

Winter Consultation 2012/13

Introduction

1. This document sets out our analysis and views for the coming winter. Previous outlook reports are published on our website¹. The document is separated into two main sections, a review of last winter and a consultation on the outlook for the coming winter. The methodology used for assessing electricity generation plant surplus for the coming winter follows broadly the same principles as undertaken for the Ofgem Capacity Assessment Report². The two reports will, however, utilise different measures of capacity adequacy. At the end of each section there are consultation questions relating to Gas and Electricity, four consultation sections in total. National Grid would welcome feedback on these specific points and also welcomes industry and wider participant views on all points raised in this document. All consultation questions and other views should be sent to energy.operations@nationalgrid.com by Friday 17th August 2012.

Industry Feedback

2. We continually seek feedback on our outlook reports to increase their usefulness to the industry and to reflect changes when they become apparent. To feed back comments on our outlook reports please contact us at energy.operations@nationalgrid.com.

Roles and Responsibilities

3. The competitive gas and electricity markets in Great Britain have developed substantially in recent years and have successfully established separate roles and responsibilities for the various market participants. In summary, the provision of gas and electricity to meet consumer demands and contracting for capacity in networks is the responsibility of suppliers and shippers. National Grid has two main responsibilities: first, as the primary transporter, for ensuring there is adequate and reliable network capacity to meet anticipated transportation requirements; second, as system operator of the transmission networks, for the residual balancing activity in both gas and electricity. The structure of the markets and the monitoring of companies' conduct within it are the responsibility of Ofgem, whilst the Department for Energy and Climate Change (DECC) has a role in setting the regulatory framework for the market.

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¹ <http://www.nationalgrid.com/uk/Electricity/SYS/outlook/>.

² Ofgem are due to submit this to the Secretary of State by September.

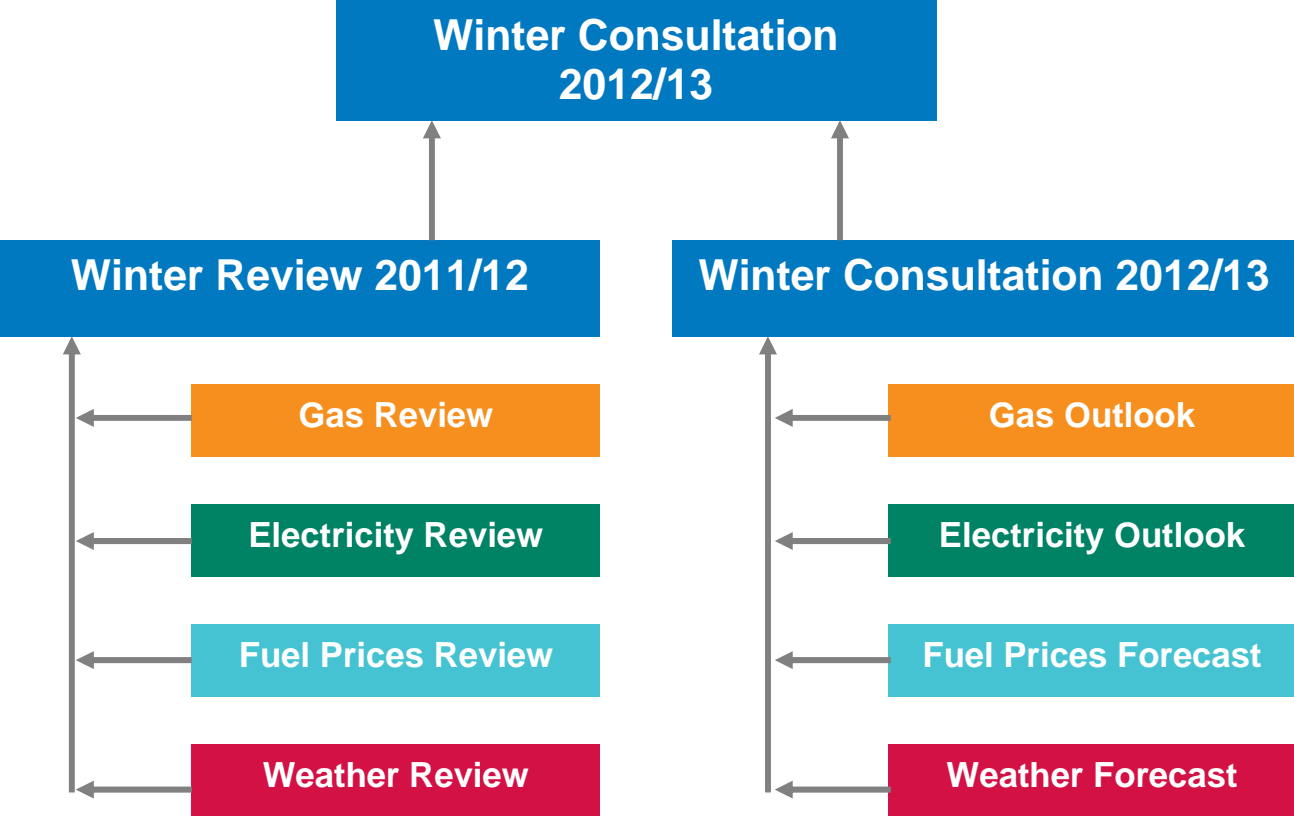
5. National Grid has prepared this consultation document in good faith, and has endeavoured to prepare this consultation document in a manner which is, as far as reasonably possible, objective, using information collected and compiled by National Grid from users of the gas transportation and electricity transmission systems together with its own forecasts of the future development of those systems. While National Grid has not sought to mislead any person as to the contents of this consultation document, readers of this document should rely on their own information (and not on the information contained in this document) when determining their respective commercial positions. National Grid accepts no liability for any loss or damage incurred as a result of relying upon or using the information contained in this document.

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Overall Summary



Winter Review 2011/12 - Key Details

Weather

Second warmest on record. Coldest day was 4th February 2012, which was a 1 in 3 warm.

Fuel Prices

Relatively stable energy prices, with the exception of declining coal and carbon prices, and a short-term spike in gas and electricity prices in February 2012.

Gas

Highest demand 2 February 2012 417 mcm/d

Gas demand depressed due to mild weather and power generation economics favouring coal burn.

2011/12 supply trends - lower UKCS (decline) and LNG (Far East demand), similar Norway and Continent and lower storage (low demand).

Electricity

Peak demand 8th February 2012 at 18:00 56.0 GW
- including interconnector exports 59.1 GW

Actual generator availability at the peak 89%

Winter Outlook 2012/13 - Key Details

Weather

Early weather forecast to be issued in Winter Outlook report in September / October 2012.

Fuel Prices

Forward energy prices for next winter are broadly flat with the exception of some seasonality in gas prices. The continuation of high gas prices relative to coal strongly favours coal as the preferred source of fuel for power generation.

Gas

Peak gas demand forecast (1 in 20 diversified demand). 507 mcm/d

The peak forecast now allows for high power generation as well as cold weather.

Little change in winter demand forecast for 2012/13 with gas for power generation expected to remain low.

2012/13 supply forecasts – further UKCS decline, similar flows for Norway, both LNG and Continent uncertain and subject to demand / prices, some additional (flexible) storage expected.

2012/13 safety monitor requirements are approximately 5% of total storage space compared to about 1.5% in 2011/12.

Electricity

| | |
|--|---------|
| Normal Demand – winter peak | 55.3 GW |
| 1 in 20 Demand – winter peak | 58.7 GW |
| Generator Capacity | 79.6 GW |
| Assumed Generation Availability (exc. Interconnectors) at winter peak | 66.7 GW |
| Surplus based on normal demand and notified generation availability (minimum over winter, excluding Interconnectors) | 18 % |

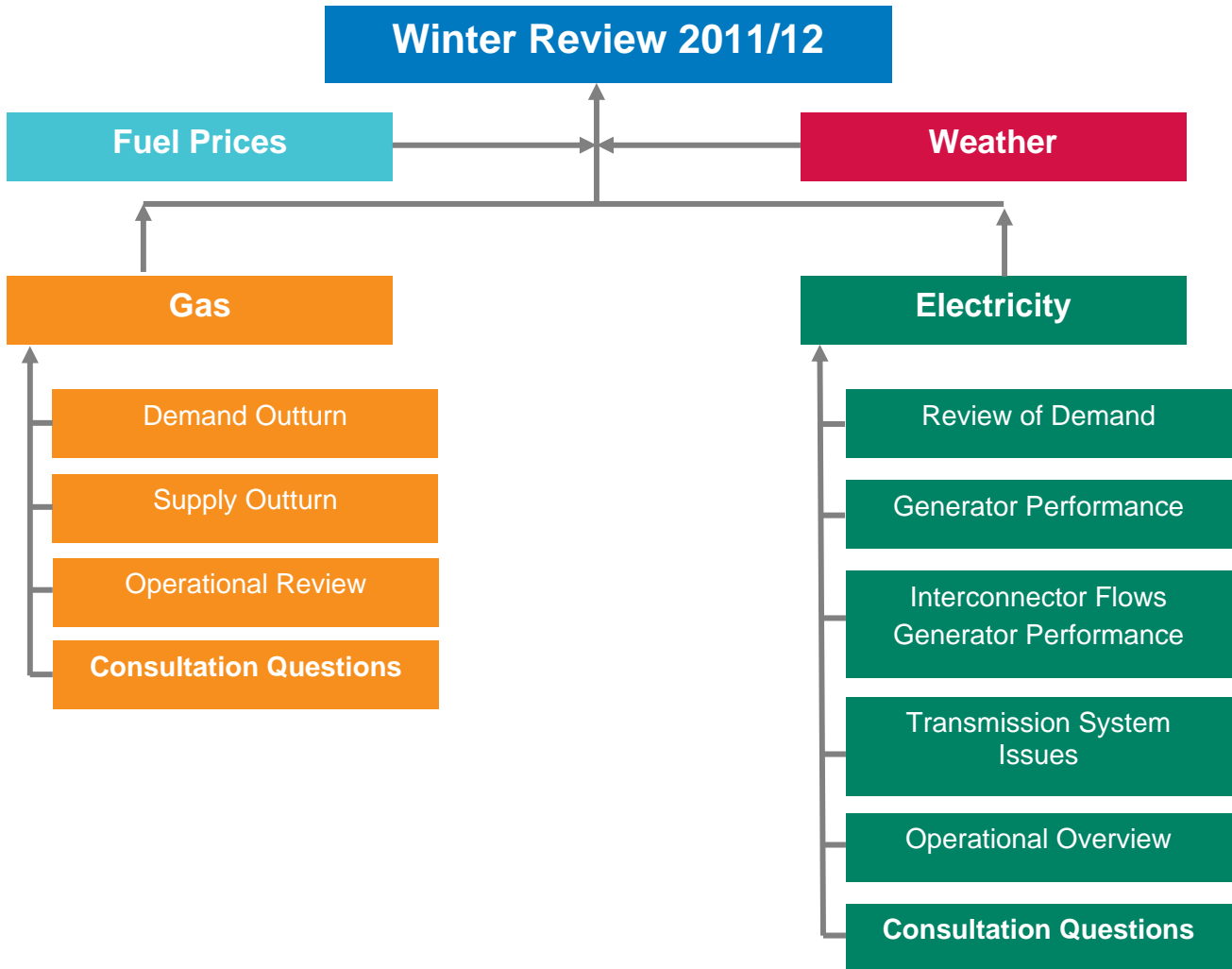
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Winter Review

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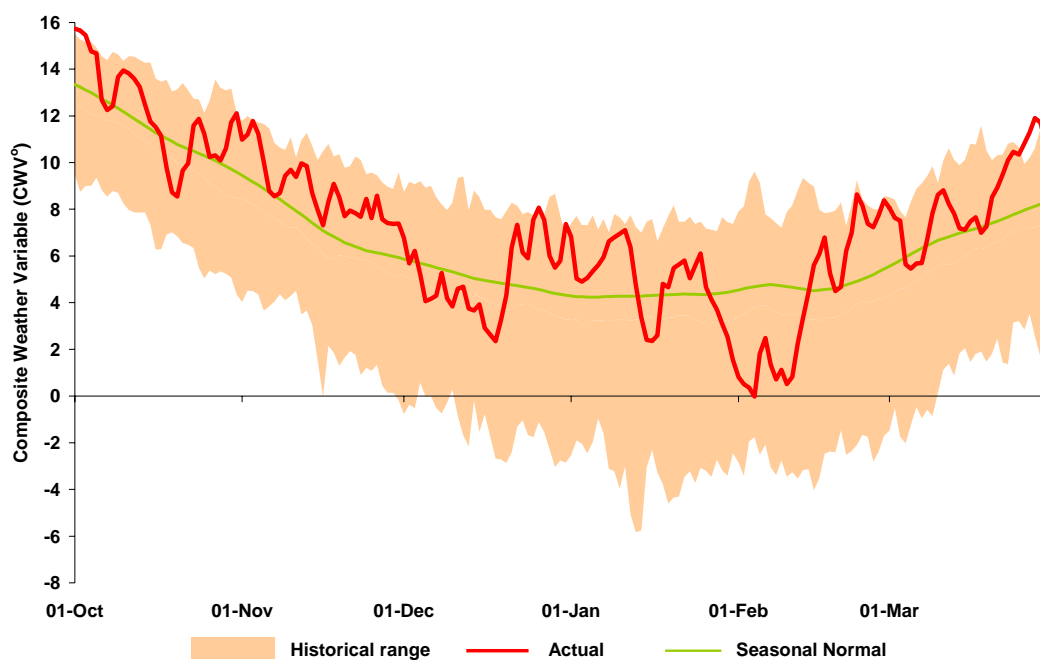
Winter Review 2011/12



Weather

7. The 6 months from October 2011 to March 2012 were mostly very warm with just the first two weeks of February with weather significantly colder than seasonal normal.
8. The 6 month period from October to March was the second warmest after 2006/07 when compared to the last 84 winters. The coldest day was on February 4th with a severity of 1 in 3 warm.
9. For the 3 month mid-winter period from December to February, the severity was 1 in 6 warm.
10. Figure W1 compares the winter 2011/12 weather with the daily maximums and minimums since October 1928. The seasonal normal line has been adjusted for climate change and is not the average of the historical values.

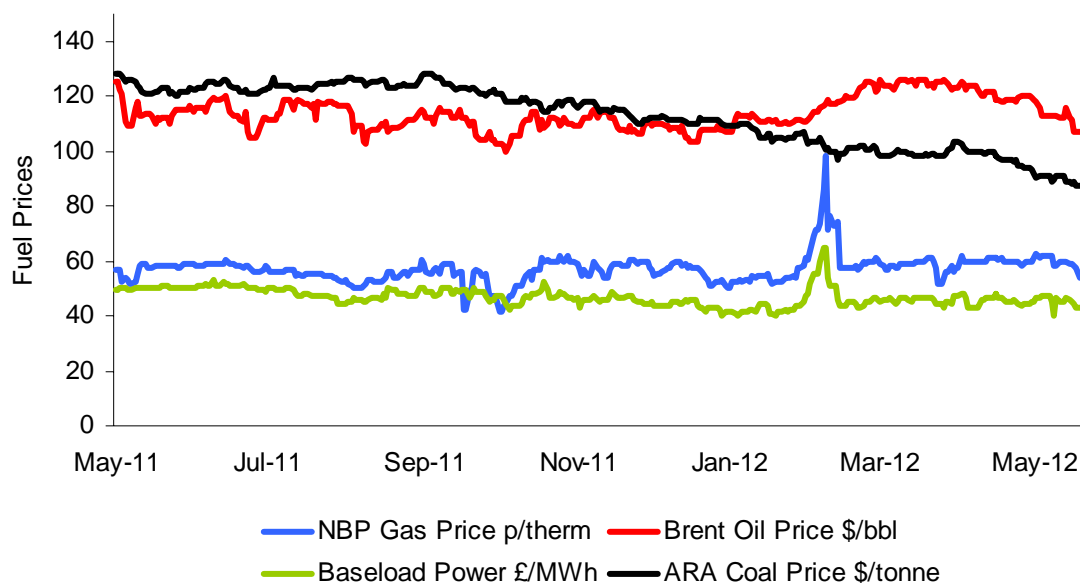
Figure W1 – Winter Composite Weather 2011/12



Fuel Prices

11. **Figure F1** shows energy prices for the 12-month period between May 2011 and May 2012.

Figure F1 - Energy Prices since May 2011

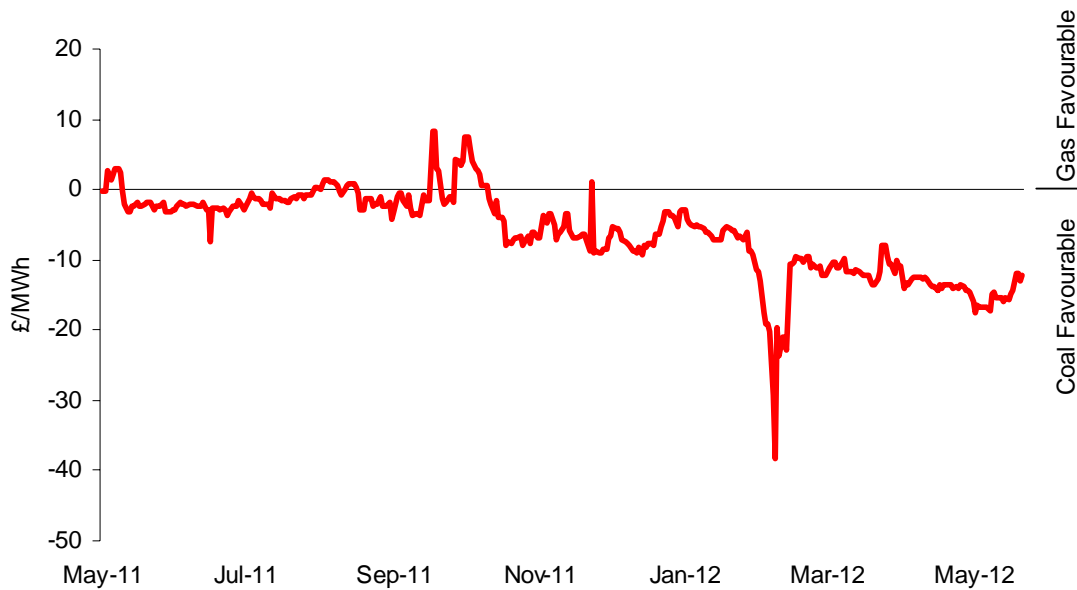


12. The chart shows that with the exception of declining coal prices and some short-term price spikes in gas and power during February 2012, energy prices have been relatively stable during the last year. However, on closer inspection, there are some subtle movements in prices and fuel price relationships that merit further comments.
13. Despite low economic growth, oil remained in a range of \$100-120 per barrel for most of the past year before briefly rising and subsequently falling towards \$100 in May 2012.
14. Since Q3 2011, coal prices have steadily declined from ~\$120/tonne to ~\$90/tonne. Possible reported reasons behind this decline include the depressed global economic position, lower coal imports to China and increased US coal exports as a consequence of higher gas burn for US power generation.
15. UK gas prices have been very steady at ~55-60 p/therm, showing essentially no summer/winter seasonality. Day-ahead gas prices briefly increased to ~£1/therm in February, which was brought about by the cold spell in Europe and high Continental power requirements.
16. Electricity prices appear to follow the gas price but on closer inspection, the differential between gas and power has steadily increased during the year. With gas prices being relatively flat, the base load power price is now more influenced by the coal price with the cost of gas for power generation setting an electricity floor price.
17. Carbon prices were ~ €16.50/tonne in May 2011, which gradually decreased to ~€10/tonne by the start of winter 2011/12. The fall continued throughout the winter to

~€7-8/tonne. The fall has followed the same trend as the coal prices, making coal favourable during the winter period. For gas to be favourable, the carbon price needs to increase to about €30/tonne

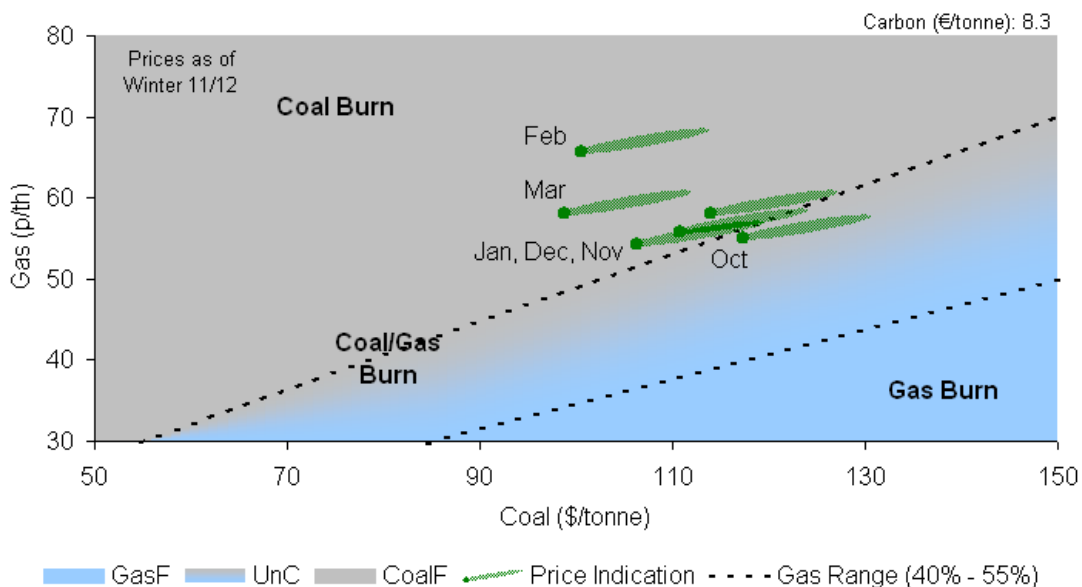
- 18. **Figure F2** shows the relative dark and spark spreads, showing whether gas or coal is favoured for electricity generation during the last 12 months.

