Power generation

[14] 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 graphs show the evolution of gas prices in Europe during Winter 2013/14:

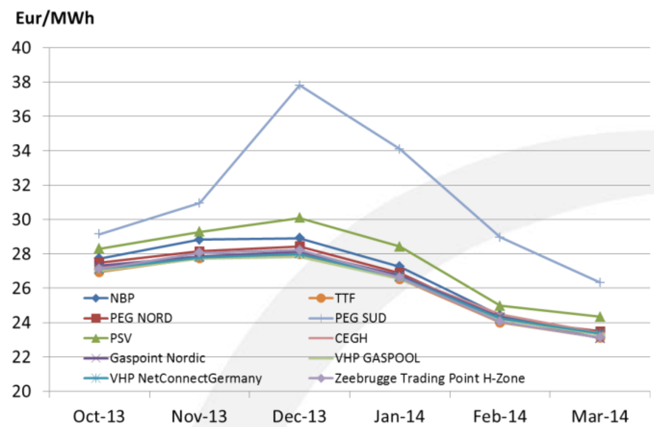


Figure 11 – Month-ahead average price by hub

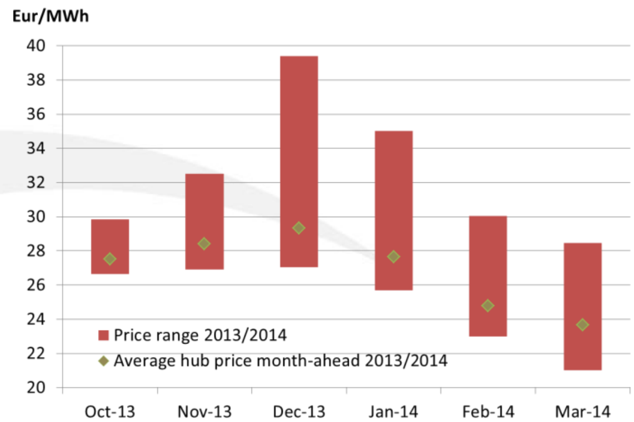


Figure 12 – Month-ahead averaged hub price[15]

Figure 11 compares the month-ahead winter average prices of the main gas hubs and figure 12 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 2013/14 was similar to the prices of previous winter while the price convergence was improved, with the exception of PEG SUD, where low LNG deliveries and congestion between GRTgaz Nord and GRTgaz Sud drove to the non-alignment of the prices.

[15] Average price calculated as non-prorated average of the hubs detailed in figure 11

- **Power generation from gas**

The generation of electricity from gas has followed a continuous decrease since winter 2010/2011. While in Winters 2011/12 and 2012/13 the production with coal remained stable, its increase during winter 2013/14 lead to a further decrease of gas-fired power generation.

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

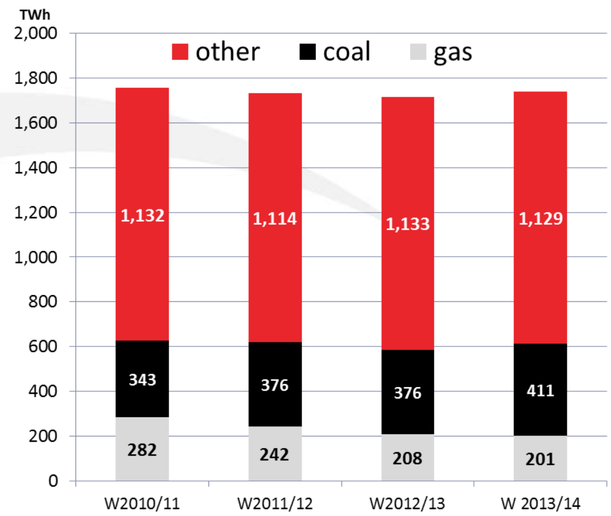


Figure 13 - Electricity mix Winters 2010-2014

In absolute terms, the electricity produced from gas was 201 TWh in Winter 2013/14 (12% of the generation mix). This figure implies a significant decrease compared to the values of previous winter, when total electricity produced was smaller and gas represented 14%.

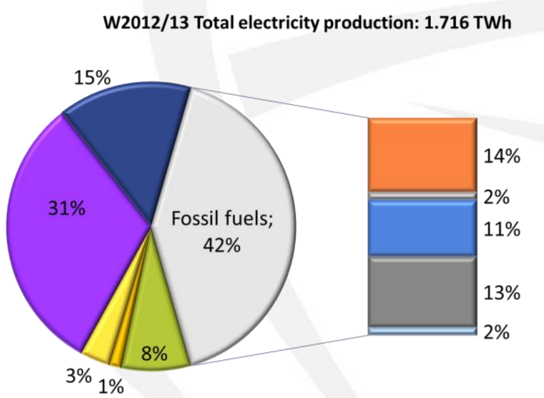


Figure 14 - Winter 2012/13 Electricity generation mix[16]

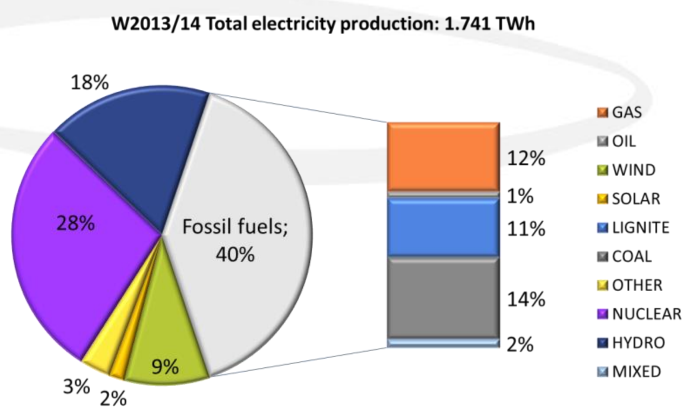


Figure 15 - Winter 2013/14 Electricity generation mix

As shown in the graphs above, the 2% decrease of the share of fossil fuels in the power generation mix is exclusively due to gas-fired power generation.

[16] The methodology used for the calculation of the total electricity production has evolved since WR 2012/13 and is based on data provided by ENTSO-E.

- **Winter demand evolution 2009-2014**

Despite the 3% growth in Winter 2012/13, the winter gas demand in Winter 2013/14 recovered the decreasing trend followed since Winter 20019/10.