Figure F2 – Relative power generation economics (1)



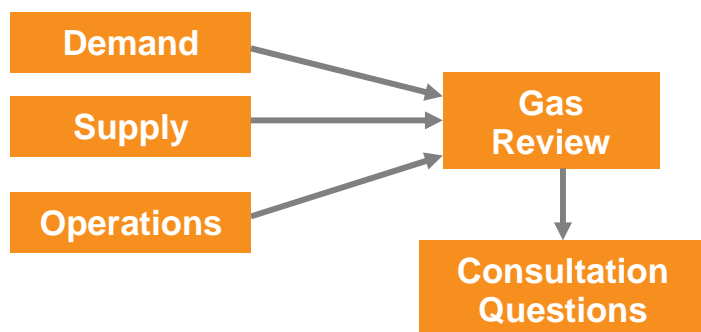
- 19. The decline in the coal price since Q3 2011 combined with a low carbon price has shifted the economics of power generation strongly towards coal. **Figure F3** details this shift on a monthly basis for winter 2011/12.

Figure F3 – Relative power generation economics (2)



20. **Figure F3** shows how prices of gas and coal have changed since October. Coal prices have tended to decline and gas prices have been relatively stable except in February and, to a lesser extent, March when the average monthly gas price increased due to the high Continental prices arising from the cold snap across much of Europe.
21. Whilst the chart shows a strong bias for coal generation, there are other factors at play that determine the precise generating mix, these include power station generating efficiencies, ownership and the portfolio of energy companies.

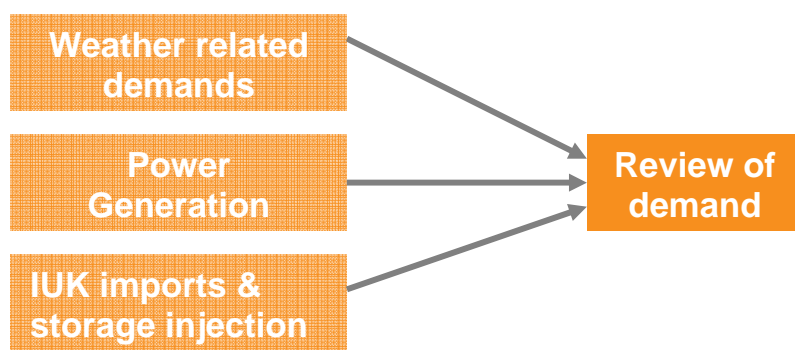
Gas



Overview

22. This section reviews winter 2011/12 in term of gas demand, supply and operational experiences.

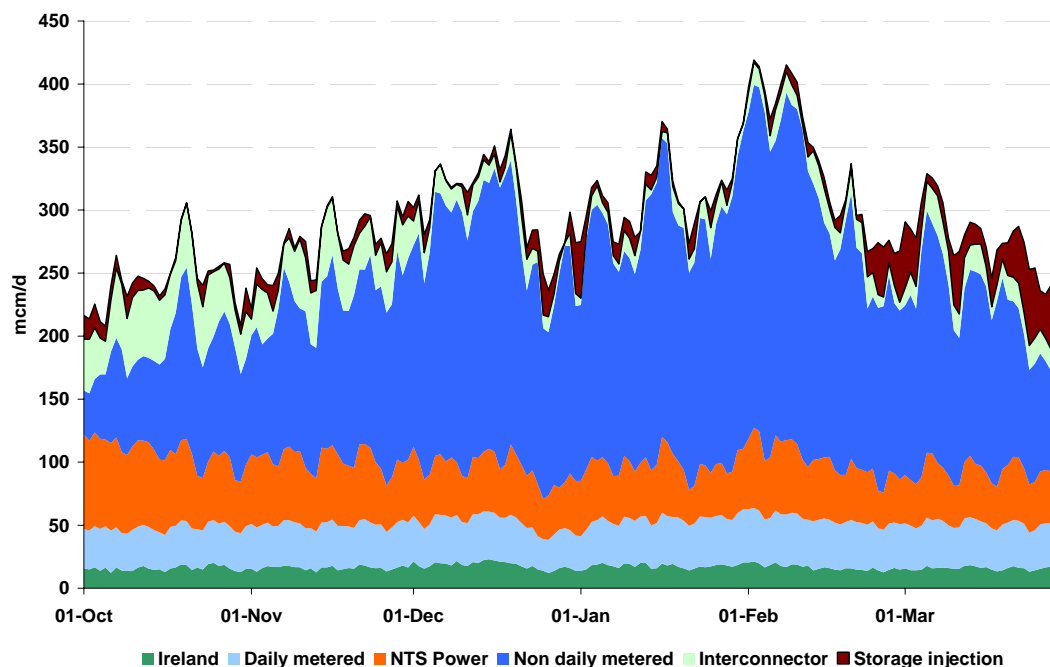
Review of Demand



23. The highest demand day in winter 2011/12 was 2 February 2012 with a demand of 417 mcm/d. This was much lower than the high demands seen in recent winters due primarily to less cold conditions and lower gas burn for power generation.

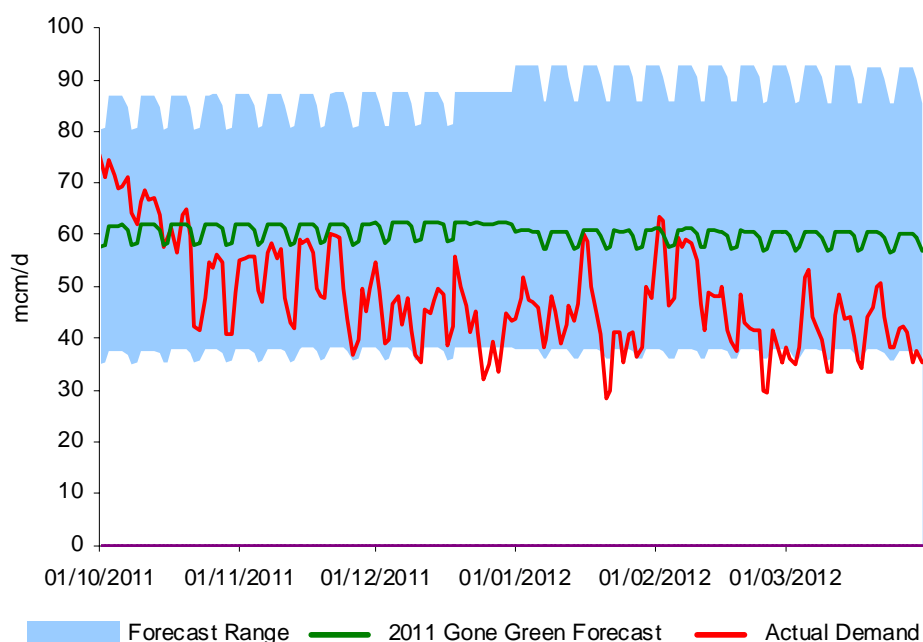
24. **Figure G1** shows the gas demand for winter 2011/12.

Figure G1 - Winter Gas Demand 2011/12



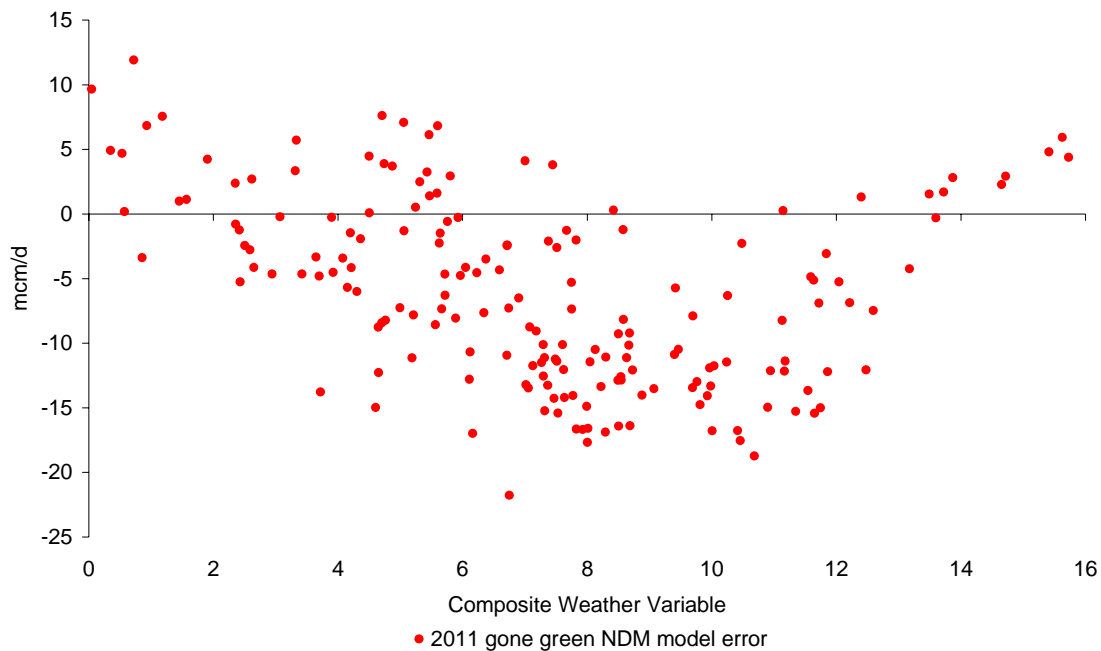
- 25. The chart shows low demands for much of the winter with the exception of the cold spell in the first two weeks of February.
- 26. IUK exports filled in troughs in the demand at the start of the winter when NDM demand was lower. Increased storage injection filled in the troughs at the end of the winter. There was also some storage injection in the mid-winter troughs.
- 27. **Figure G2** shows the NTS connected power generation demand for winter 2011/12 together with the pre-winter base case forecast and high and low forecast ranges to reflect plausible generation merit orders depending on whether gas is base load or marginal generation.

Figure G2 - Winter Power Generation Demand 2011/12



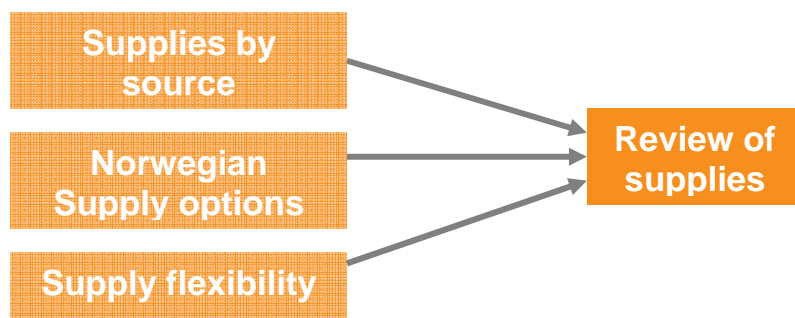
28. The chart shows that with the exception of the first few days of October, power generation was lower than forecast with coal at near base load conditions for much of the winter. Coal was predicted to be the primary source of fuel for power generation but the mild weather resulted in even lower gas demand for power generation with demand only returning to base case forecast levels during the cold period in February when UK also exported electricity to the Continent.
29. **Figure G3** shows the difference in actual NDM demand against our forecast model in terms of an error relative to CWV (composite weather variable). The chart shows a trend of over forecasting NDM demand during warmer weather and under forecasting demands during colder weather. This possibly suggests consumers responding to higher gas prices but when the weather was cold keeping warm becomes more important than saving money. For our 2012 forecasts, we are modifying our relationship between NDM demand and CWV to reflect this.

Figure G3 – 2011 Gone Green Model Forecast Error



30. The review of gas supplies section shows the demand associated with IUK exports and storage injection in more detail.

Review of Supplies



31. **Table G1** summarises the make-up of gas supplies for winters 2009/10, 2010/11 and 2011/12 by supply source.

Table G1 – Winter Gas Supply by Source

| | 2009/10 | | 2010/11 | | 2011/12 | |
|--------------|-----------|-----|-----------|-----|-----------|-----|
| | bcm | % | bcm | % | bcm | % |
| UKCS | 28 | 44% | 24 | 39% | 21 | 39% |
| Norway | 15 | 24% | 15 | 25% | 16 | 31% |
| Continent | 6 | 10% | 5 | 9% | 4 | 8% |
| LNG | 9 | 14% | 13 | 21% | 8 | 15% |
| Storage | 5 | 7% | 4 | 7% | 3 | 6% |
| Total | 63 | | 62 | | 53 | |

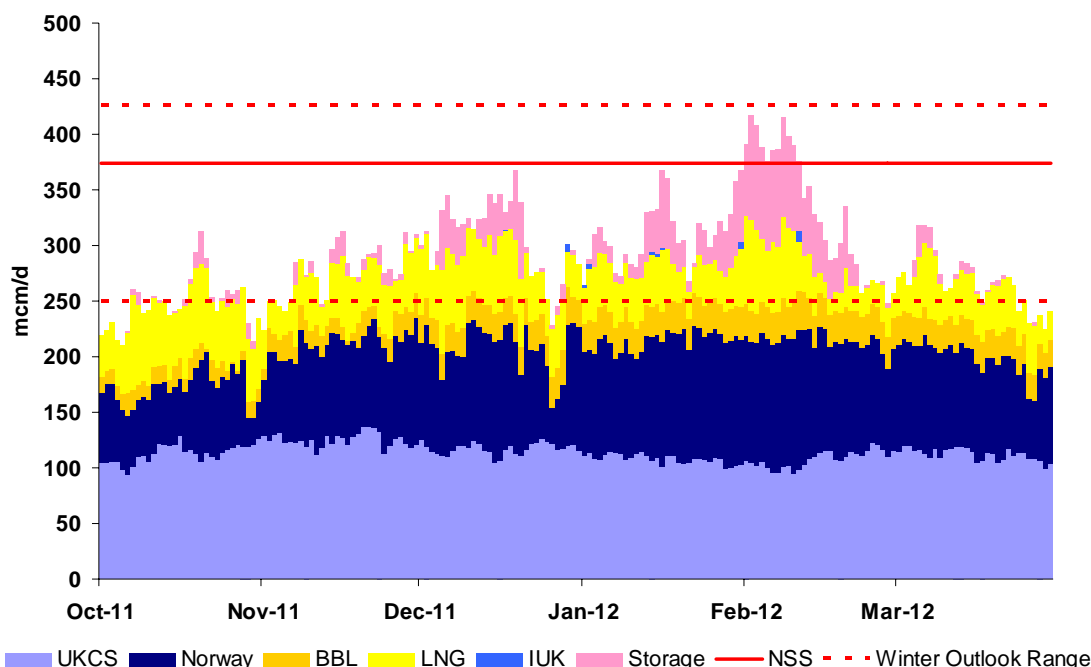
32. For winter 2011/12 the table shows:
- Further decline in UKCS
 - Comparable levels of imports from Norway and the Continent
 - Less LNG
 - Less use of storage than in 2010/11.
33. **Table G2** shows the make up of supplies for winters 2009/10, 2010/11 and 2011/12 by terminal.

Table G2 – Winter Gas Supply by Terminal

| | 2009/10 | | 2010/11 | | 2011/12 | |
|--------------|-----------|-----|-----------|-----|-----------|-----|
| | bcm | % | bcm | % | bcm | % |
| Bacton | 14 | 22% | 13 | 20% | 12 | 22% |
| Barrow | 2 | 4% | 2 | 3% | 2 | 3% |
| Grain | 3 | 4% | 4 | 6% | 3 | 5% |
| Easington | 15 | 24% | 15 | 24% | 14 | 27% |
| Milford H. | 6 | 10% | 9 | 15% | 5 | 10% |
| Burton P. | 0 | 0% | 0.2 | 0% | 0.2 | 0% |
| St Fergus | 15 | 23% | 12 | 19% | 11 | 21% |
| Teesside | 4 | 7% | 4 | 6% | 3 | 5% |
| The'd'pe | 3 | 5% | 3 | 4% | 2 | 3% |
| Storage | 1 | 2% | 1 | 2% | 1 | 2% |
| Total | 63 | | 62 | | 53 | |

- 34. For winter 2011/12, the table shows similar flows at most terminals with the main exceptions being lower flows through the Grain and Milford Haven LNG terminals.
- 35. **Figure G4** shows the gas supply by source for winter 2011/12; each of the supply sources is considered in turn in the following sub-sections.

Figure G4 – 2011/12 Supply Performance



- 36. The chart also shows forecast range of Non Storage Supply (NSS) and the NSS as used in calculating the Gas Balancing Alert (GBA) trigger. This remained at 374 mcm/d over the winter period. For the supply days above 400 mcm/d, the average level of NSS was 321 mcm/d. This was well below our 374 mcm/d forecast level but

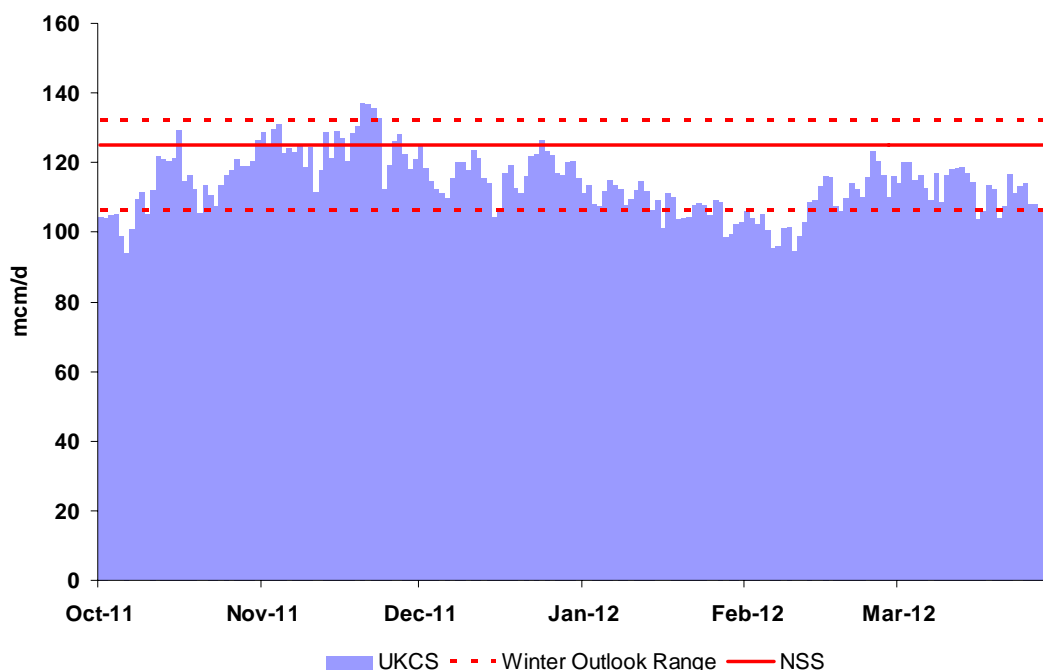
was never really tested due to low demands for most of the winter and the need to flow some storage for both commercial and seasonal use.

- 37. The highest day of supply was 417 mcm/d on 2 February, in aggregate there were 3 days of supply in excess of 400 mcm/d (23 in 2010/11) and 17 days in excess of 350 mcm/d (64 in 2010/11). Average supply for the highest 100 days of supply was 320 mcm/d, 55 mcm/d lower than in 2010/11.

UKCS Supplies

- 38. The peak forecast for UKCS supplies for winter 2011/12 was 147 mcm/d, for operational purposes a lower forecast is used. The UKCS range as reported in the Winter Outlook document was 106 -132 mcm/d, for setting the level of NSS for the GBA a level of 125 mcm/d was used.
- 39. **Figure G5** shows our UKCS forecast range from last year's Winter Outlook report, and actual flows from the UKCS during winter 2011/12. For most of the winter, UKCS supplies were relatively steady and within the Winter Outlook range.