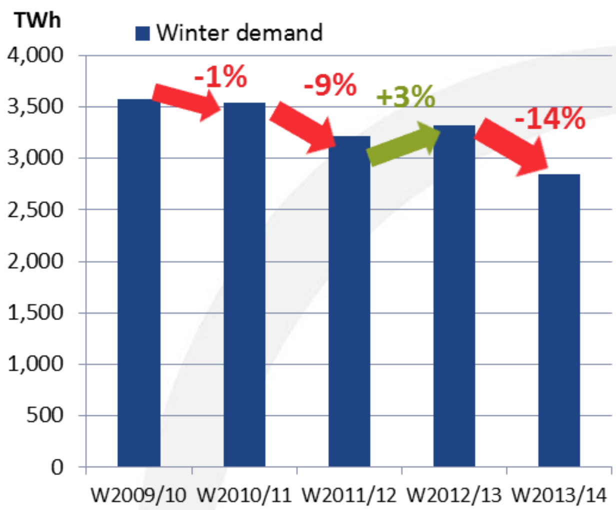


Figure 16 - Total consumption Winter 2009-2014

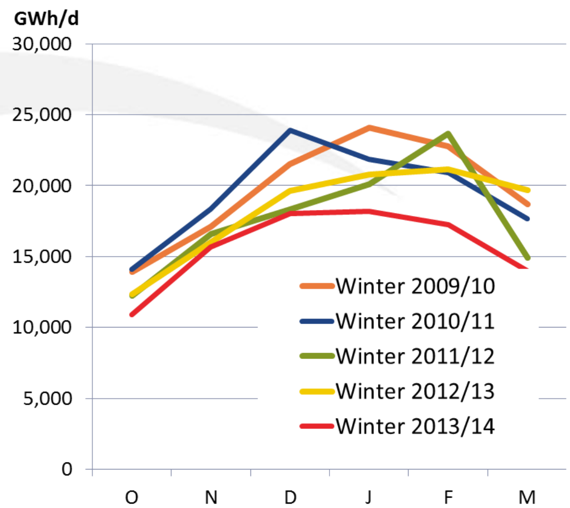


Figure 17 - Demand. Monthly average. Winter 2009-14

Gas demand for Residential, Commercial and Industrial sectors decreased during winter 2013/14. The more severe decrease in the power generation has now less impact given the very low level reached by this sector over last years.

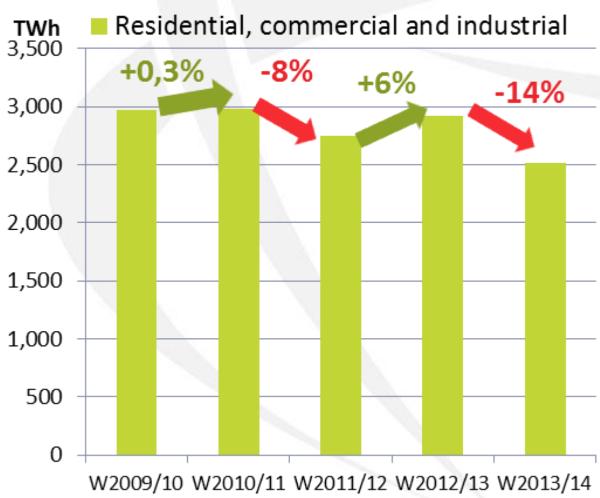


Figure 18 – Gas consumption for non-power generation Winter 2009-2014[17]

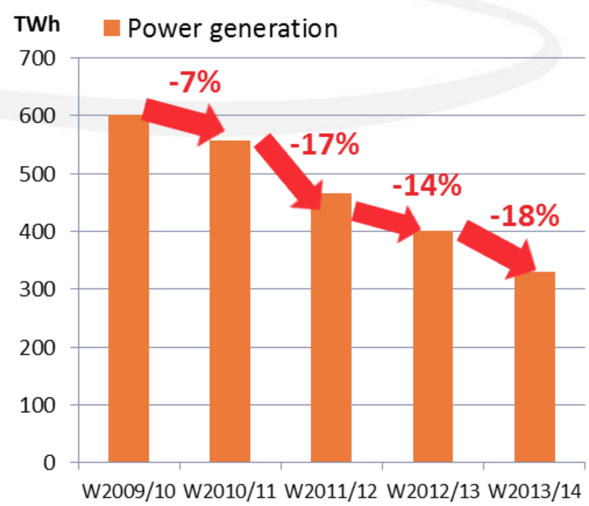


Figure 19 - Gas consumption for power generation. Winter 2009-2014

[17] See footnote 13

- **Country detail**

The decrease of gas demand compared to previous winter gas homogeneous all along Europe. The single significant variation was found in FYROM where a demand increase was experienced.