Figure G5 – 2011/12 UKCS Supplies (est. Vesterled/Tampen flows deducted)



- 40. The profile for UKCS supplies also suggests some 'within winter' decline, with average supplies of 125 mcm/d in November compared to 112 mcm/d in March.
- 41. Average flows from the UKCS across the 6-month winter period were 114 mcm/d and 113 mcm/d for the 100 days of highest demand. **Table G3** shows the 2011/12 Winter Outlook peak forecast of UKCS supplies by terminal and the actual terminal supplies for the day of highest UKCS supplies (20 November 2011) and the highest day for each terminal.

Table G3 – 2011/12 UKCS Supplies by Terminal

| Peak (mcm/d) | Winter Outlook | Actuals | |
|--------------------------|----------------|--------------|--------------|
| | Forecast | Max UKCS Day | Max Terminal |
| Bacton | 51 | 53 | 53 |
| Barrow | 11 | 10 | 11 |
| Burton Point | 2 | 1 | 3 |
| Easington | 9 | 9 | 10 |
| St Fergus ³ | 41 | 36 | 42 |
| Teesside | 20 | 18 | 20 |
| Theddlethorpe | 13 | 9 | 12 |
| Total | 147 | 137 | 151 |
| (90% Op Forecast) | 132 | | |

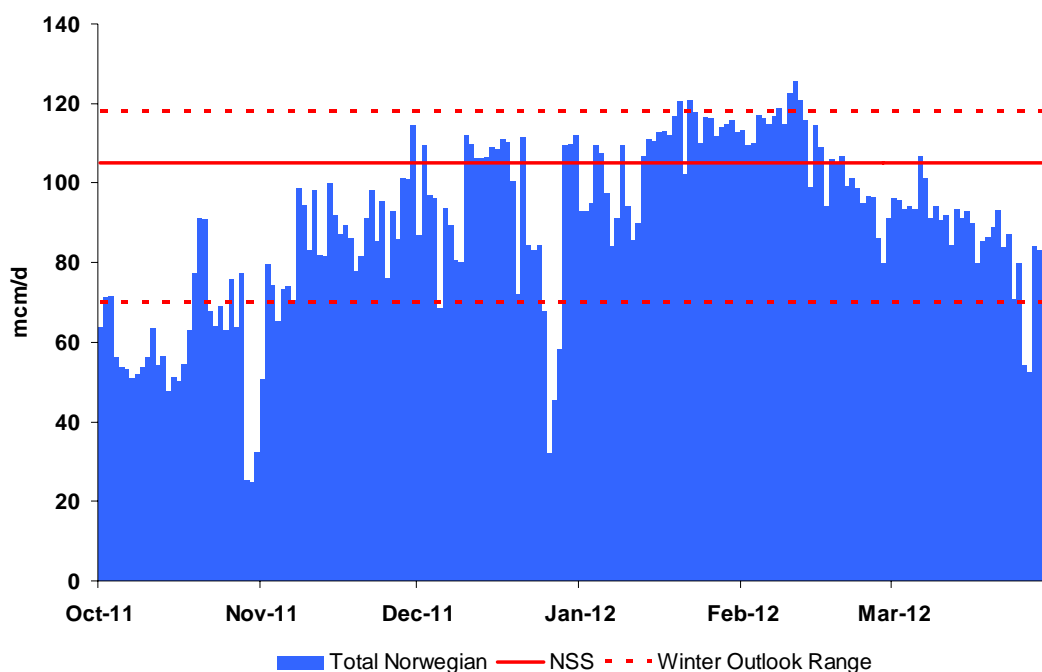
42. The table highlights that the day of highest UKCS supplies of 137 mcm/d was slightly above the maximum operational forecast of 132 mcm/d (90% of peak forecast). A comparison of our 147 mcm/d forecast should be made against the aggregated highest terminal flows (151 mcm/d).

Norwegian Imports

43. Our forecasts for Norwegian imports to the UK for winter 2011/12 were subject to numerous uncertainties notably contractual obligations and transportation options regarding delivery to the Continent in Germany, France and Belgium. To capture this uncertainty a Central View of Norwegian flows to the UK was produced within a range (70-118 mcm/d) based on high flows to the Continent (thus low UK flows) and low flows to the Continent (thus high UK flows).
44. **Figure G6** shows Norwegian flows through Langeled and our aggregated estimates for Norwegian imports to St Fergus through Vesterled and the Norwegian flows via the FLAGS pipeline.

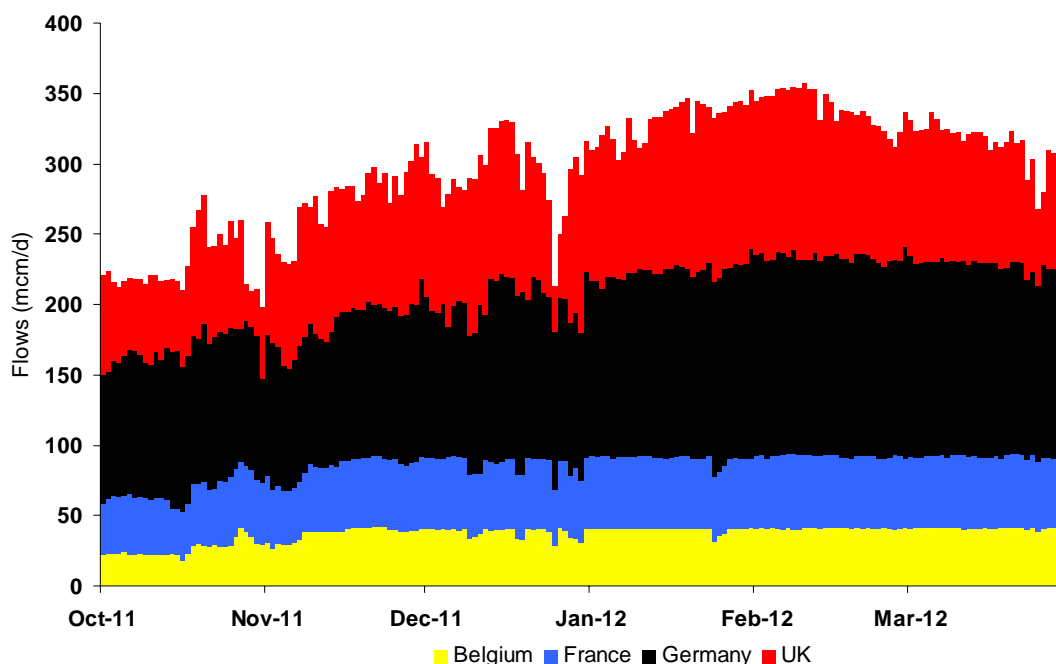
³ Excludes estimates for Vesterled, Tampen and Gjoa

Figure G6 - 2011/12 Norwegian Imports to UK



45. The chart shows that from November onwards Norwegian flows were generally within our anticipated range. Average Norwegian flows across the 6-month winter period was 89 mcm/d with flow for 90% of days within a range of 51-116 mcm/d. For the days of supply above 105 mcm/d, average Norwegian flows were above our 105 mcm/d NSS forecast at 113 mcm/d.
46. Besides the option to flow gas to the UK, Norwegian gas is also exported to Germany, France and Belgium. **Figure G7** shows our estimate of daily Norwegian exports to the UK and the Continent during winter 2011/12.

Figure G7 - 2011/12 Norwegian Exports to UK and the Continent

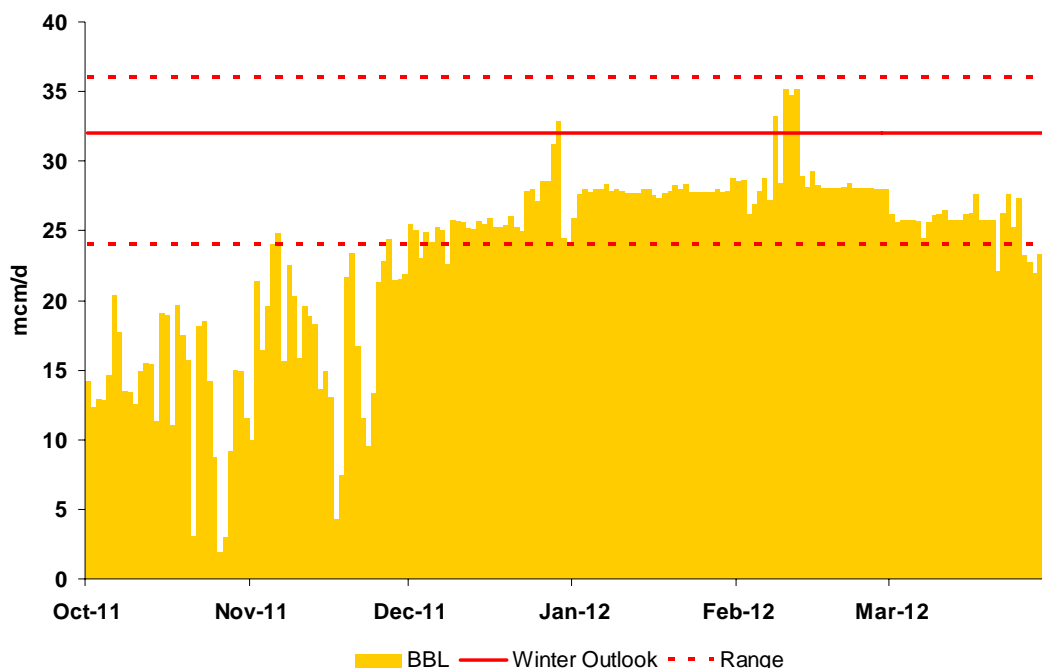


- 47. The chart shows some seasonality in Norwegian production. The average level of Norwegian production across the 6-month winter period was 321 mcm/d and 340 mcm/d for December to February. These flows are in line with the pre-winter forecasts of 320 and 335 mcm/d respectively.
- 48. The chart also clearly shows that when the Norwegian production suffered supply losses, most of the flow reduction was experienced in the UK rather than the Continent. This was probably as a consequence of contractual commitments with flows to the UK having a lower priority than those to the Continent.

Continental Imports - BBL

- 49. **Figure G8** shows BBL flows for winter 2011/12. Flows were generally within our 24-36 mcm/d forecast range for much of the winter averaging ~23 mcm/d across all the winter and 28 mcm/d for December to February.

Figure G8 - 2011/12 BBL Imports to UK

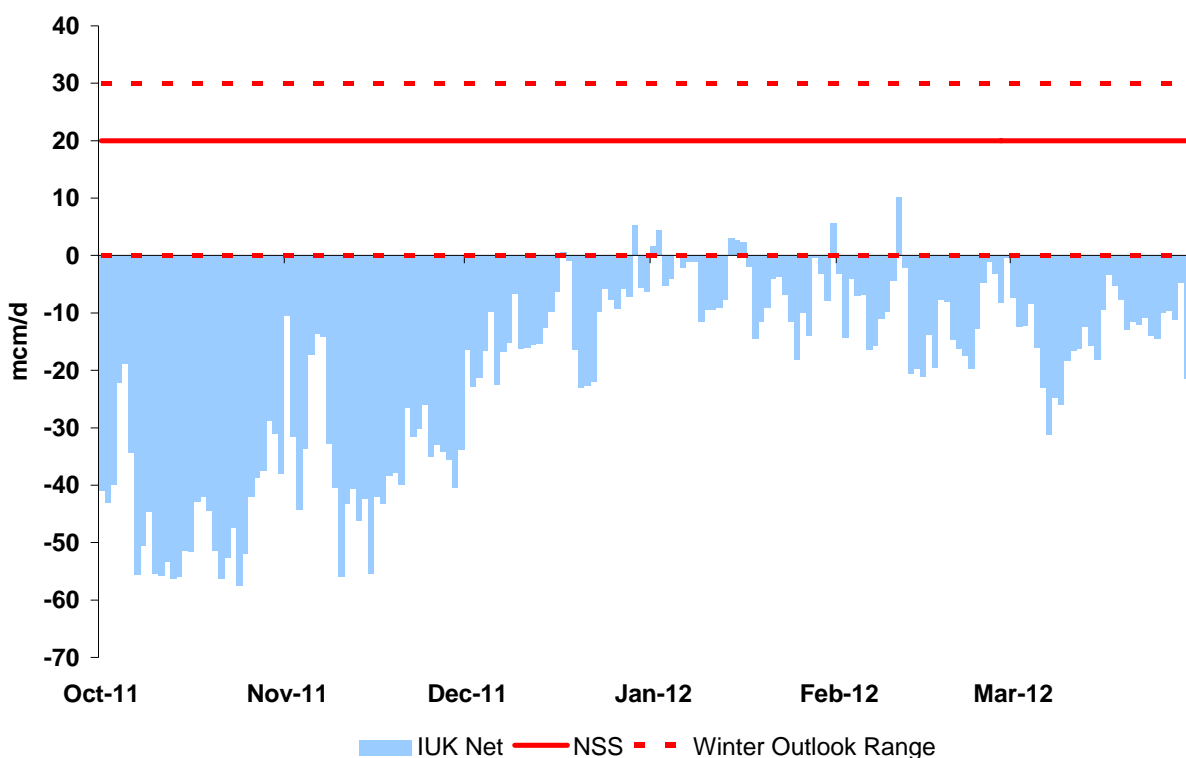


50. Factors that could have limited BBL flows to the UK include; relatively low UK demands, periodic cold weather on the Continent and non physical reverse flows to the Continent.

Continental Imports – IUK

51. As in previous winters, IUK was forecast as the marginal source of non-storage supply and would, in terms of operation, be similar to storage when UKCS and other imports could not meet demand with potential upper flows of 30 mcm/d. IUK flows were expected to be dependent on demand (price) and the availability of other supplies, notably, other imports.
52. **Figure G9** shows IUK import and export flows for winter 2011/12. IUK imports were forecast to be between 0 - 30 mcm/d. With mild weather and the UK well supplied, IUK spent the majority of the winter in export mode and only on occasion reverted to UK imports.

Figure G9 - 2011/12 IUK Imports & Exports

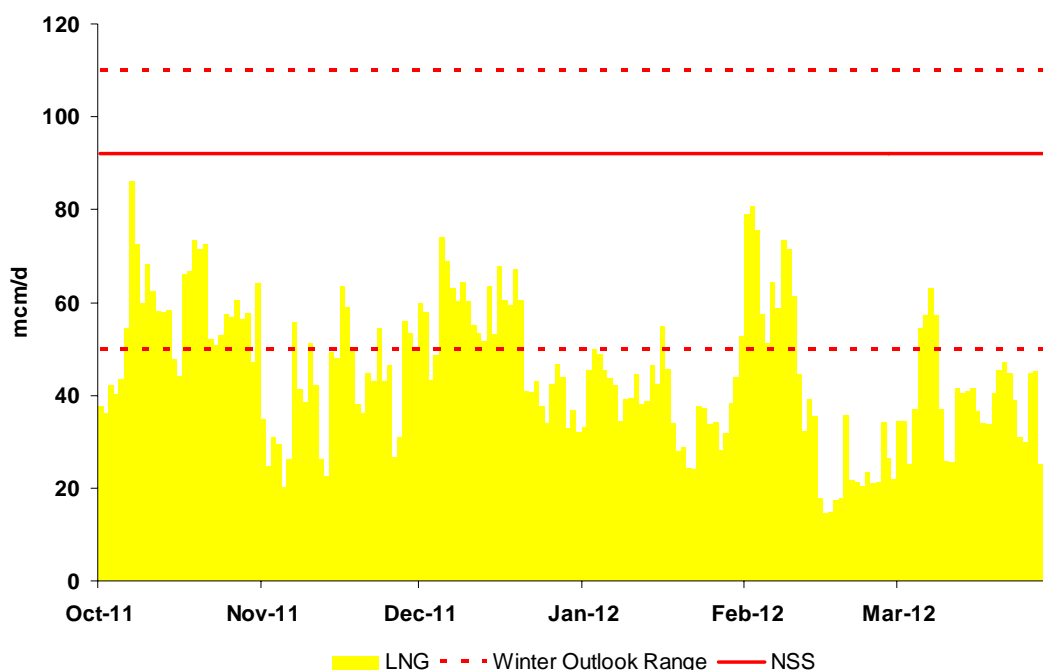


53. In aggregate, imports were just 36 mcm and exports were ~3.7 bcm. The highest flow for IUK imports was 10 mcm/d, and on average, IUK was exporting 20 mcm/d across the winter.

LNG Imports

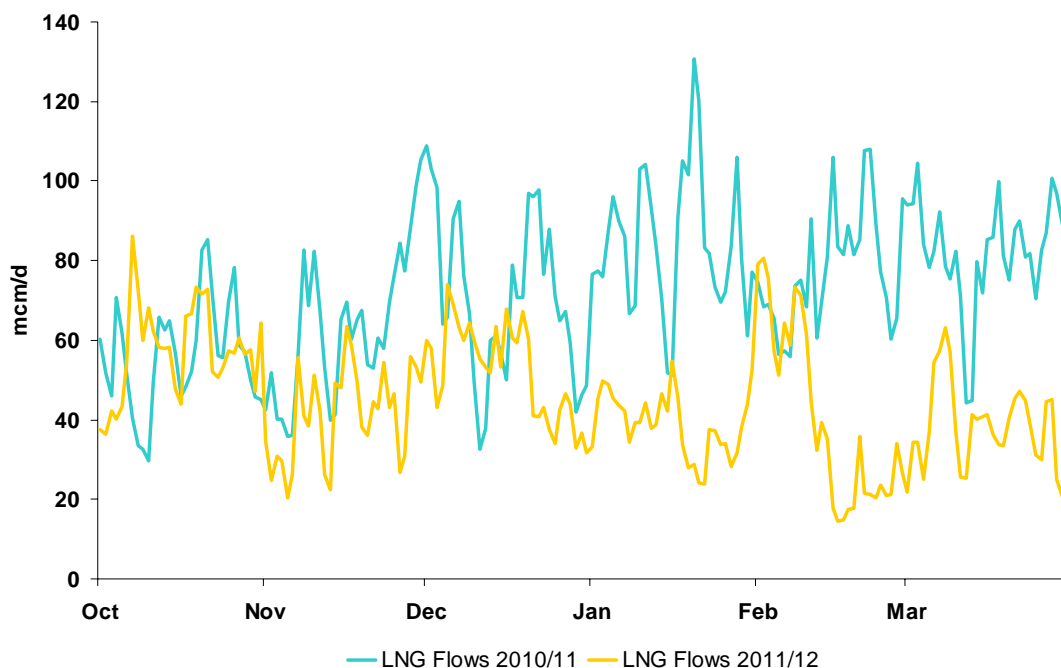
54. The forecast range for LNG imports for winter 2011/12 highlighted considerable uncertainties, hence an assumed range between 50 and 110 mcm/d, with flows of 92 mcm/d expected at demands above 400 mcm/d.
55. **Figure G10** shows LNG imports through Grain and Milford Haven, and our forecast range.

Figure G10 - 2011/12 LNG Imports



56. The chart shows considerable variation in day-to-day LNG flows ranging from ~15 to 85 mcm/d with an average flow of 45 mcm/d. For the days of demand above 400 mcm/d, the average flow was 77 mcm/d. Hence throughout the winter LNG flows tended to be below our forecast.
57. In aggregate, LNG imports were an estimated 8.2 bcm, of which 2.8 bcm was through Grain and 5.4 bcm through Milford Haven. This was around one third lower than the estimated 13 bcm in 2010/11. The reduction was probably due to higher demand and prices in the Far East (notably Japan), and generally mild weather conditions in the UK over the winter. **Figure G11** shows UK LNG imports over the last 2 winters.