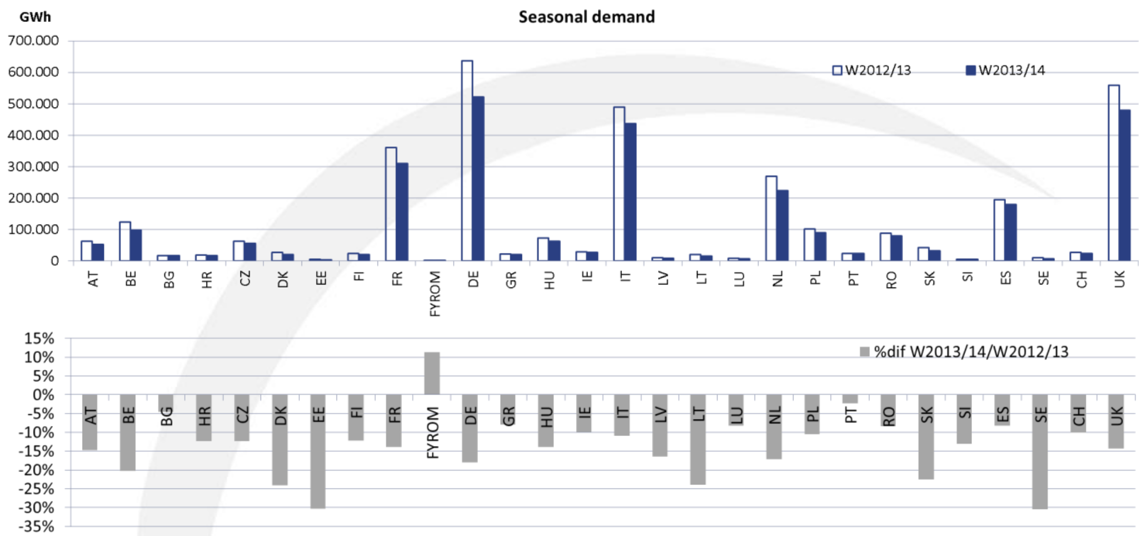


Figure 20 - Winter demand. Country detail

> European peak demand

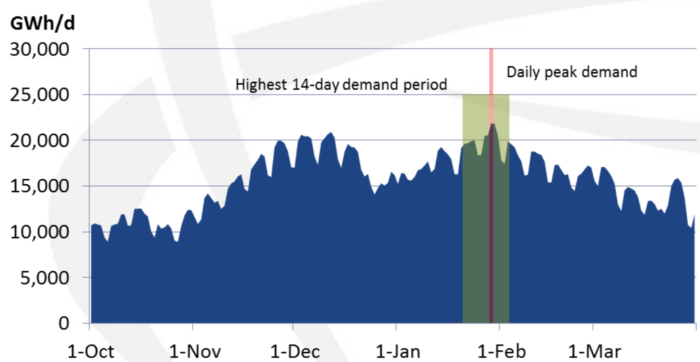


Figure 21 - Winter 2013/14 demand profile

14-day Peak period	21/01/2014 – 01/02/2014
Average 14-day consumption	19.742 GWh/d

Peak day	29/01/14
Peak consumption	21.842 GWh/d

Peak demand was reached by the end of January, in between the 14-day peak period. Nevertheless, it should be noted that the demand level during these days was not significantly higher than the demand reached during November and December 2013, as the winter was characterized by the lack of any particular cold period.

Observed by sector in the graphs below, while the peak period for the residential, commercial and industrial consumptions coincided with the one for the total gas demand, peak consumptions for the power generation sector happened in December 2013.

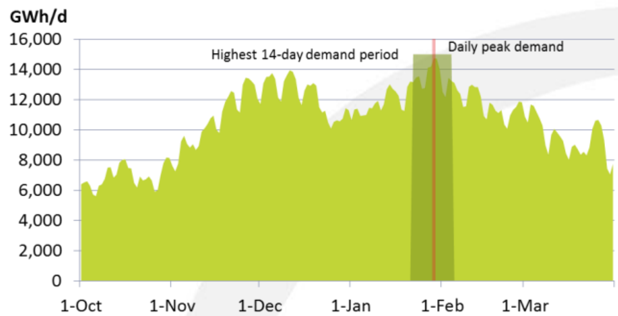


Figure 22 - Winter 2013/14 demand profile (Residential, commercial and Industrial)[18]

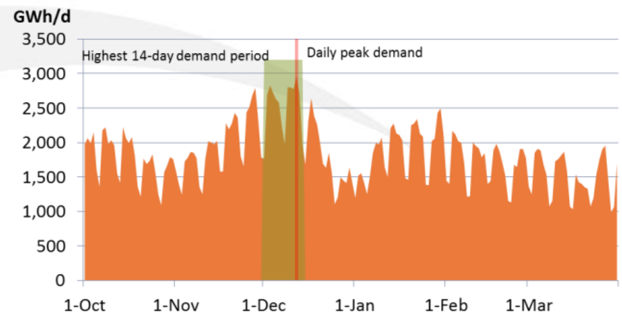


Figure 23 - Winter 2013/14 demand profile (Power generation)

Looking at the modulation described by the gas demand for power generation, the consumption levels by the end of 2013 seem to be significantly higher than the ones of the first quarter 2014.

- **Peak demand evolution 2009-2014**

The absence of extreme cold during Winter 2013/14 lead to peak demand levels, both daily and on a 14-d basis, significantly lower than the ones reached during the previous four winters.

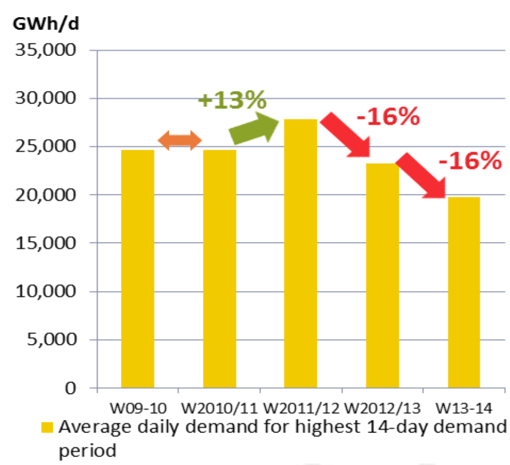


Figure 24 - Average daily demand for highest 14-day demand period. Winters 2009-2014

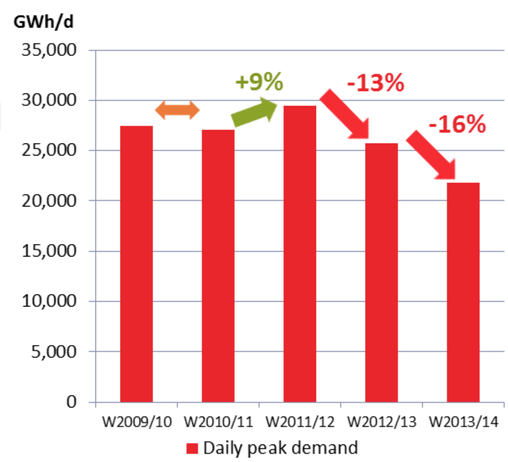


Figure 25 - Daily peak demand. Winters 2009-2014

[18] See footnote 13

- **Seasonal modulation**

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. The graph below shows the deviation of the monthly average demand from the winter average for each of the last five winters. Winter 2013/14 is characterized by the low demand modulation, with no month reaching positive deviations over 20% of the winter average.

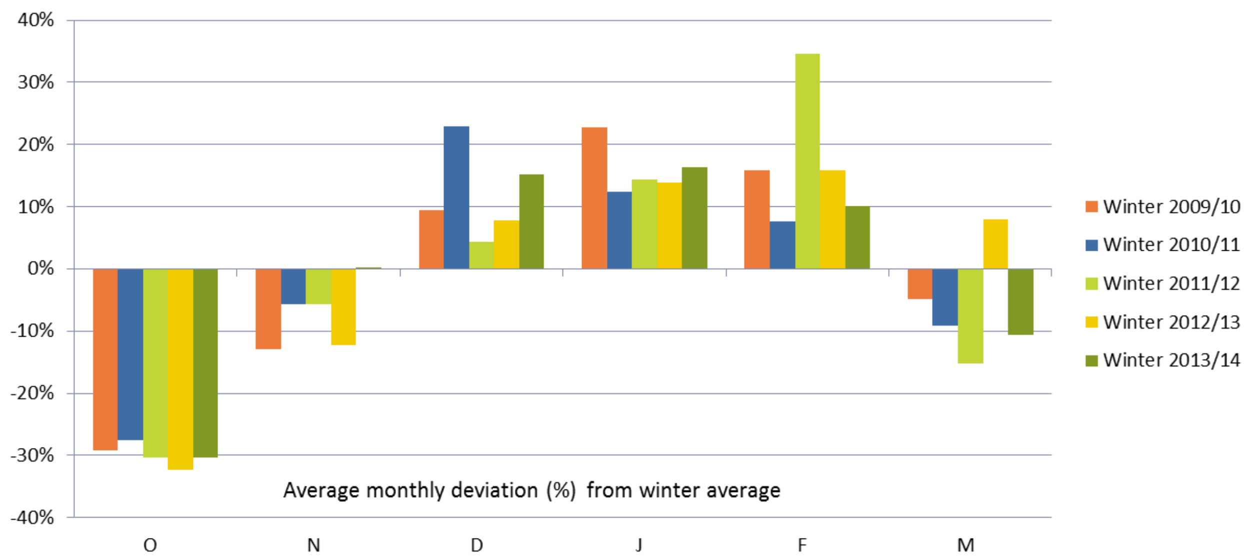


Figure 26 - Winter modulation 2009-2014

Figure 27 shows the monthly variation between the maximum and minimum daily demand. When comparing Winter 2013/14 with previous winters, it comes out that both the maximum and the minimum daily demand were systematically lower month by month than the daily maximum and minimum of previous winters.

Figure 27 - Monthly demand ranges

- **Country detail**

While the decrease of seasonal demand was generalized across Europe in Winter 2013/14, several countries experienced an increase in the peak consumption. That was the case for Poland and Fyrom, with increases between 5% and 10% and Bulgaria, Latvia, Portugal and Romania, with increases below 5%.

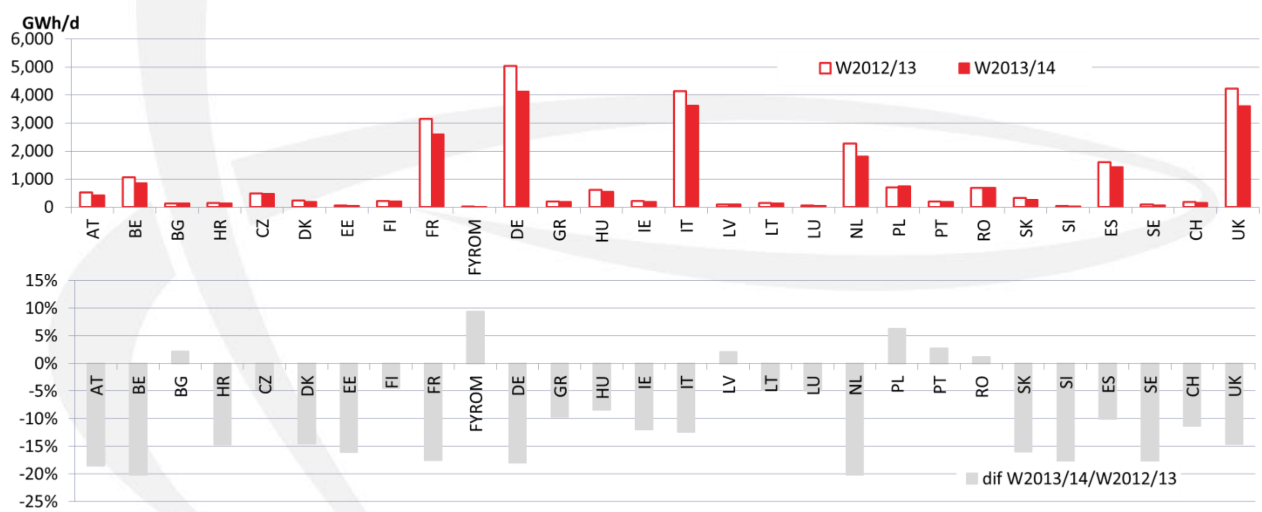


Figure 28 - Daily peak demand

Similar behaviour is observed in the distribution of the 14-day peak demand, in this case the most significant increases happened in Portugal (over 15%):

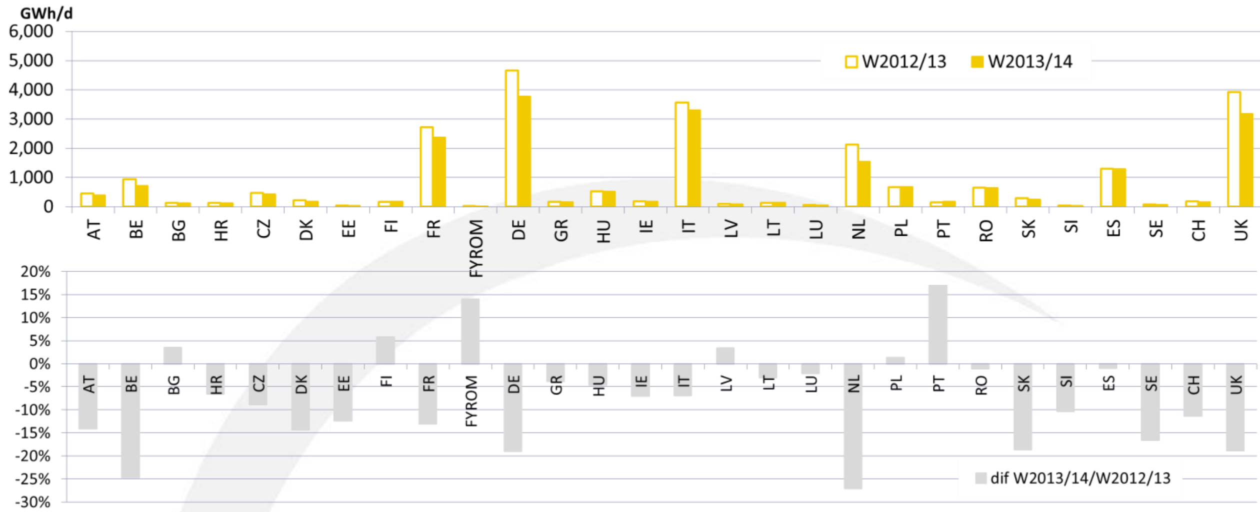


Figure 29 - Highest 14-day demand

The following graph shows the minimum, maximum and average daily demand during Winter 2013/14, as well as the daily maximum and minimum of the last four winters per countries:

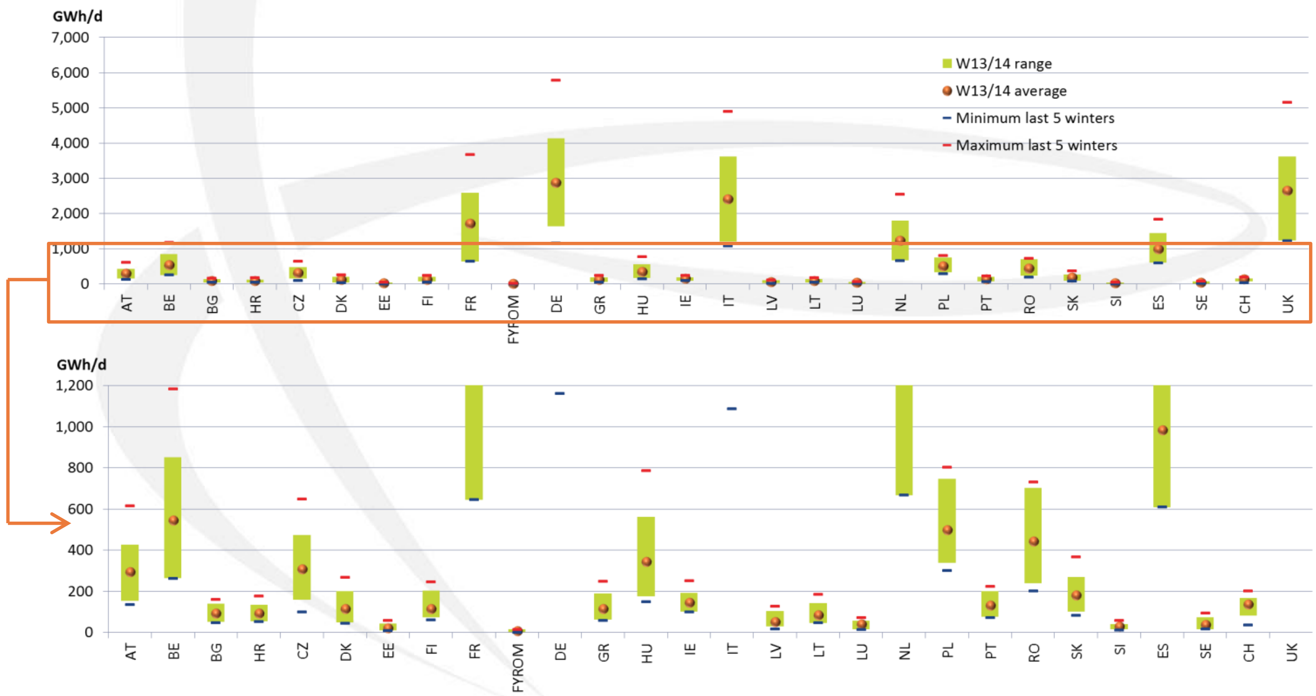


Figure 30 - Winter maximum and minimum

- **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 29 January 2014, was 94,3%, a value significantly lower than the simultaneity reached during the previous two winters but higher than the simultaneity levels during the peak in Winter 2009/10 and 2010/11.

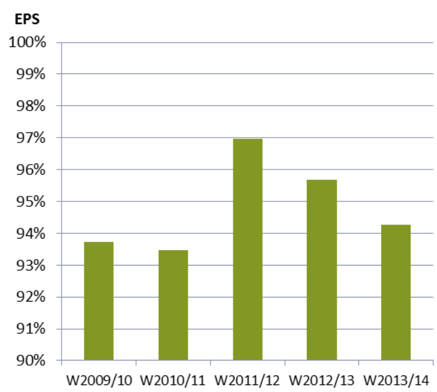


Figure 31 - European peak simultaneity

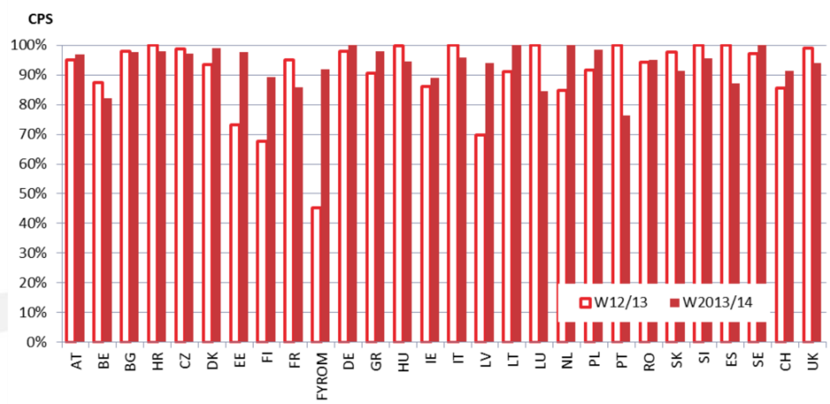


Figure 32 - Simultaneity of the highest single day between last 2 winters

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%
W13/14	29/01/2014	21,842	94%

Table 1 - 2009-2014: Peak demands and their simultaneity

Supply

> European seasonal gas supply

The graph below shows the evolution of the aggregated gas supply in Europe during winter 2013/14.

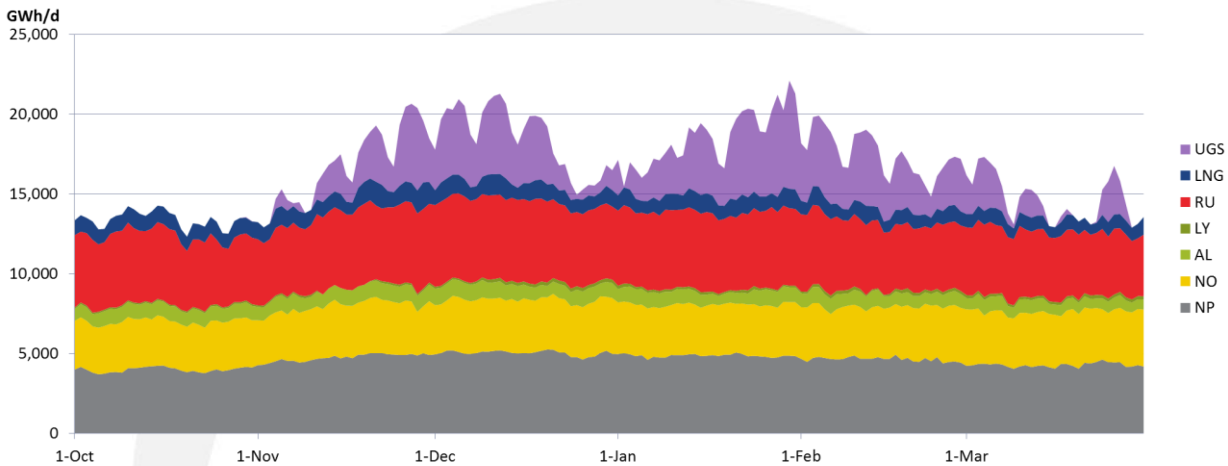


Figure 33 - Winter 2013/14 supply profile

The next graphs give an overview of Imports, National production and UGS supply shares during Winters 2013/14 and 2012/13 in both absolute and relative terms (Total winter supply of 2,956 TWh):