Figure G11 - LNG Flows during Winter 2010/11 and 2011/12

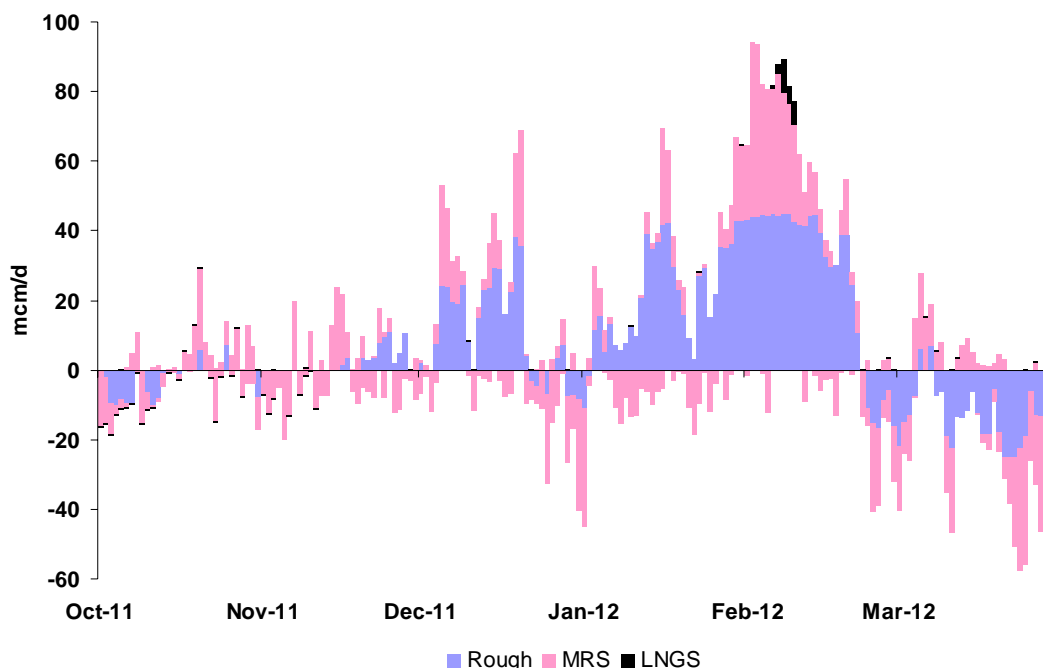


58. The chart shows similar LNG flows in October of both years, for the rest of the winter period, flows were appreciably lower in 2011/12 compared with the previous year. The chart also shows that there some response to the cold spell in February 2012.

2011/12 Storage Performance

- 59. The forecast for storage for winter 2011/12 included no new storage facilities; however, storage space was approximately 1% higher (69 mcm) than the previous winter, primarily due to an increased declaration from Rough. The start of operations at Holford in December 2011 provided an upside to the forecast.
- 60. Storage deliverability was forecast to be about 10% lower (10 mcm/d), this was primarily due to the closure of Partington in 2011. The loss of Partington reduced 'short range' deliverability rather than a loss of endurance capability.
- 61. **Figure G12** shows storage withdrawals and injections over the winter in terms of Rough, MRS and LNG storage.

Figure G12 - 2011/12 Storage Withdrawals and Injection

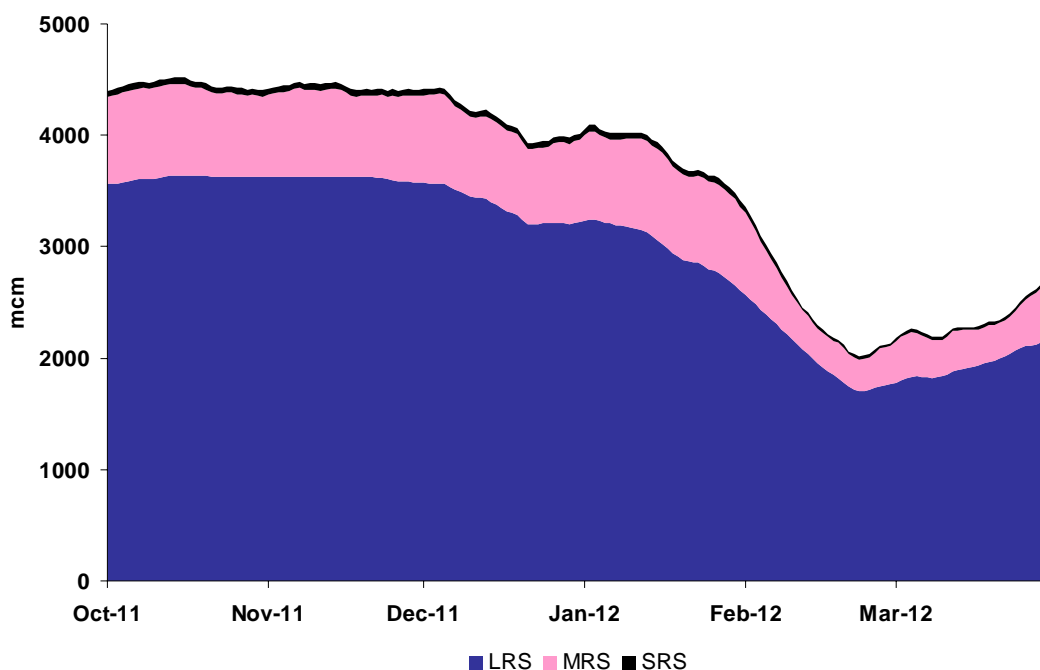


62. The chart shows:

- MRS withdrawal and injection throughout the winter (including many days of both withdrawal and injection). For the 6 month winter period, aggregated MRS withdrawals were 1.3bcm compared to 1.0bcm injected
- The main withdrawals from Rough were during the high demand period in late January and February. Until this period, lower demands mitigated withdrawals. Between October and December there were only about 0.5bcm of withdrawals from Rough
- LNG storage was little used throughout the winter period
- The return of mild weather in March started the 'injection season'.

63. **Figure G13** shows the level of storage stocks through the winter.

Figure G13 - 2011/12 Storage Stocks

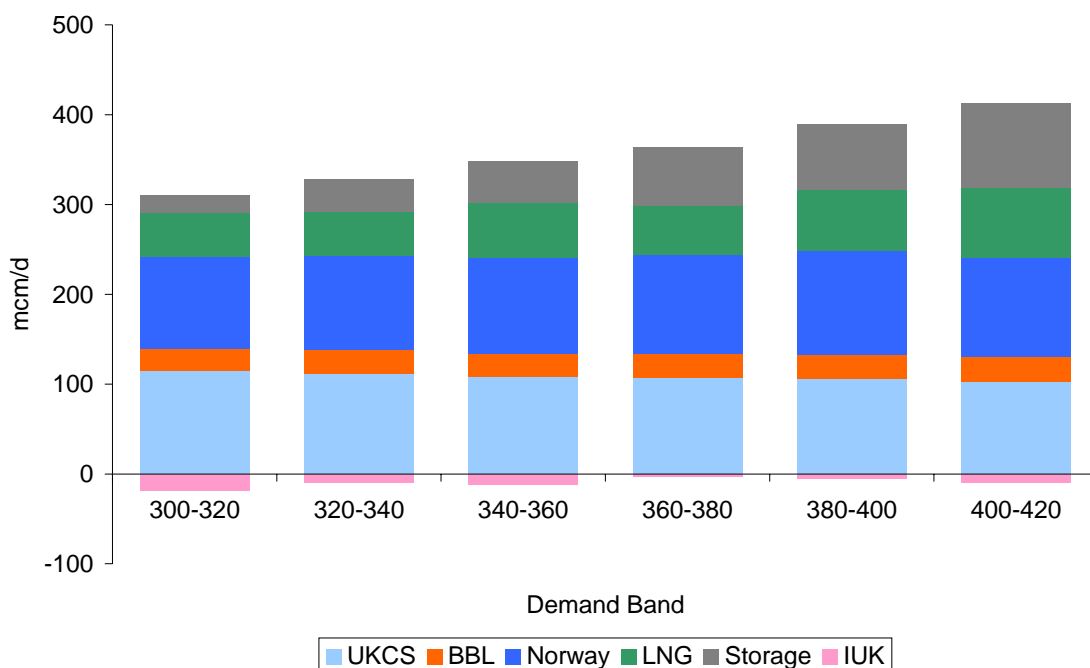


64. The chart shows little change in stocks over the first half of the winter period primarily due to mild weather, but appreciable decline in stock levels during January and February. By late February stocks fell to a low of 2 bcm (around 43%), compared with 1.2 bcm in 2010/11 and 0.6 bcm in 2009/10.

2011/12 Supply Flexibility

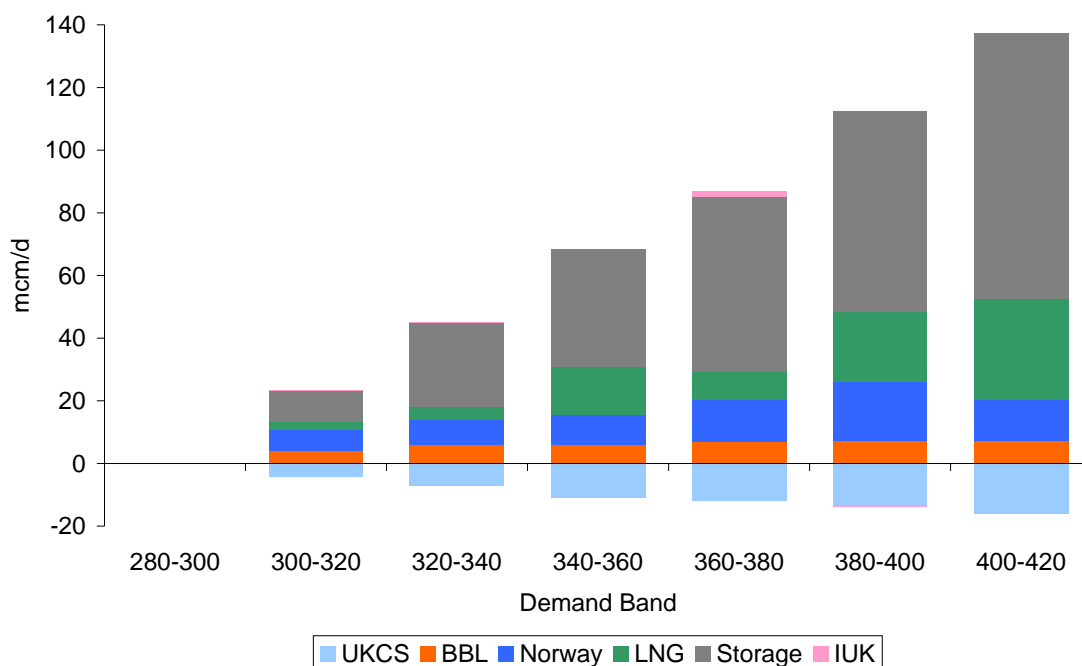
65. Historically, storage and to a lesser extent, IUK imports and some UKCS supplies have provided most of the necessary supply flexibility to meet variable demand. However, the changing supply mix with increased reliance on imports has created a 'new order' on how supplies are utilised to meet high demands. This is demonstrated for winter 2011/12 in the following three charts, **Figure G14**, **Figure G15** and **Figure G16**.

Figure G14 - Supply Make-up Winter 2011/12 (all demand)



66. The chart displays the make-up of supplies by supply type in demand bands of 20 mcm/d increments. As demand increased:
- IUK remained in export mode through the winter due to low demands although exports fall as UK demands increase
 - UKCS and BBL remained flat (i.e. no swing or seasonality)
 - Norway, LNG and storage increased (i.e. some swing or seasonality).

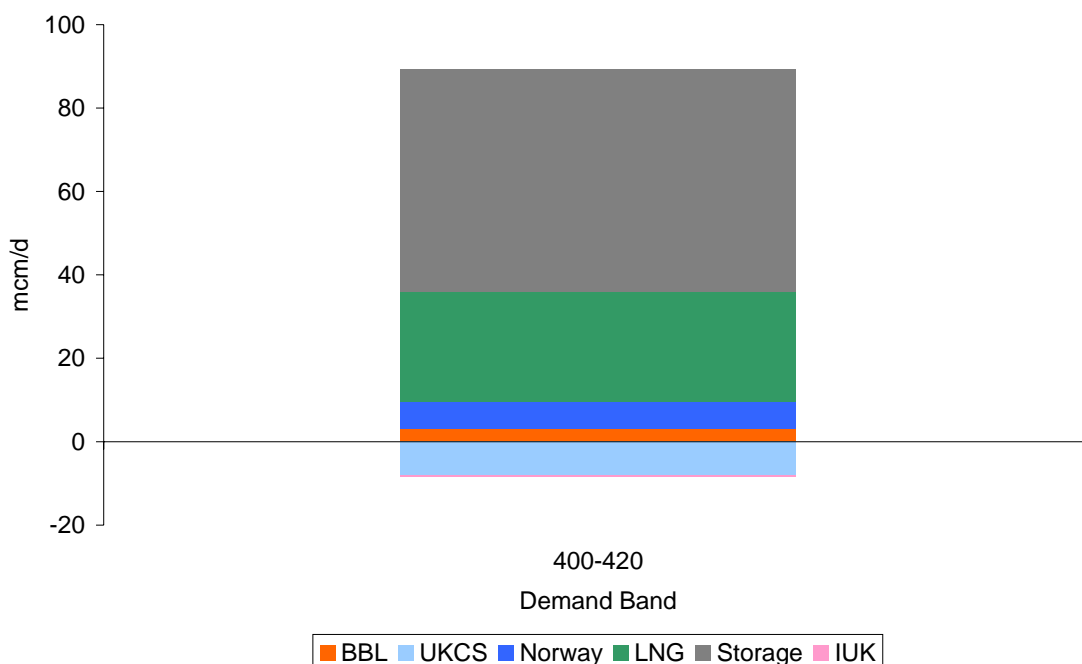
Figure G15 - Incremental Supplies Winter 2011/12 (demand above 300 mcm/d)



67. The chart displays the incremental make-up of supplies by supply type in demand bands of 20 mcm/d increments for demand above 300 mcm/d. This incremental approach identifies those supplies that are responsive / flexible. As demand increased:

- UKCS declined (field decline)
- Minor flow changes via IUK and BBL
- A small response from Norway
- A modest responses from LNG
- A significant response from storage
- On a % basis, the supply response for demands above 300 mcm/d was met by: UKCS -16%, IUK 0%, BBL 9%, LNG 24%, Norway 16% and storage 68%.

Figure G16 - Incremental Supplies Winter 2011/12 (demand above 400 mcm/d)



68. The chart displays the incremental make-up of supplies by supply type for demand above 400 mcm/d. This incremental approach identifies those supplies that are responsive / flexible. As demand increased:
- Little or no response from UKCS, Norway, BBL or IUK
 - Supply response dominated by LNG and Storage
 - On a % basis the supply response for demands above 400 mcm/d was met by: UKCS -10%, IUK -1%, BBL 4%, Norway 8%, LNG 33% and storage 66%.

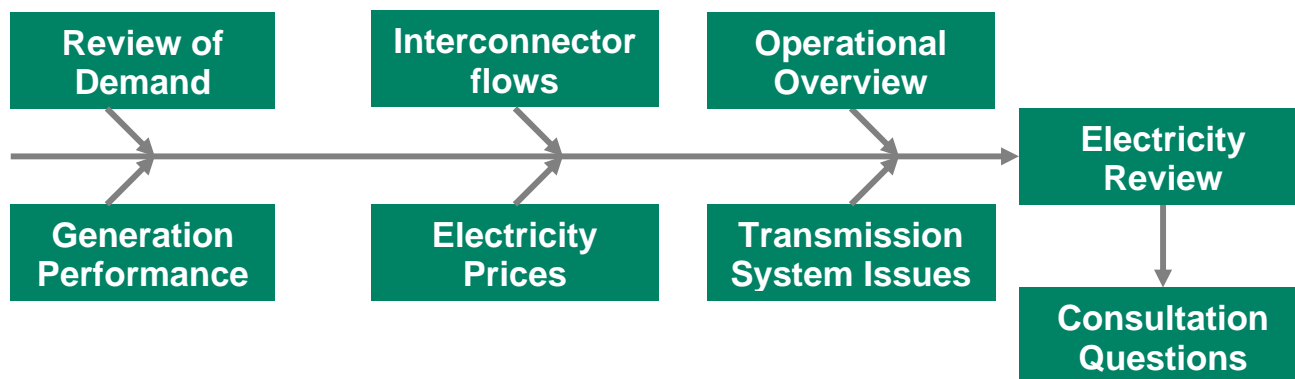
Operational Review

69. The weather for the first four months of the winter was relatively benign, with gas demand being at or below seasonal normal levels. Relatively high gas prices also depressed gas demand for power generation. Despite lower LNG supplies, the supply side of the equation was not particularly stretched and consequently storage levels were well above typical winter levels throughout the winter.
70. The cold snap in February coincided with even colder conditions on the Continent. This resulted in very high gas and electricity demands in Europe. This caused a short term spike in both gas and electricity prices with the UK following rather than leading Continental prices. With UK gas and electricity prices being below those on the Continent both the gas interconnector (IUK) and the electricity interconnector (IFA), exported to the Continent at the time of the highest winter demand. For about a week, this resulted in much higher utilisation of UK storage, notably from medium range storage and Rough. Compared to recent winters, this was of a lesser concern due to the storage stock position, the timing within winter and the prospect of milder weather to come.
71. No operational issues were experienced during this time, with supplies into the UK being balanced across a range of diverse supply sources.
72. In general, the winter was characterised by relatively low levels of LNG imports, stable UKCS supplies and mainly stable supplies from Norway. There were a few occasions where losses were experienced from Norwegian supplies, but these did not coincide with high demands and were dealt with using normal operational tools.
73. Demand forecasting was increasingly challenging, driven mainly by storage withdrawing and injecting during the same day. We expect this trend to continue as more fast-fill storage sites commission during the next few years.
74. Levels of gas-fired power station demand were relatively low and there were no observed examples of within day changes of this demand as a result of variable wind generation on the electricity network. This remains a potential issue and we will continue to monitor the interaction between changes in wind generation and gas-fired power station demand.

Consultation Questions - Gas - Review

| Number | Question |
|--------|---|
| GQ1. | Historically there has been close linkage between gas and power prices, however, we have suggested that the power price is now more influenced by the coal price with the cost of gas (fuel used for power generation) setting an electricity floor price. Do you agree with these observations or have any other comments regarding power / price relationships? |
| GQ2. | For the coldest days last winter, the level of NDM demand exceeded our model forecasts. Are there any possible reasons to explain this? For example is it due to consumer behaviour, appliances or other reasons? |
| GQ3. | The 374 mcm/d forecast level of non storage supply (NSS) as used in the GBA trigger was not attained last winter. Was this primarily due to the combination of low demands and availability of supply (including storage) or were there other factors to consider? |
| GQ4. | From a security of supply perspective, should we be concerned that in February IUK exported despite high UK prices and high UK demand? If UK needed more imports during this period when Continental demand was high, could the UK have attracted IUK imports? If so, how much and at what price? |
| GQ5. | LNG deliveries to UK were lower during winter 2011/12 compared with 2010/11. Were there any other factors besides high demand and high prices in the Far East? |
| GQ6. | If UK gas prices were higher for a sustained period last winter, could UK have attracted LNG from the Far East? |
| GQ7. | In terms of supply flexibility, to what extent could LNG have responded if weather conditions had been more severe? |

Electricity



Overview

The section of the report reviews the last winter, 2011/12, for electricity and discusses some of the key learning points from the winter and assess the analysis from last years Winter Outlook Report.

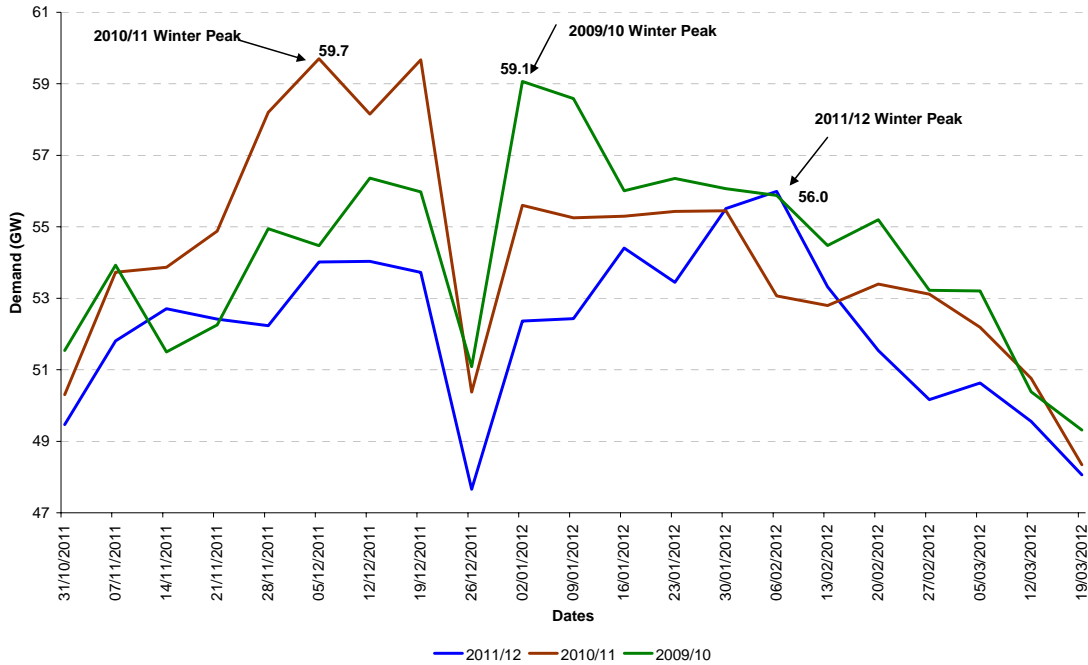
Review of Demand

75. Unless otherwise stated, demand discussed in this report excludes any exports to France, The Netherlands and Northern Ireland but does include station load and exports from the Transmission System to meet GB demand.



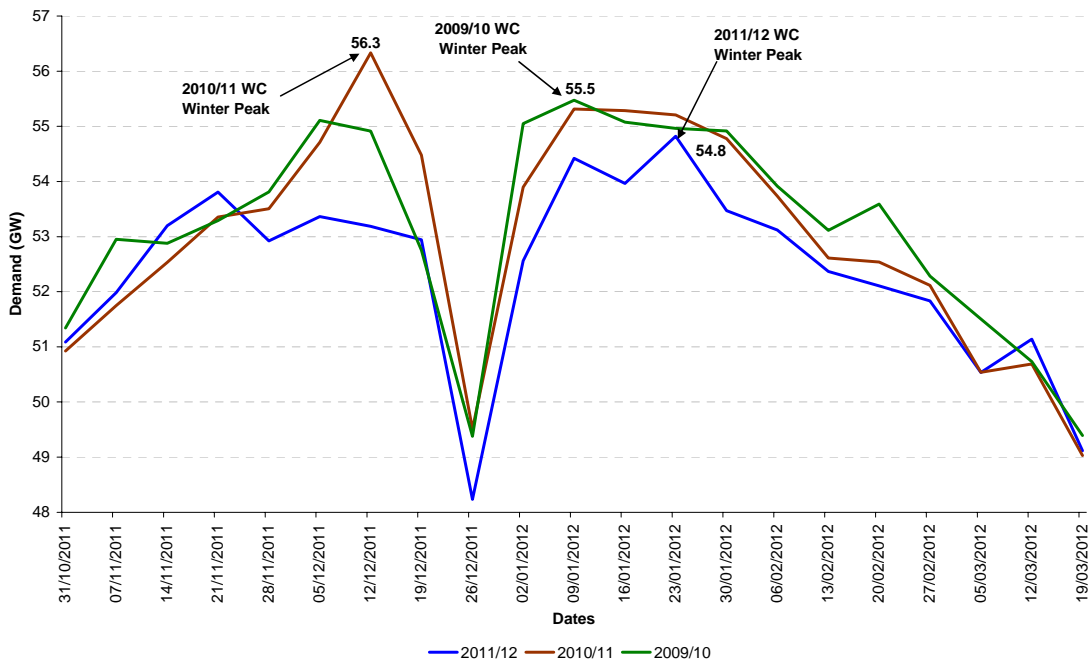
76. The highest electricity demand over the winter reached 56.0 GW for the half-hour ending at 18:00 on 8th February 2012. Very mild weather in December 2011 and January 2012 was followed by a severe cold spell in February 2012. Additionally, over the peak 3.1 GW was being exported to France, Netherlands and Northern Ireland. The peak figure of 59.1 GW compares to the highest demand of 60.1 GW for the winter of 2010/11, when just 0.4 GW was being exported to Northern Ireland.. The last three years winter demands at a weekly resolution are shown in **Figure E1**.

Figure E1 - Weekly Peak Demand for the last three winters



77. To understand the underlying demand trends for average weather conditions the out-turn demand for the last three winters have been weather corrected. This can be seen in **Figure E2**.

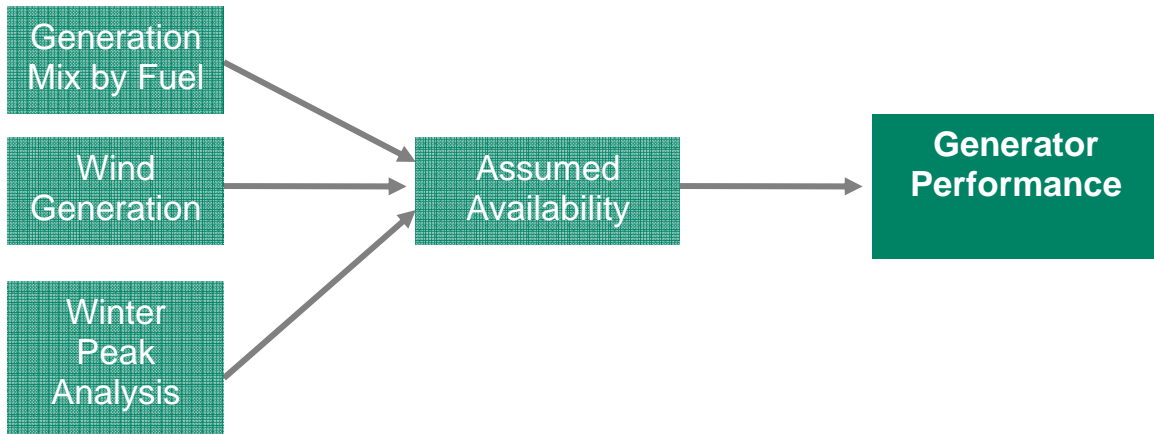
Figure E2 - Weather Corrected Weekly Peak Demand for Last Three Winters



Winter Review

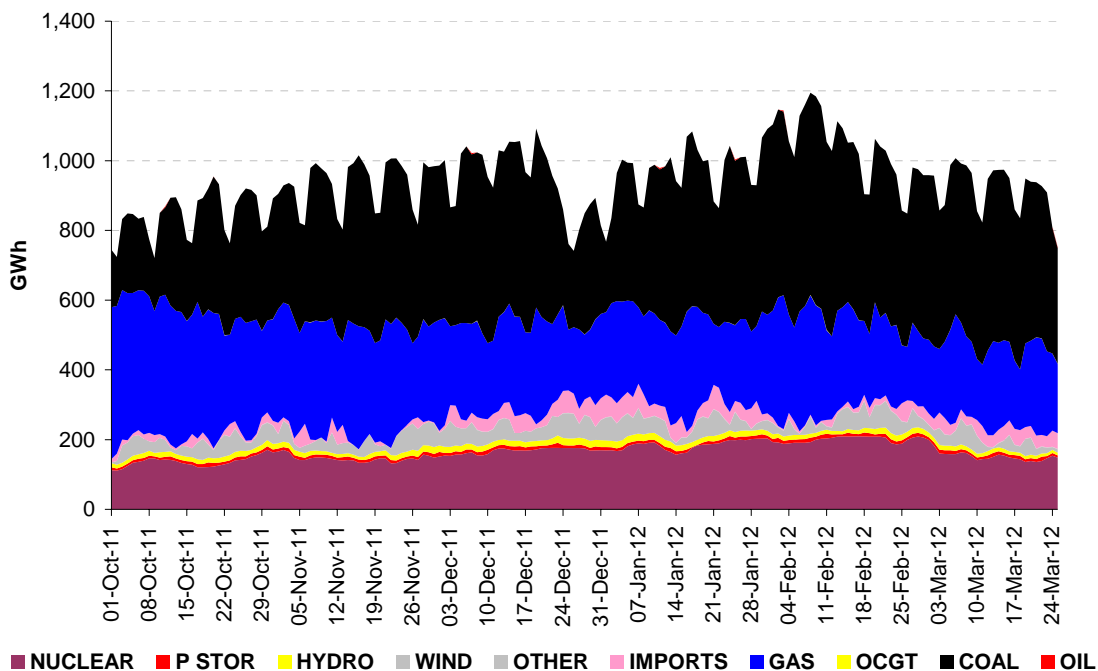
78. Underlying demand over the winter period 2011/12 was down on the previous two years. Some of the difference may be accounted for by the exceptionally mild weather before Christmas, as weather correction fails to deal fully with very unusual conditions; but the main reasons for the reduction are likely to have been the high cost of energy and the state of the economy.

Generator Performance



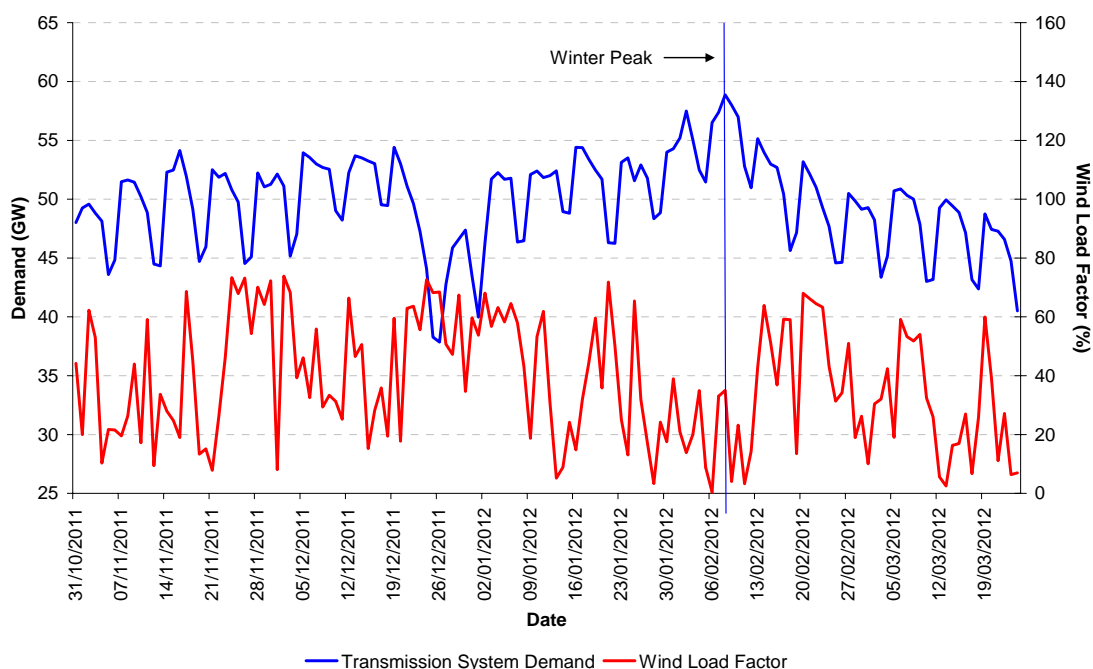
79. **Figure E3** shows the actual 2011/12 generation mix. Coal fired generation provided a greater proportion of the total generation than gas from mid-November onwards as the relative fuel price made coal the cheaper of the two fuels. No oil fired generation was run over the winter peak on 08th February 2012.

Figure E3 - 2011/12 Generation Mix by Fuel Type



- 80. **Figure E4** shows a detailed view of the wind load factor during the winter. This data is based on the wind farms that are currently visible to National Grid through operational metering. These metered wind farms had a total capacity of approximately 4600 MW during the winter compared to 2600 MW last winter. This data gives an average load factor of 37.9% on the peaks over the period and a minimum of 0.5%.
- 81. The effect of wind on operation of the system is a key issue going forward. The uncertainty and intermittency of wind output requires strategies to ensure security of supply. Analysis of some of the effects of this going forward can be found in the recent National Grid publication - Operating the Electricity Transmission Networks in 2020⁴.

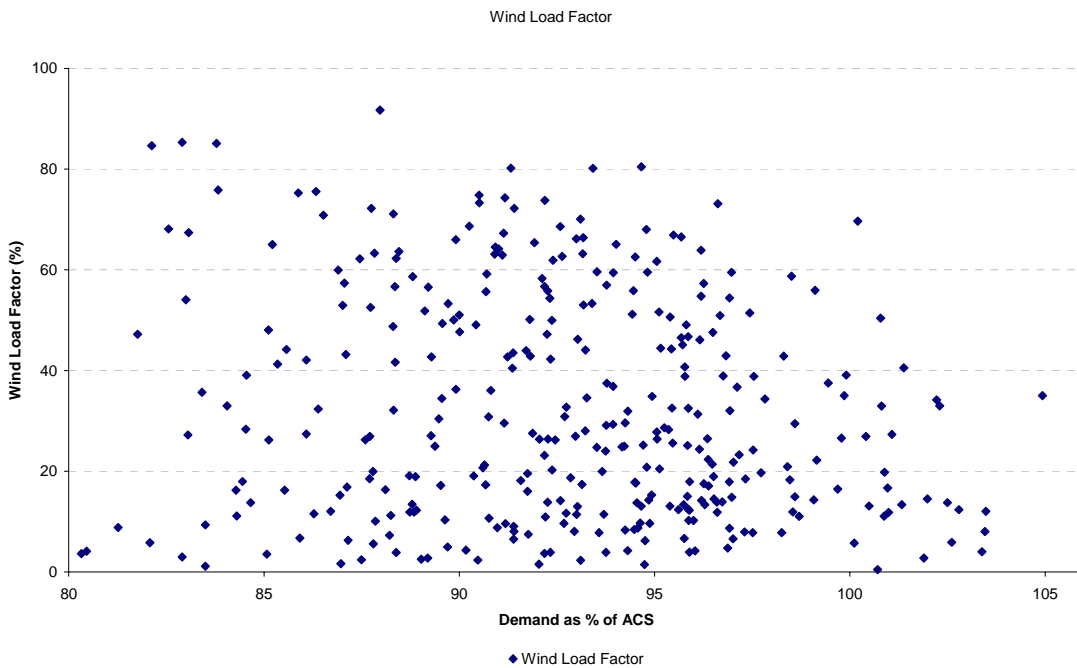
Figure E4 - Daily Peak and Wind Generation Outturn



- 82. **Figure E5** shows the wind load factor at the time of the daily peak demand over the past four winters plotted against the corresponding demand expressed as a percentage of that year's ACS demand. It can be seen that there is a wide range of wind load factors at all demand levels.

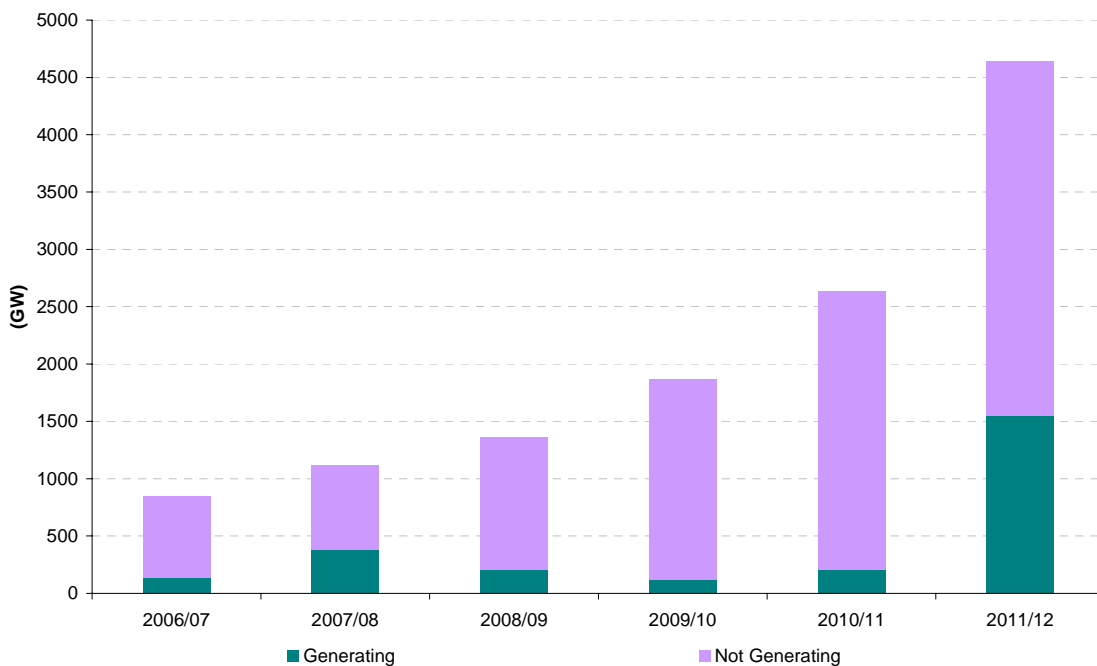
⁴ <http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/>

Figure E5 - Wind and Daily Peak Demand Levels over the last 4 winters



83. **Figure E6** shows the wind output over the winter peak compared to installed capacity for the last six years.

Figure E6 - Wind Generation compared to capacity for the last 5 years



84. **Table E1** gives a summary of wind power generation volumes as operationally metered by National Grid for the last six winters. The volume of wind power generation itself is not a key metric for system operation perspective but does provide

an indicator of growth. In the same way as cold and warm winters have an effect on system operation windy and calm winters are likely to play a key part in system operation.

Table E1 - Wind Generation volumes over recent winters

| | Wind Generation GWh | % increase on prior year |
|---------|---------------------|--------------------------|
| 2006/07 | 1156 | |
| 2007/08 | 1234 | 7% |
| 2008/09 | 2092 | 70% |
| 2009/10 | 2139 | 2% |
| 2010/11 | 3674 | 72% |
| 2011/12 | 7137 | 94% |

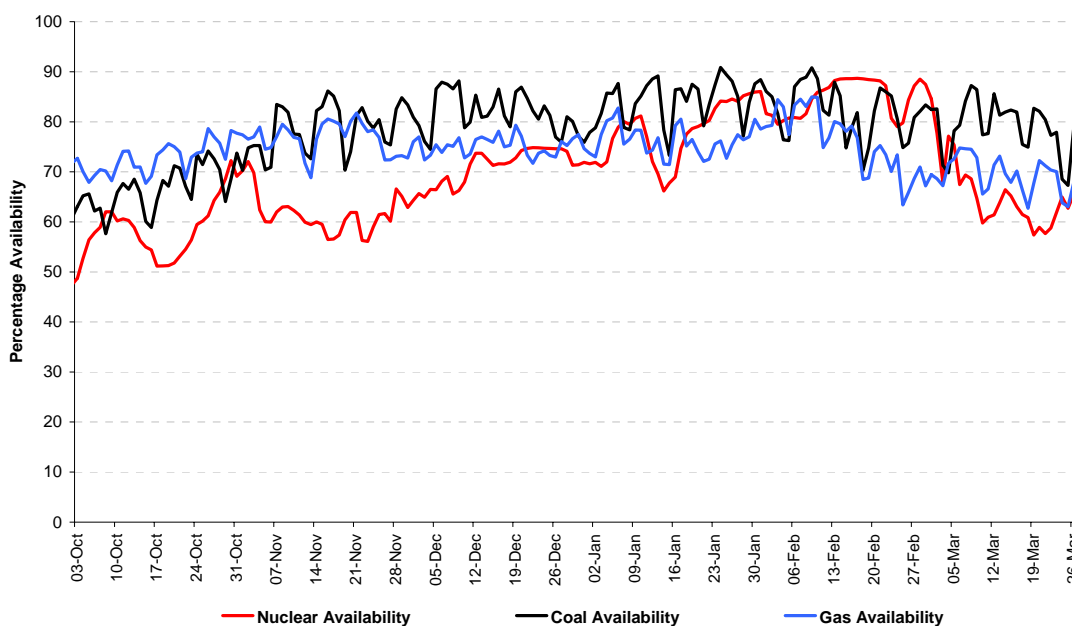
- 85. Looking across the range of generation sources, the assumed availabilities from last years Winter Outlook Report are compared with the actual out-turn availabilities of the winter peak. This data is presented in **Table E2**.
- 86. For wind and hydro generation the basis of the assumed availability is different to that for other fuel types as it is actual load factor at the time of the demand peak and not technical notified availability as in both cases availability of input energy to the generation is the limiting factor.
- 87. Overall the availability at the winter peak was 89% compared with an assumed availability of 84%. Plant availability generally was very good and higher than the winter average for coal, gas and nuclear. Wind generation was also relatively high for a winter peak at 38%.

Table E2 - 2011/12 Assumed and Actual Availability of Generation Plant

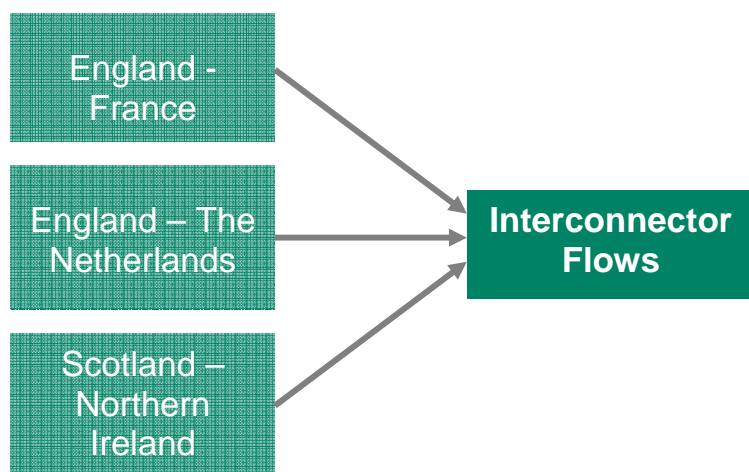
| Power Station Type | Assumed Availability at Demand Peak | Actual Availability at Demand Peak |
|-----------------------|-------------------------------------|------------------------------------|
| Nuclear | 83% | 85% |
| French Interconnector | 100% | 100% |
| Hydro generation | 70% | 87% |
| Wind generation | 8% | 38% |
| Coal | 86% | 94% |
| Oil | 70% | 73% |
| Pumped storage | 96% | 100% |
| OCGT | 98% | 92% |
| CCGT | 89% | 93% |
| Overall | 84% | 89% |

88. Looking at the main fuel types across the whole winter period **Figure E7** shows the availability of the Nuclear, Coal and Gas generation.