Figure 34 shows the seasonal supply by source for the last two winters in absolute terms.
Following the reduction in gas demand, total supply reduced by was 12%. This decrease was not homogeneous between the different supply sources.
While the reduction of National production and Norwegian imports was limited (-6% and -6.6% respectively), the decrease was significantly more important for all the other import sources. In particular LNG flows went down by 28%, while Algerian and Libyan imports were reduced by 22%. Along with LNG, the most significant reduction in the use of supply sources was UGS (-45%).

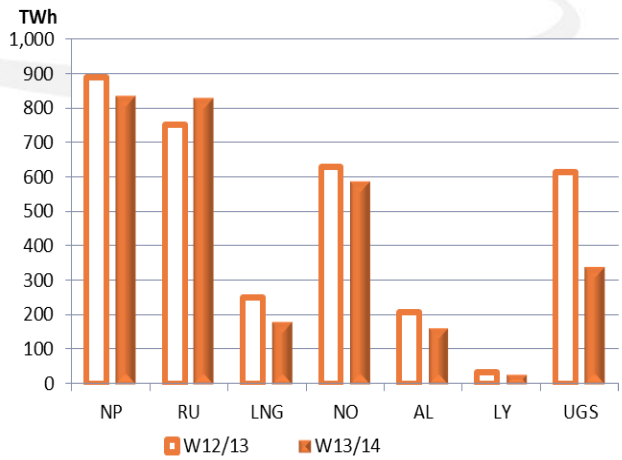


Figure 34 - Seasonal supply

Against the common trend, Russian supply increased by 10.3%.

The heterogeneous evolution of the supply sources induced significant changes in the supply shares, as shown in the Figures 35 and 36.

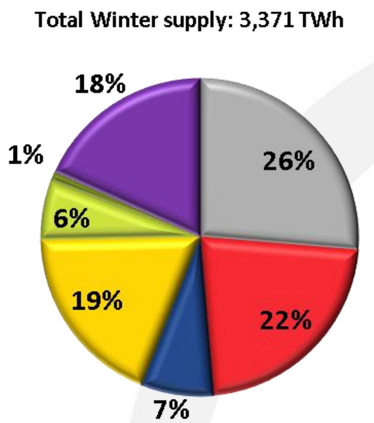


Figure 35 - Supply shares. Winter 2012/13

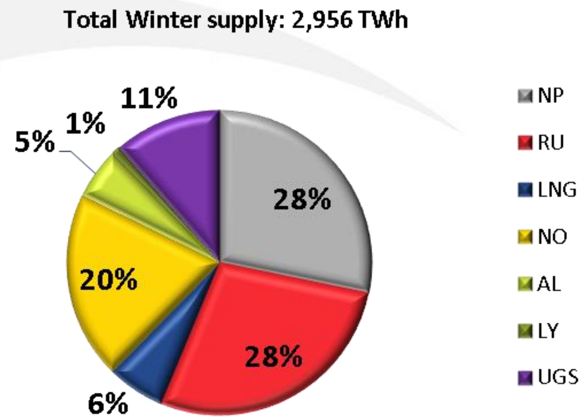


Figure 36 - Supply shares. Winter 2013/14

Even when the LNG supply has followed its continuous decrease, following the divergence of gas prices between Europe and Asia, fostering cargo redirection and preventing the arrival of spot cargos, in relative terms the decrease has been limited.
The reduction of gas demand has seen the increase of the relative shares in the gas supply of Indigenous production and Norwegian imports, while Russian supply increased its share up to 28% due to its absolute increase.

- **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).

Range W2013/14 | Winter range 2013/14
Average W2013/14 | Range W2012/13
Average W2012/13