Figure E7 - 2011/12 Generation Availability by Main Fuel Types



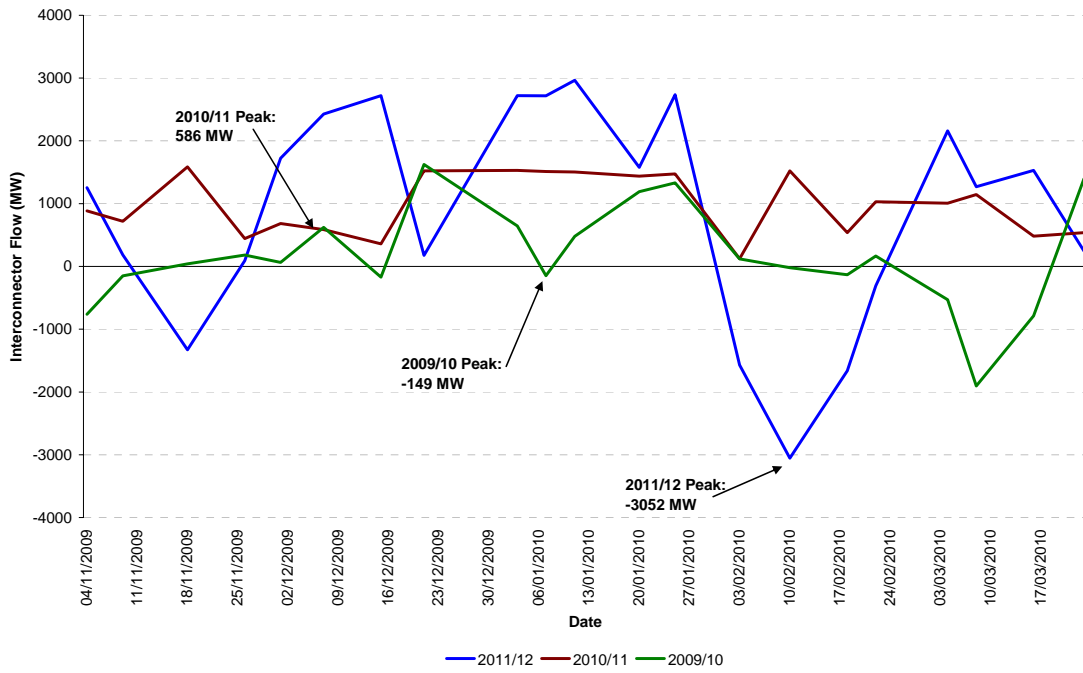
Interconnector Flows



Interconnectors

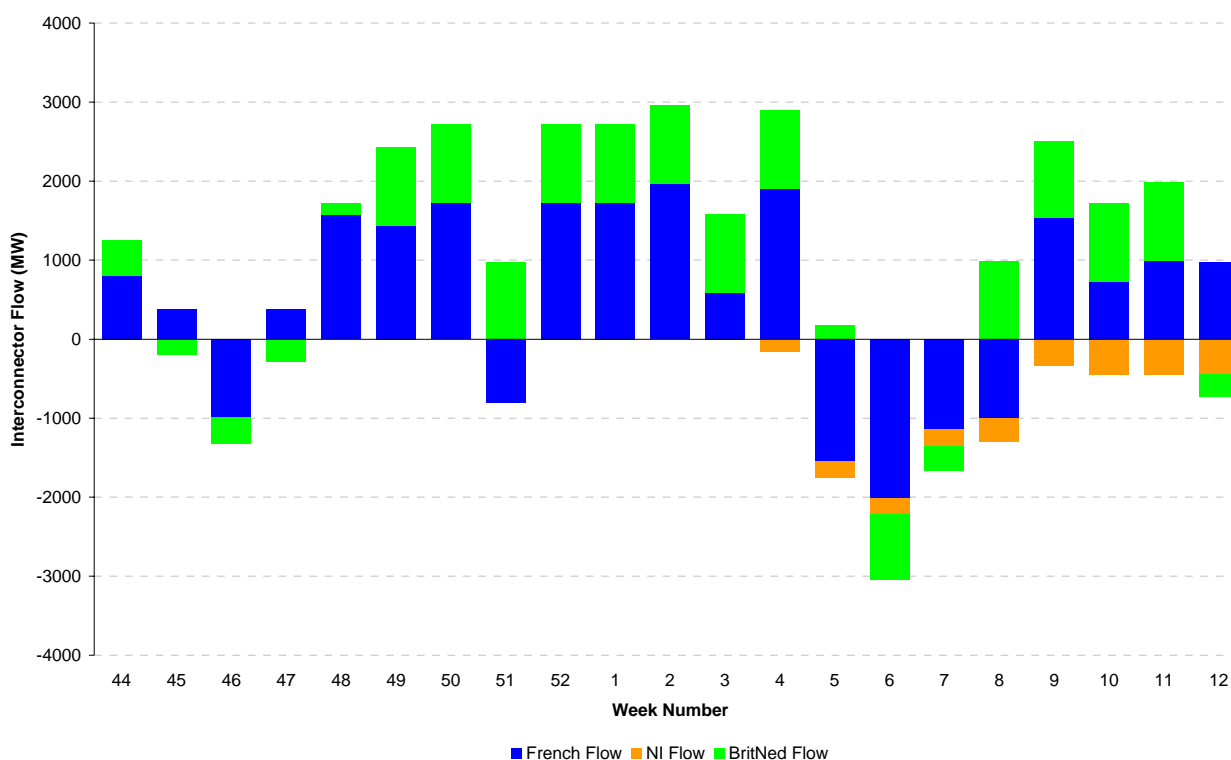
89. The IFA connecting England to France can deliver up to 2GW in either direction. The Moyle interconnector can deliver up to 500 MW in either direction. The maximum flows on the interconnector are however reduced below this figure due to commercial restrictions. The BritNed interconnector can deliver up to 1GW in either direction, and began operating on 1 April 2011.
90. The new interconnector to Ireland, the East-West Interconnector, is due to be commissioned over the summer so it has not been included for the review of Winter 2011/12 but will be considered in the Outlook for 2012/13.
91. **Figure E8** shows the combined interconnector flow for the last three winters at the GB weekly demand peak. As the interconnector capacity has increased it can be seen that there is scope for greater fluctuations in interconnector flow. Interconnectors are no longer subject to Transmission Use of System Charges. Hence it is possible for flows to be out of GB over the winter peak, as was observed at the time of this winter's peak demand on 8 February 2012, when it was exceptionally cold on the Continent as well as in Great Britain and the interconnectors were exporting a total of 3052 MW.

Figure E8 - Combined Interconnector Flow at Weekly GB Peak Demand



92. **Figure E9** shows the breakdown by interconnector of the flows at the weekly demand peaks during 2011/12. The Moyle interconnector was out of service until the end of January 2012 as a result of cable damage. The French interconnector was restricted to 1GW from 1 March 2012 for planned valve replacement. There was some ‘wheeling’ of flows when imports from BritNed occurred at the same time as exports on IFA, including at the time of two of the weekly demand peaks.

Figure E9 – Interconnector Flows at Weekly GB peak Demand 2011/12

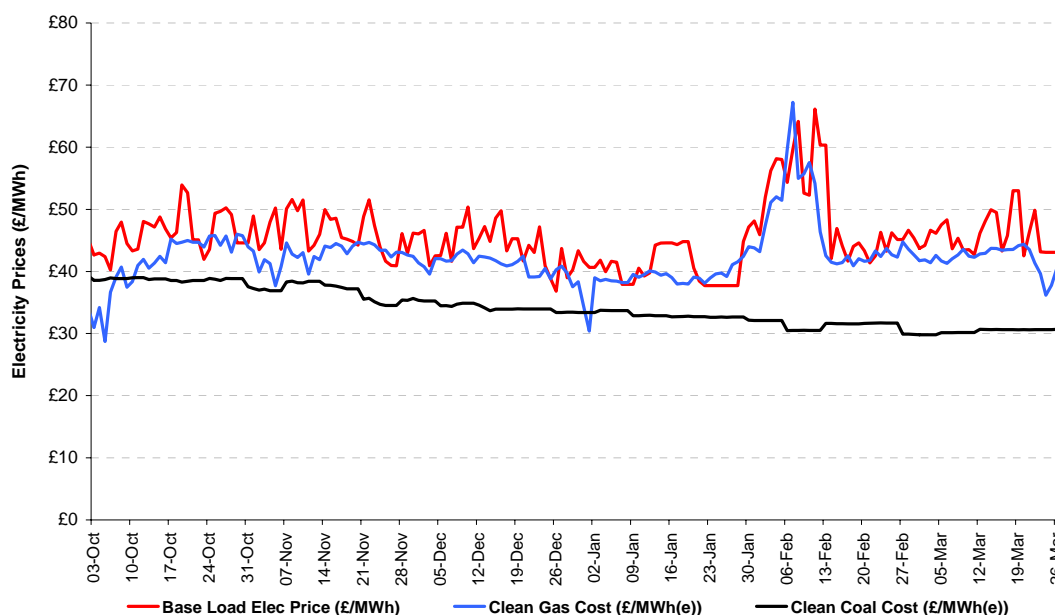


Electricity Prices

Electricity Prices

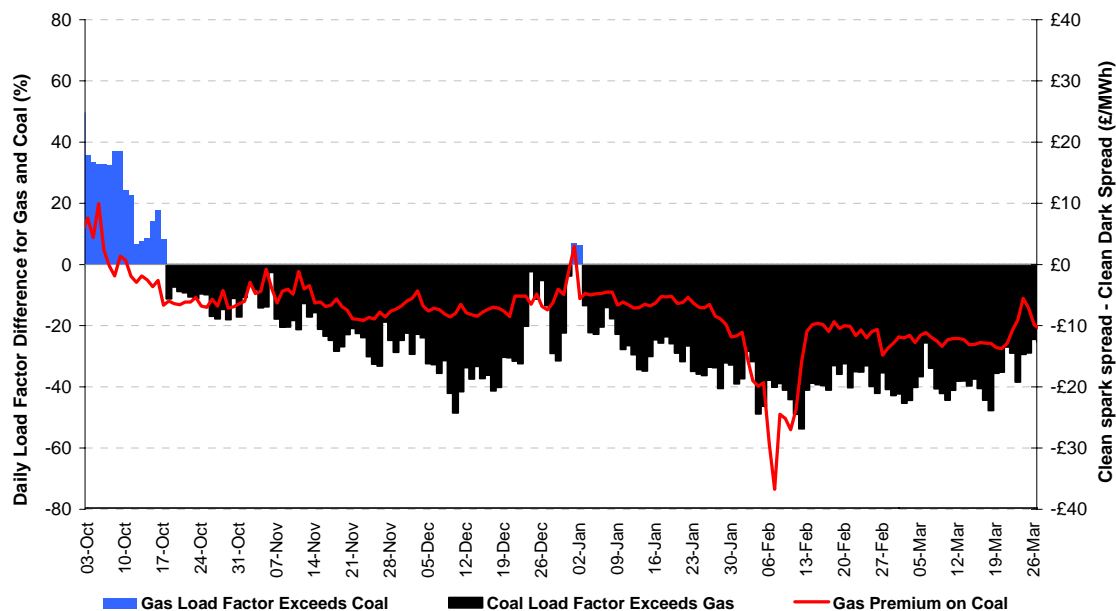
93. Day ahead base load electricity prices initially trended downwards in line with the clean gas generation cost until rising sharply in early February in response to the cold snap as shown in **Figure E10**. Prices dropped back after the cold spell but not to as low a level as before it and then continued to trend up a little towards the end of March.

Figure E10 - 2010/11 Base Load Electricity Prices and Clean Gas/Coal Costs



94. Looking at the gas premium on coal in **Figure E11** it can be seen that from mid-October onwards, apart from two days between Christmas and New Year, the cost of gas fired generation was higher than coal and as a result coal became the base load fuel source with an increasing dominance as the winter progressed.

Figure E11 - 2010/11 Difference between Daily Total Gas and Coal Generation



Operational Overview

Operational Overview

95. A Risk of System Disturbance (RSD) was issued on the morning of Tuesday 3 January as severe winds in Scotland had caused several overhead lines to trip and there was a high risk of further circuit losses.
96. Several system warnings were issued on the morning of Saturday 11 February after overnight temperatures had dropped to -13°C in some parts of England. During the course of the morning there was an accumulation of an exceptional level of generation losses, particularly from CCGTs, that reached a total of 3,500 MW. Some generators did not synchronise on time, some tripped and some reduced their capability. Although some of the losses were related to the cold weather, such as instrument lines freezing, there was also a high volume of losses due to breakdowns resulting from non-weather related causes. It was necessary to despatch Short Term Operating Reserve and invoke Emergency Assistance on the French Interconnector. A Demand Control Imminent (DCI) notice was issued at 10:25 hrs and Demand Control was instructed to five Distribution Network Operators (DNOs) in order to maintain system security. All demand control was achieved by voltage reduction and there was no loss of supply. A Risk of System Disturbance (RSD) and a Notice of Insufficient Margin (NISM) were also issued.

Transmission System Issues

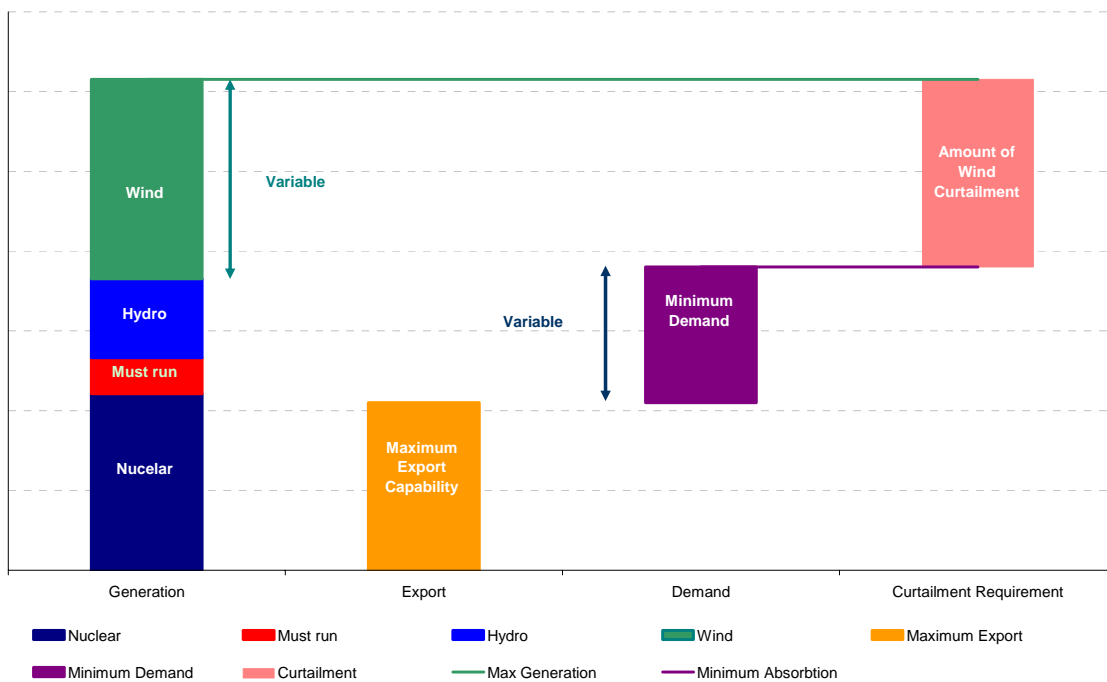
Transmission System Issues

97. Action was taken at various times during the winter to reduce output from certain wind farms in Scotland in order to maintain system security across constraint boundaries. A total of 150 GWh was constrained off through a combination of option contracts, trading and bid acceptances. This was 2% of the Great Britain total of 7238 GWh of metered wind output during the same period.
98. **Figure E12** illustrates the requirement for wind curtailment across a constraint boundary. For this example the Scotland to England boundary of the transmission system has been used.
- A boundary can be created to cover an area of the system where there will be an amount of generation and demand, in this example Scotland is the area inside the boundary
 - When the demand inside a boundary is equal to the generation inside a boundary the flow across the boundary is zero
 - Any imbalance between the demand and generation inside a boundary will create a flow across the boundary
 - A boundary with a constraint will have a limit to the amount of flow across the boundary, normally dictated by the capacity of the transmission network. This is a constraint boundary
 - The Green line shows the Maximum expected Generation capacity during a minimum demand period. Hence the following fuel types are either expected to run or have the potential to run during a minimum:
 - Nuclear due to current inflexible nature
 - Must run generation required for system security
 - Hydro generation that will run in the event of a wet and windy period
 - Wind power as output will follow wind conditions.
 - The purple line is the Minimum Absorption Capability from the group and is made up from:
 - Maximum Export Capability (Yellow Box) which is the transmission capacity between Scotland and England - the constraint boundary in this example
 - Minimum Demand (Purple Box) within the group.
 - The difference between the two lines is the volume of generation that would have to be curtailed in order to maintain system security. In the event of a requirement to reduce generation inside the constraint group the most cost

effective generation would be used, in these wet and windy events Wind and Hydro generation are normally the most cost effective and would be reduced first.

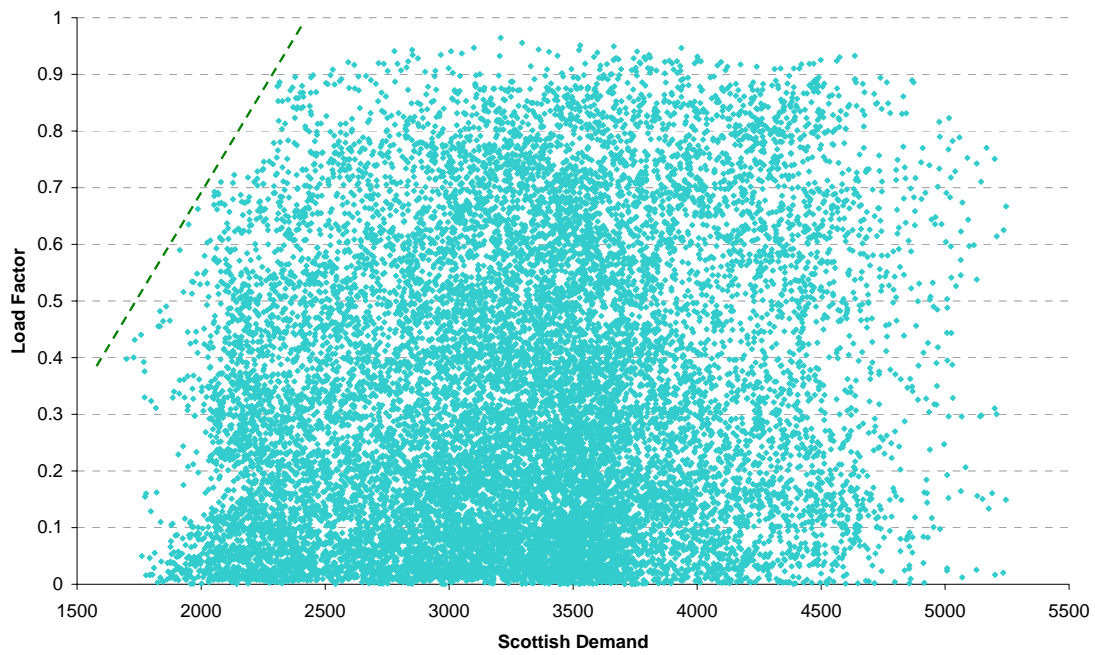
99. The analysis within the chart assumes the worst case scenario where by all generation units of all the fuel types are available and operational. It also includes a pessimistic value for the constraint from Scotland to England. In real terms these events coincide very rarely. There is also variability within the data.

Figure E12 - Derivation of Wind Curtailment Requirement between Scotland and England



100. The wind power and minimum demand are the most volatile variables in this analysis and in **Figure E13** the half hourly levels for the Scottish demand and Scottish wind output for 2011 have been plotted against each other. The data is based on wind load factor rather than wind output due to the steadily increasing value of wind capacity.
101. The top left corner of the data is the most significant part where there are low demands and high wind outputs. The absence of points in this area as marked by the dotted line results from the curtailment of wind farm output during times of low demand. More analysis is presented in the second part of the document when looking at the potential for wind curtailment during the forthcoming winter.