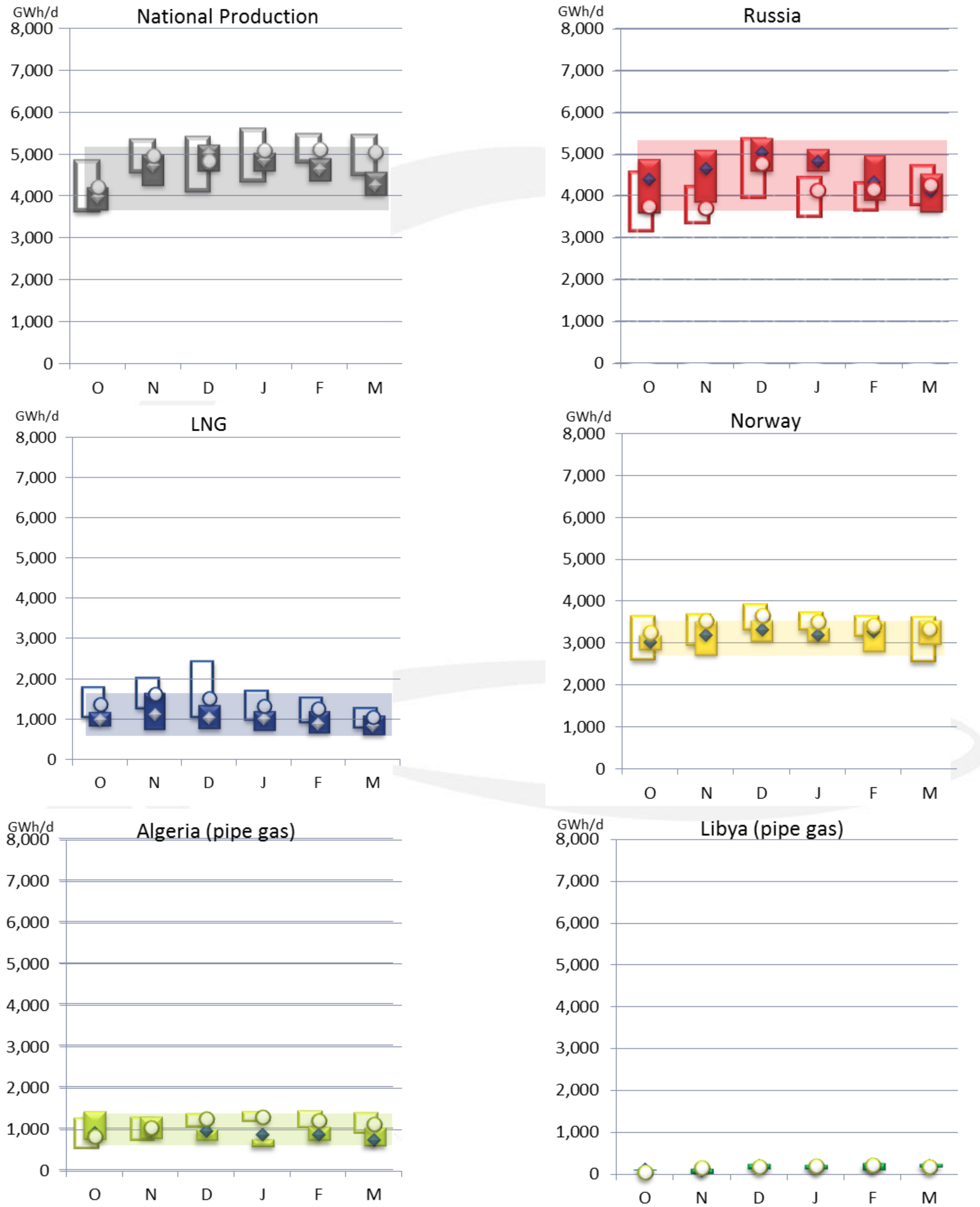


Figure 37 - Supply modulation

- **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 2013/14 the general low demand levels motivated a very modest use of the UGS, as can be seen in the graphs below.

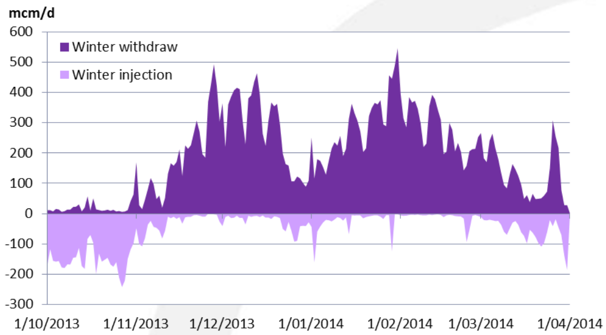


Figure 38 - UGS injection/withdraw profile. Source AGSI

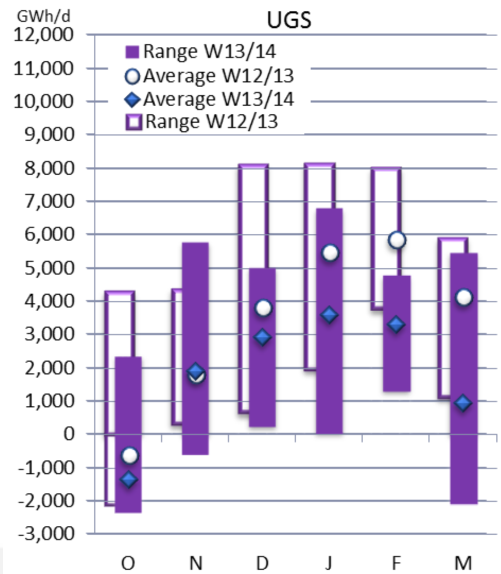


Figure 39 - Use of UGS during Winter 2013/14 & 2012/13

In addition, the absence of a particularly cold period limited the peak deliverability of UGS to 6,786 GWh/d, implying a 16% decrease from the previous year.

Figure 40 compares the stock level evolution curve of the last four winters (source AGSI). The stock level started from a significantly low level (78%) consequence of the low level reached at the end of the previous winter. Nevertheless the injection period continued during the month of October, and the maximum stock level (84%) was reached at the beginning of November. By the end of the winter, the stock level was 45%, the highest value of the last four years, due to the limited withdrawals following the moderated demand level.

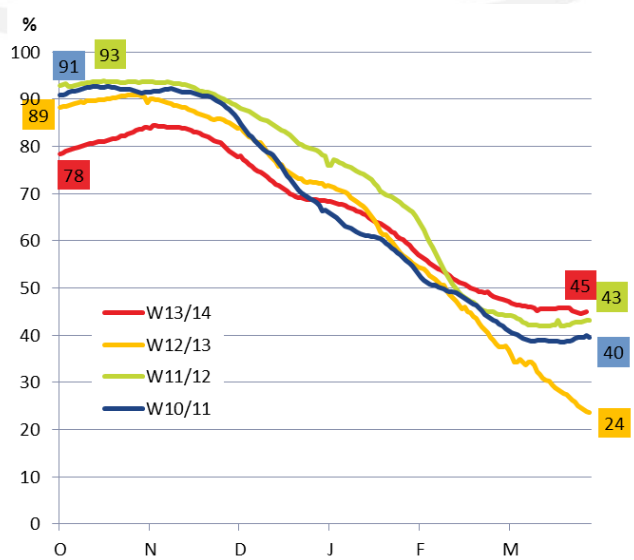


Figure 40 - Evolution of stock level. Winters 2010-2014

The figure 41 shows the variation between the maximum and the minimum stock level reached during the winter season.

Winter	UGS utilization (% WGV)
W2010/11	54%
W2011/12	52%
W2012/13	67%
W2013/14	40%

Figure 41 - UGS winter use

- **Supply coverage of high daily demands**

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.

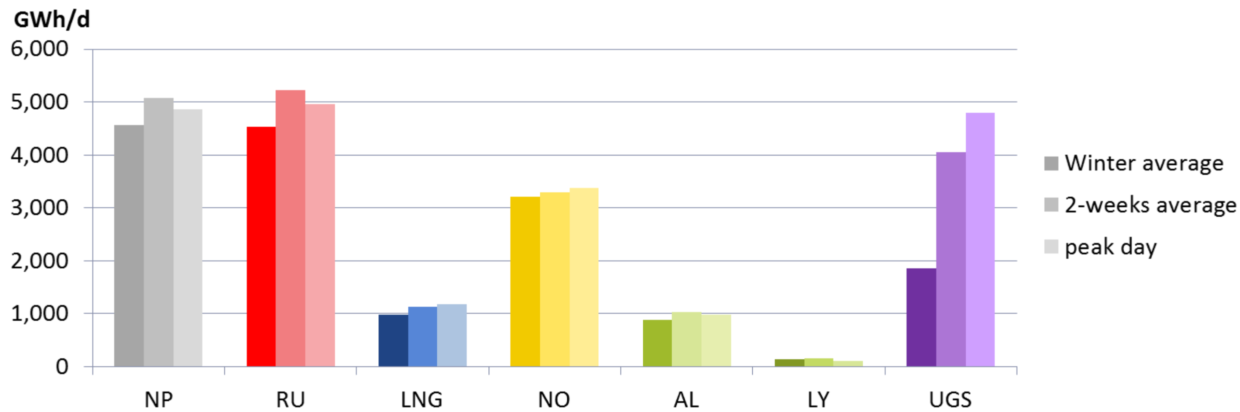


Figure 42 - Winter daily average supply / Average daily supply for highest 14-day demand period / Daily supply for the daily peak demand

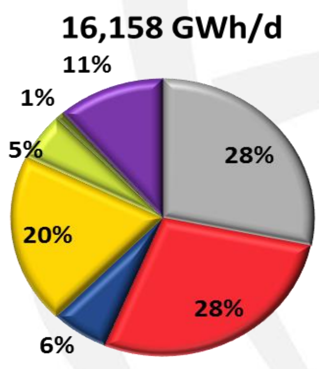


Figure 43 - Winter average

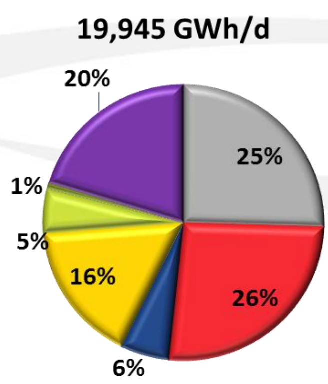


Figure 44 - 14-d high demand period (21 Jan - 3 Feb 2014)

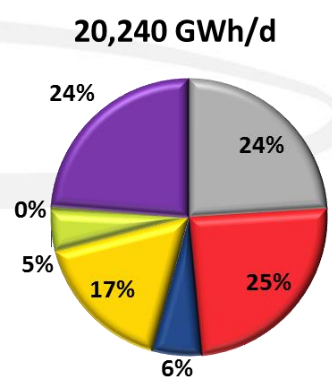


Figure 45 - 29 January 2014

- **Winter supply evolution 2009-2014**

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

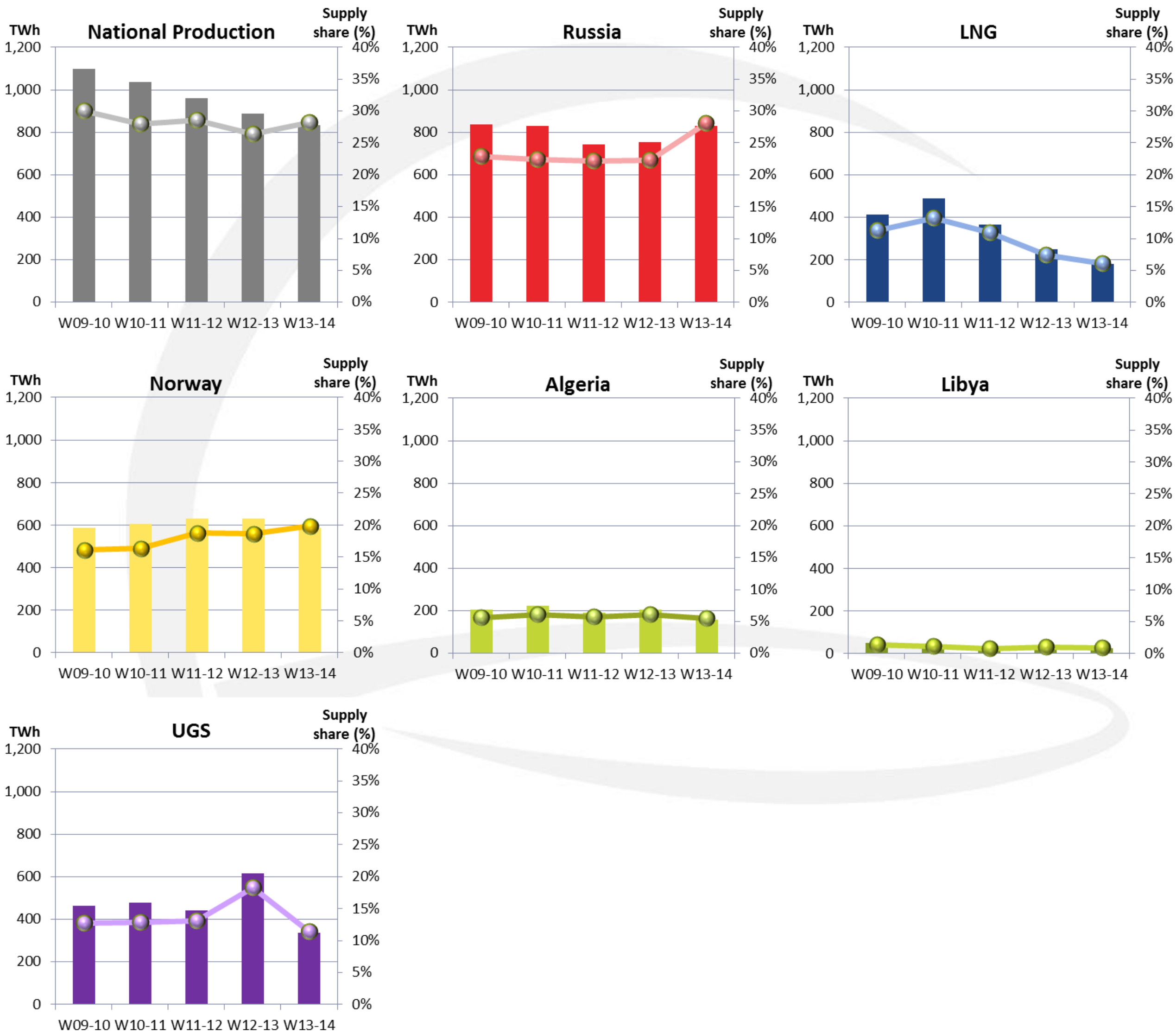


Figure 46 - Evolution of winter gas supplies 2009-2014