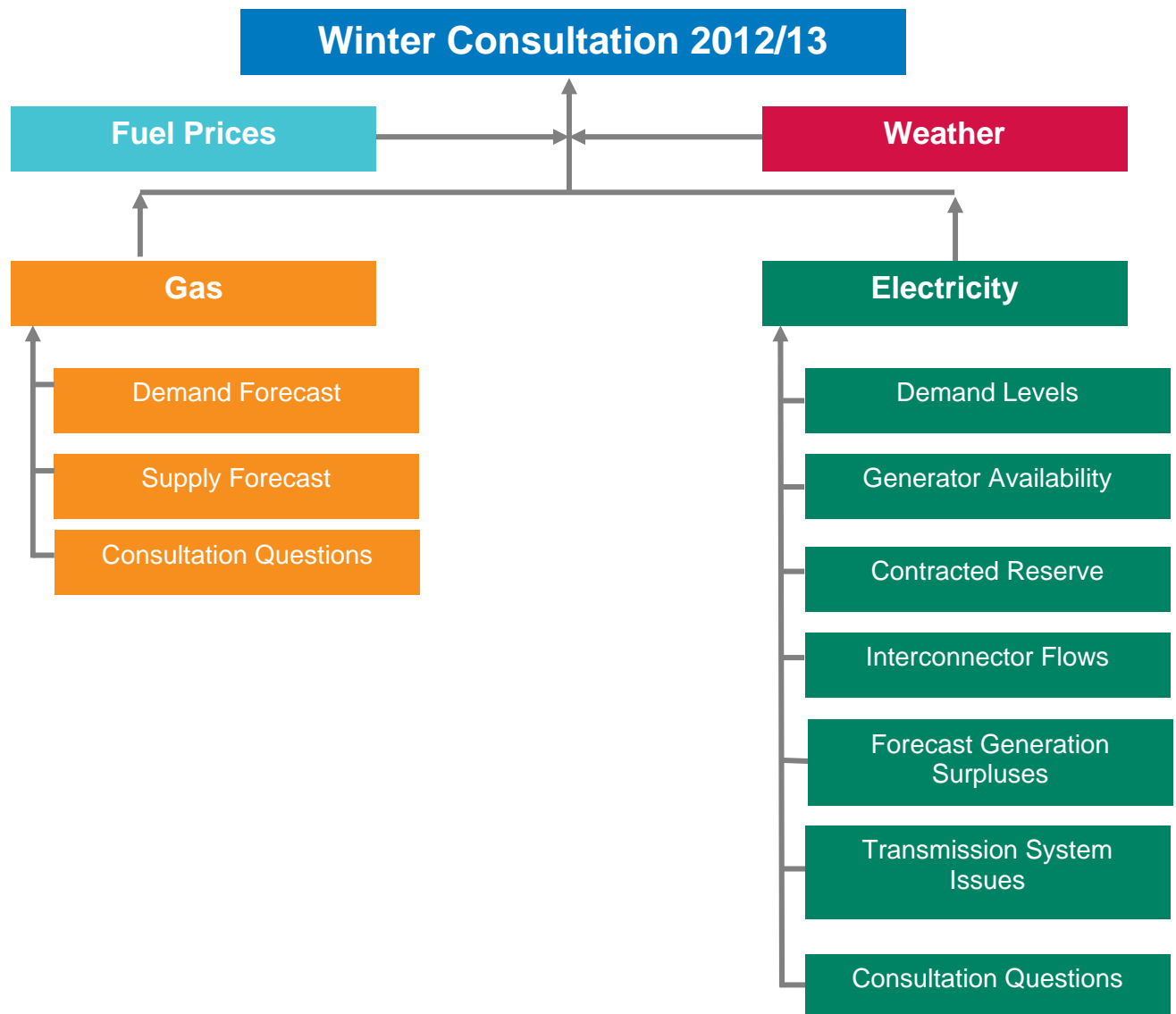
Figure E13 - Scottish Half hourly wind and demand levels for 2011



Consultation Questions - Electricity - Review

| Number | Question |
|--------|--|
| EQ1. | What further analysis of the winter peak would be useful for the winter consultation/outlook? |
| EQ2. | What other factors could be used in understanding the flows on interconnectors? |
| EQ3. | Are there any other fuel sources that require further analysis other than wind? |
| EQ4. | Is the description of the issues surround wind curtailment beneficial or is more detail and analysis required? |

Winter Consultation 2012/13



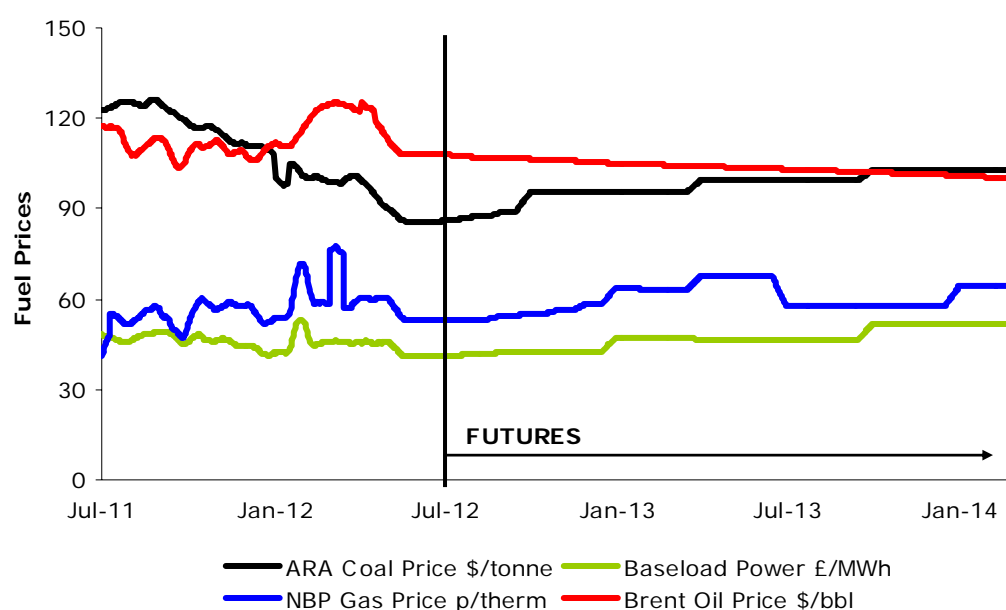
Weather

102. Information relating to winter weather for 2012/13 will be issued in the Winter Outlook Report in September / October.

Fuel Prices

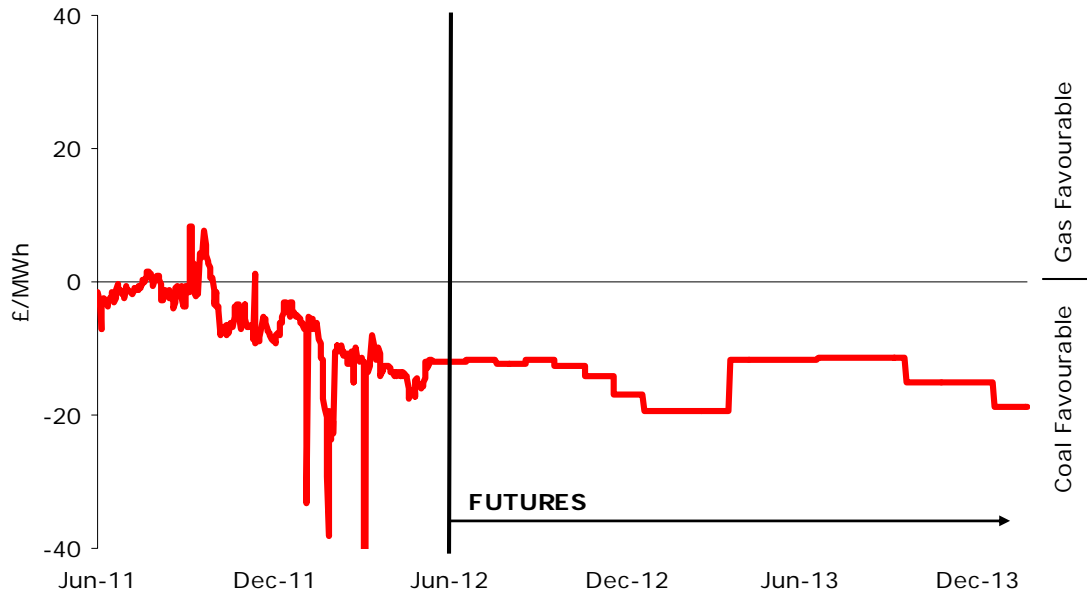
103. **Figure F4** shows historic energy prices and future prices as of 24 May 2012. These prices should reflect the markets view of energy related risks, such as the global economic outlook, continued tensions in North Africa and the Middle East and Japan's and other Asian markets appetite for high LNG imports.

Figure F4 - Historic and Future Energy Prices



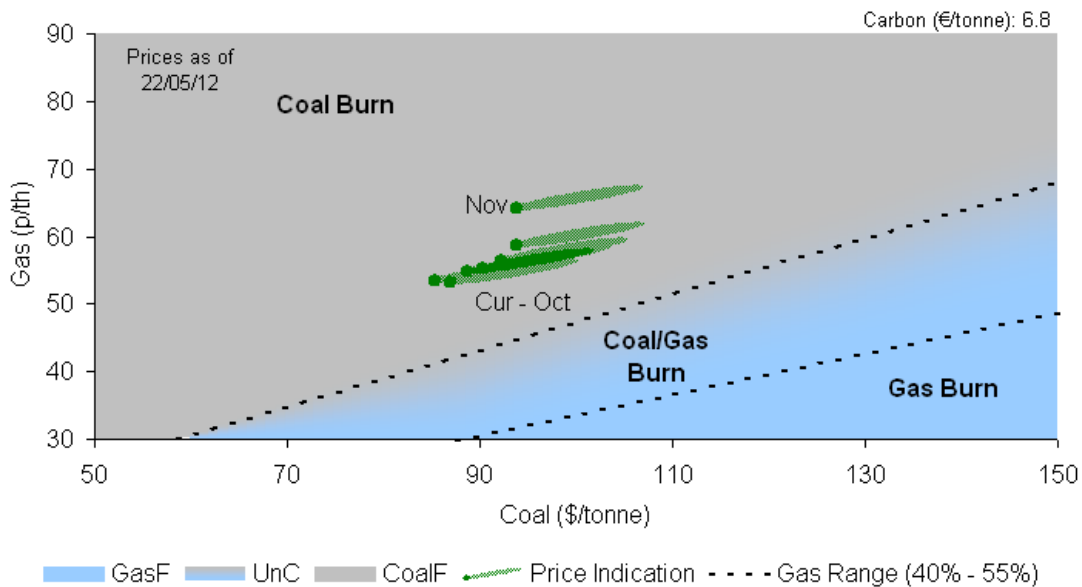
104. The forward gas price shows some seasonality with the highest winter prices similar to gas prices based on oil indexed contracts. These prices currently provide a ceiling to the UK gas price. Other forward energy prices show less variation. Oil shows a small decline, coal shows a steady increase and power shows a small increase and some winter related seasonality.
105. Though not shown, next winter's forward US gas prices are only about \$3.3 / million BTU (20 p/therm), hence diversion of LNG cargoes to the US is not expected.
106. There are numerous factors that could affect the UK winter gas price, these include; changes to the oil price and other UK and Continental factors such as supply, demand, generation availability and storage levels.
107. **Figure F5** shows the relative dark and spark spreads, showing whether gas or coal is favoured for electricity generation next winter. Despite forward coal prices increasing, the current prices strongly favour coal burn over gas for all of next winter and beyond.

Figure F5 – Relative power generation economics (1)



108. **Figure F6** shows the relative economics of coal versus gas burn for power generation for next winter on a monthly basis.

Figure F6 - Relative power generation economics (2)



109. The analysis strongly suggests that coal should be the favoured source of fuel for generation for next winter. Other factors may part mitigate this; these include running hours for LCPD and generation portfolios.

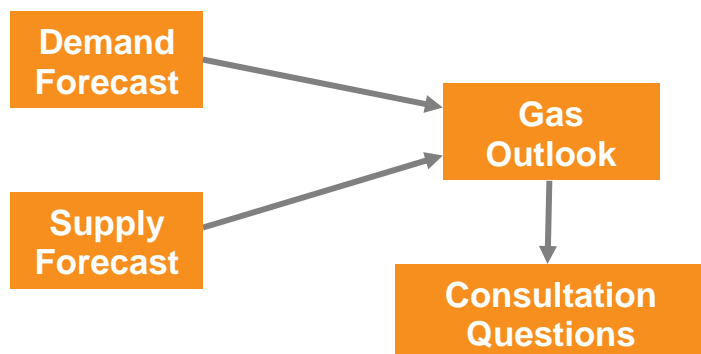
Winter Review

Fuel Prices

09 July 2012

110. For gas to become the preferred source of fuel for power generation next winter, the gas price needs to fall by about 20 p/therm or there needs to be a further increase in coal price of about \$50/tonne.

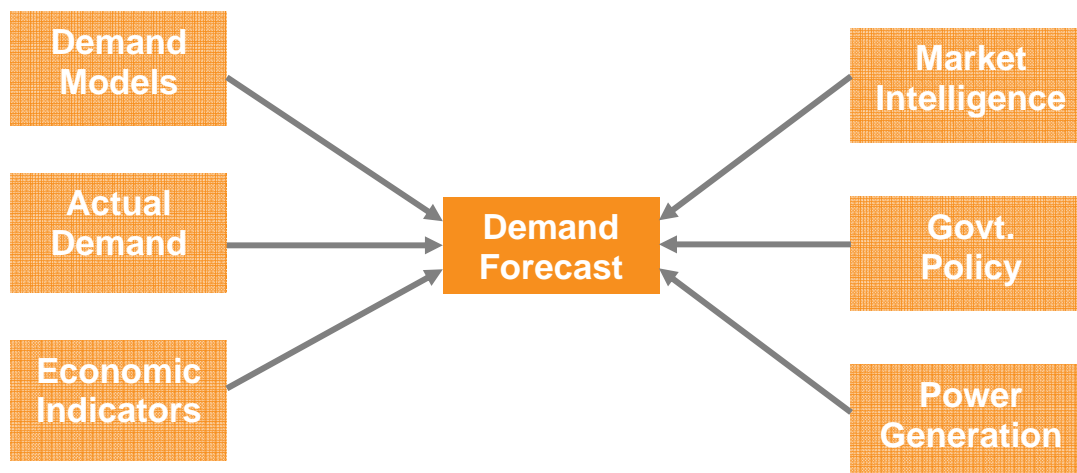
Gas



Overview

111. This chapter covers the gas supply-demand outlook for the forthcoming winter together with an update on the Safety Monitors and provision of new NTS capacity.

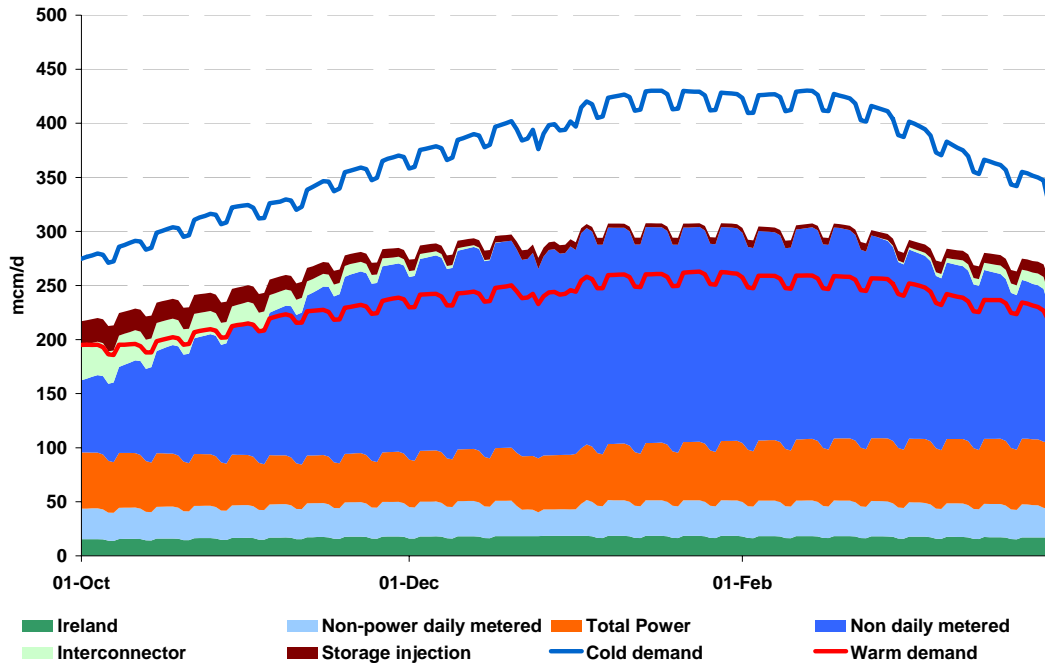
Demand Forecast



112. The 2012/13 winter demand forecasts are similar to the 2011/12 weather corrected demands except for IUK exports and storage injection. Gas for power generation is forecast to be the marginal generation in 2012/13 with demands similar to 2011/12.

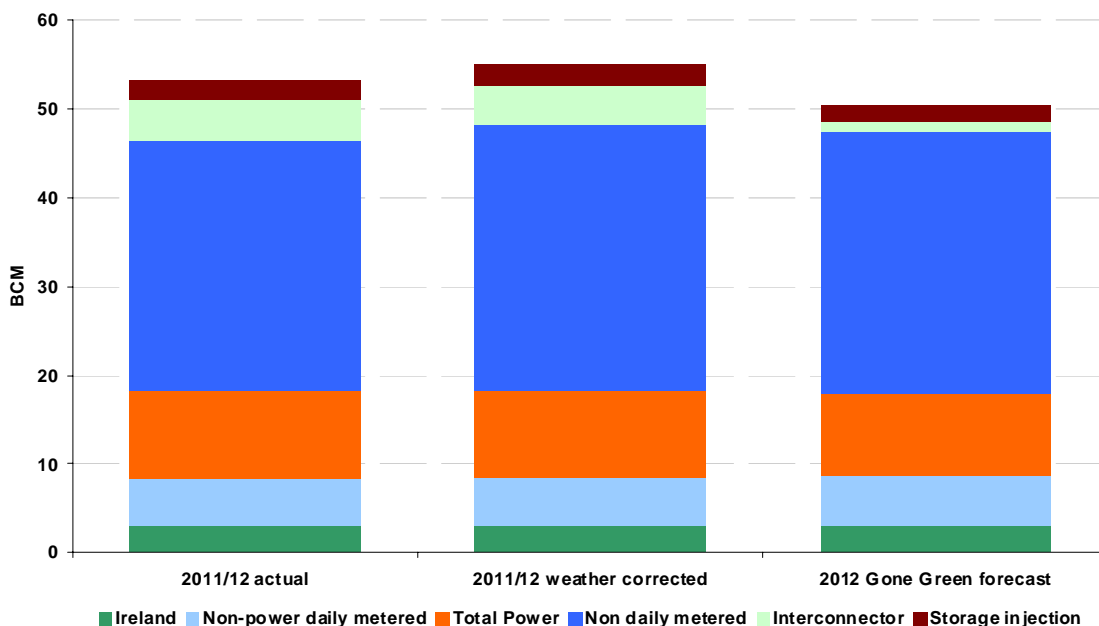
113. **Figure G17** shows the forecast gas demand for winter 2012/13 based on seasonal normal demand. In addition, lines to represent cold and warm demand are also shown. These lines represent the influence of weather rather than any demand changes associated with, for example, power generation economics.

Figure G17 - Forecast Gas Demand Winter 2012/13



- 114. The chart shows seasonal normal demand peaking at about 300 mcm/d. In reality, peak winter demands will be appreciably higher than this, as for much of the winter, temperatures can be expected to be colder than seasonal normal temperatures.
- 115. **Figure G18** shows the actual and weather corrected demand for last winter and also the Gone Green forecast demand for winter 2012/13.

Figure G18 - Forecast Gas Demand October 2012 to March 2013



116. The chart shows:

- The impact of weather correction on the 2011/12 NDM demand
- Little difference between weather corrected 2011/12 and the winter forecast for 2012/13. The only noticeable difference being the forecasts for IUK exports and storage injection. These are subject to considerable uncertainty.

117. **Table G4** shows the historic actual and weather corrected demand for winters 2009/10 through to 2011/12 and the forecast for winter 2012/13.

Table G4 - Forecast Gas Demand- October to March 2012/13

| October to March winter bcm | 2009/10 | | 2010/11 | | 2011/12 | | 2012/13 |
|--------------------------------|-------------|-------------------|-------------|-------------------|-------------|-------------------|-------------|
| | actual | weather corrected | actual | weather corrected | actual | weather corrected | forecast |
| NDM | 33.6 | 32.0 | 34.2 | 31.4 | 28.2 | 29.9 | 29.4 |
| DM + Industrial | 6.0 | 5.9 | 5.8 | 5.8 | 5.3 | 5.3 | 5.5 |
| Ireland | 3.6 | 3.6 | 3.6 | 3.6 | 3.0 | 3.1 | 3.1 |
| Total Power | 16.6 | 16.6 | 12.5 | 12.4 | 9.9 | 9.9 | 9.3 |
| Total demand | 60.5 | 58.9 | 56.6 | 53.7 | 46.7 | 48.4 | 47.7 |
| IUK export | 1.1 | 1.1 | 2.1 | 2.1 | 4.4 | 4.4 | 1.4 |
| Storage injection | 1.2 | 1.2 | 1.8 | 1.8 | 2.3 | 2.3 | 1.8 |
| GB Total | 62.8 | 61.2 | 60.5 | 57.6 | 53.5 | 55.2 | 50.9 |

118. On a weather corrected basis, the table shows some decline in all sectors except IUK exports and storage injection. Power generation continues to fall due to fuel prices continuing to favour coal generation over gas.

119. **Table G5** shows the daily average demand for last winter and the forecast demand for winter 2012/13. The table also shows the actual range of demand experienced last winter and a forecast range.

120. The low forecast range for weather sensitive loads is based on a very warm early October⁵ day, Ireland, IUK and storage on historic data and power on our low gas scenario.

121. The high forecast range for weather sensitive loads is based on a very cold January day, Ireland on our peak day forecast, IUK and storage on historic data and power on our high gas scenario.

122. **Table G6** shows a similar table to **Table G5** but is based on the mid-winter months of December to February.

⁵ For the December to February range in Table G6, the very warm day applies to early December

Table G5 - Forecast Daily Gas Demand- October to March 2012/13

| October to March winter | | | | | | | |
|-------------------------|----------------|---------------------------|---------------|--------------|--------------|----------------|--------------|
| mcm/d | Daily average | | | Actual range | | Forecast range | |
| | 2011/12 actual | 2011/12 weather corrected | 2012 forecast | 2011/12 low | 2011/12 high | 2012/13 low | 2012/13 high |
| NDM | 154 | 163 | 162 | 35 | 277 | 35 | 344 |
| DM + Industrial | 29 | 29 | 30 | 19 | 35 | 19 | 45 |
| Ireland | 17 | 17 | 17 | 12 | 23 | 12 | 30 |
| Total Power | 54 | 54 | 51 | 35 | 81 | 35 | 95 |
| Total demand | 255 | 265 | 262 | 156 | 401 | 140 | 516 |
| IUK export | 24 | 24 | 8 | 2 | 58 | 0 | 60 |
| Storage injection | 13 | 13 | 9 | 0 | 60 | 0 | 60 |
| GB Total | 292 | 302 | 278 | 209 | 421 | 205 | 516 |

Table G6 – Forecast Daily Gas Demand – December to February 2012/13

| December to February winter | | | | | | | |
|-----------------------------|----------------|---------------------------|---------------|--------------|--------------|----------------|--------------|
| mcm/d | Daily average | | | Actual range | | Forecast range | |
| | 2011/12 actual | 2011/12 weather corrected | 2012 forecast | 2011/12 low | 2011/12 high | 2012/13 low | 2012/13 high |
| NDM | 195 | 196 | 190 | 130 | 277 | 125 | 344 |
| DM + Industrial | 30 | 30 | 31 | 19 | 35 | 19 | 45 |
| Ireland | 17 | 17 | 18 | 12 | 23 | 12 | 30 |
| Total Power | 51 | 51 | 52 | 35 | 71 | 35 | 95 |
| Total demand | 295 | 295 | 292 | 205 | 401 | 200 | 516 |
| IUK export | 15 | 15 | 1 | 2 | 28 | 0 | 30 |
| Storage injection | 10 | 10 | 2 | 0 | 45 | 0 | 45 |
| GB Total | 320 | 320 | 295 | 238 | 421 | 235 | 516 |

123. The ranges in the tables highlight the considerable variation that exists for essentially all demand sectors even for the main winter months of December to February.
124. **Figure G19** and **Table G7** show the highest ever day of demand in December 2010 and the 1 in 20 peak day demand forecasts for winter 2012/13. The biggest difference in the demands is through the accounting methodology for power generation and to a lesser extent Ireland.

Figure G19 - 1 in 20 Peak Day Gas Demand 2012/13

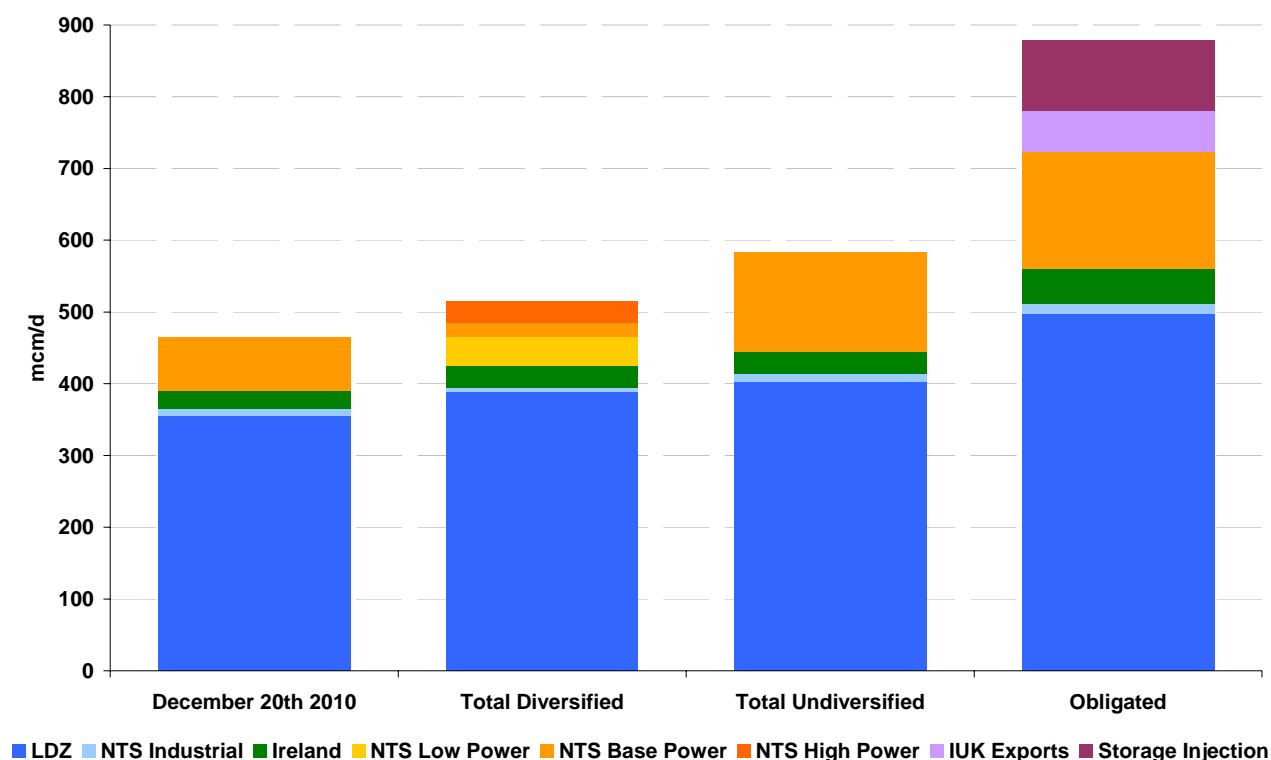


Table G7 – 1 in 20 Peak Day Gas Demand 2012/13⁶

| mcm/d | December 20th 2010 | 2012/13 Gone Green Forecast | | Obligated |
|-------------------|--------------------|-----------------------------|---------------------|------------|
| | | Total Diversified | Total Undiversified | |
| LDZ | 356 | 388 | 403 | 497 |
| NTS Industrial | 9 | 7 | 11 | 15 |
| Ireland | 25 | 30 | 30 | 48 |
| NTS Power | 74 | 90 | 139 | 163 |
| IUK Exports | 0 | 0 | 0 | 57 |
| Storage Injection | 0 | 0 | 0 | 98 |
| Total | 465 | 516 | 583 | 878 |

125. Due to the price assumptions, the Gone Green base case forecast for gas-fired power generation is relatively low. For the 1 in 20 peak, the high case forecast for power generation is now used. This assumes lower gas prices relative to coal, and

⁶ Demand data can differ between different sources for a number of reasons including classification, CV and closeout date. Power generation classifications are: in tables G4 to G6 the LDZ connected power stations at Fife, Derwent, Shoreham, Barry, Severn Power and Fawley are included in the total power category but in G7 they are included in LDZ demand. Grangemouth and Winnington NTS offtakes are included in total power in G4 to G6 but NTS industrial in G7. Immingham and Shotton Paper are classified as NTS power stations for all 3 tables.

lower availability of non-gas generation such as nuclear and wind. For the 2012/13 Gone Green forecast, this increases the power generation component of the diversified peak day forecast by 30 mcm from 60 mcm to 90 mcm.

126. The CWV formula has been modified to adjust for the increase in demand in cold weather observed in the last 3 gas supply years. This corrects for the increase in weather sensitivity in cold weather described in paragraph **29** and adds 6% to the 2012/13 Gone Green LDZ peak demand forecast. This is partly offset by a 4% reduction in annual demand giving a net increase of 2% to the peak forecast.

Supply Forecast



127. This section examines each of the potential (non-storage) gas supply sources in turn: UKCS and imports from Norway, the Continent and LNG. As in previous winters, there is considerable uncertainty in both the source and the level of imported supplies for next winter. Our initial view is appreciably influenced by our experience last winter and feedback through our Future Energy Scenarios⁷ (FES) consultation process. This should not be seen as a definitive view at this stage but a means for industry engagement and consultation.

UKCS Gas Supplies

128. For the purposes of this document, our initial assessment of UKCS supplies for winter 2012/13 is based primarily on industry feedback recently received from our 2012 FES consultation. **Table G8** compares our UKCS outturn from Winter 2011/12 and our initial view for 2012/13.

Table G8 - Preliminary 2012/13 UKCS Maximum Forecast by Terminal

| Peak (mcm/d) | 2011/12 | | 2012/13 |
|------------------------------|----------------|------------|--------------|
| | Winter Outlook | Highest | Initial View |
| Bacton | 51 | 53 | 38 |
| Barrow | 11 | 11 | 9 |
| Burton Point | 2 | 3 | 2 |
| Easington | 9 | 10 | 14 |
| St Fergus⁸ | 41 | 42 | 38 |
| Teesside | 20 | 20 | 25 |
| Theddlethorpe | 13 | 12 | 11 |
| Total | 147 | 151 | 137 |
| 90% Op Forecast | 132 | | 123 |

129. **Table G8** shows a provisional UKCS maximum supply forecast of 137 mcm/d for Winter 2012/13. This represents a 7% decline against the equivalent forecast for Winter 2011/12. In previous years, reported declines have been typically between 5% and 10%. The decline in 2012/13 is primarily due to general field decline and the possibility of continued flow reductions to Bacton through SEAL arising as a consequence of the Elgin gas leak.

⁷ Formerly known as Transporting Britain's Energy (TBE) consultation process

⁸ Excludes estimates for Vesterled and Tampen

- 130. Despite the overall decline a number of new fields are forecast to come on-stream before or during the 2012/13 winter, particularly at Easington and Teesside.
- 131. For the purposes of supply / demand analysis and for security planning, a lower operational forecast of UKCS is used. For this purpose, an availability of up to 90% is used, resulting in a UKCS planning assumption for next winter of 123 mcm/d.
- 132. **Table G9** details how the 2012/13 UKCS forecast is derived.

Table G9 – Derivation of 2012/13 UKCS Maximum Forecast

| | mcm/d |
|--|------------|
| 2011/12 Highest | 151 |
| Forecast decline and loss through SEAL | -31 |
| Forecast production increase from new fields | +17 |
| 2012/13 Winter Forecast | 137 |
| 2012/13 90% Operational Forecast | 123 |

Norwegian Imports

- 133. Norwegian imports to the UK flow through two dedicated import pipelines; Langeled to Easington and Vesterled to St Fergus and two additional offshore connections; Gjoa and the Tampen Link, both to the UKCS FLAGS pipeline to St Fergus.
- 134. In order to forecast Norwegian flows to the UK for next winter, an estimate of total Norwegian production is made, based on historical trends and expectations for the coming winter. An estimate of likely Continental flows is then made, which takes into account historical ranges along with expectations for this winter. As was the case in the Winter Outlook, there is now also an estimate for Norway’s own-use gas, which is largely used in industry but also includes some domestic, industrial and power generation.
- 135. Due to the potential variation in Continental flows, a range of Norwegian flows to the UK is calculated based on observed load factors to each of the Continental countries that receive Norwegian supplies. For winter 2012/13, our preliminary forecast of Norwegian supplies to the UK is 90 mcm/d within a range from 70 to 115 mcm/d.
- 136. **Table G10** shows the forecast range of Norwegian exports for winter 2012/13. Also shown is a higher estimate of Norwegian flows for the mid-winter period to account for supply seasonality.

Table G10 – Winter 2012/13 Estimates of Norwegian Exports

| (mcm/d) | High flows to Continent | Low flows to Continent | Central | Central (mid winter) |
|--------------|-------------------------|------------------------|------------|----------------------|
| Norway | 25 | 25 | 25 | 25 |
| Belgium | 40 | 35 | 37 | 40 |
| France | 50 | 45 | 48 | 50 |
| Germany | 135 | 100 | 120 | 130 |
| UK | 70 | 115 | 90 | 95 |
| Total | 320 | 320 | 320 | 340 |

Continental Imports

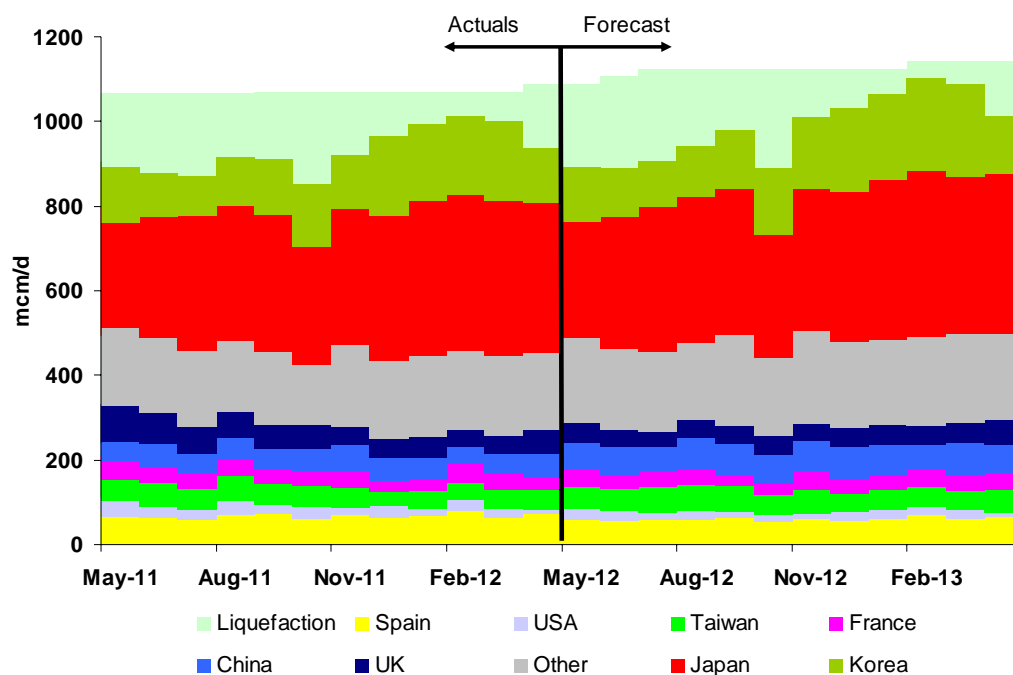
137. Supplies through the BBL pipeline were more volatile than usual at the start of last winter; this may have been due to the commercial arrangements for interruptible non-physical reverse flow (i.e. non-physical exports). This trend could continue with BBL showing more responsiveness to UK market conditions.
138. For planning purposes, our preliminary forecast for BBL for next winter flows is 30 mcm/d. This is the same as last year's forecast and that experienced last winter on days over 400 mcm/d demand.
139. Previous winters have shown IUK to be responsive to the following factors:
- Gas price
 - UK demand
 - Availability or rather non-availability of other non-storage supplies
 - Storage flows / stocks.
140. The low levels of imports seen last winter was consistent with these assumptions as lower demands and high storage stocks limited the need for significant IUK imports.
141. For next winter, these relationships are anticipated to generally hold true again with IUK importing when the UK has a market need for additional supplies above those supplied by most but not all other sources.
142. Our forecast for IUK imports next winter is to typically commence imports when demand exceeds the aggregate of all other non-storage supplies. Based on the range of other supplies, the resultant demand range is ~300-400 mcm/d. Under certain conditions, for example, low storage stocks, high UK gas prices, or supply losses, then IUK could be expected to import at lower demands. Conversely, if storage stocks were high, UK gas prices low or supply availability was above expectations then IUK could be expected to import at higher demands.
143. Maximum IUK flows are forecast based on the average peak for the past two winters of ~40 mcm/d. However, for security planning, a lower value of 20 mcm/d will initially be used until there is evidence of higher flows.

LNG Imports

144. Last winter, as shown in **Figure G11**, the UK received a lower level of imports than winter 2010/11. Our view is that LNG imports will remain suppressed due to the high levels of demand in Japan and other Far East markets. The movements of LNG reflect the higher prices paid in these markets compared to the UK, Europe and the US. Forward prices suggest this trend will continue through the winter 2012/13.
145. **Figure G20** shows our internal analysis of LNG demand on a historic and forward basis. The chart shows liquefaction capacity (light green) overlaid with global demand. The chart shows the LNG market may remain tight over winter 2012/13, and this may lead to continued suppressed LNG deliveries to the UK.

Figure G20 - Global LNG Supply / Demand

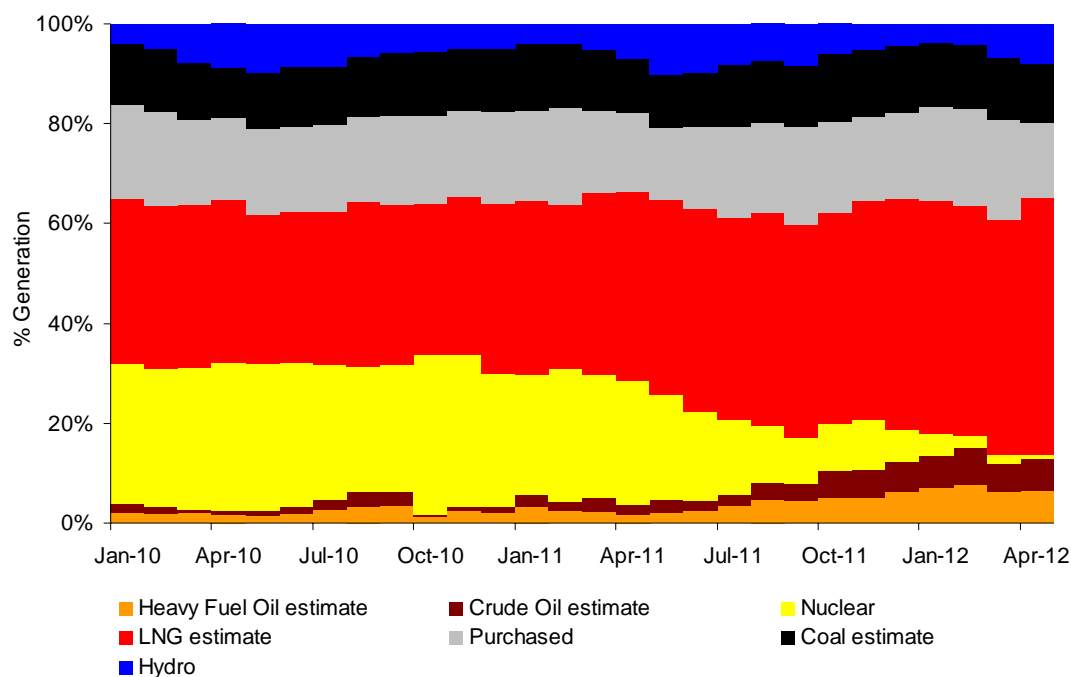
Source: Lloyd's List, LNG Journal, National Grid



146. In terms of LNG production, the chart shows increased LNG production during 2012. The Pluto project in Australia started production in May, while projects in Angola and Algeria are expected to start initial production over the summer.
147. In terms of LNG demand, the chart shows an overall year on year increase of around 5%. Our view is that short term future growth in Japan is now modest as our analysis suggests most Japanese CCGTs are now operating close to maximum levels, this being reflected by the increase use of expensive oil burn to make up for lost nuclear power, as shown in **Figure G21**.

Figure G21 - Estimated Japanese Power Generation Mix

Source: Federation of Electric Power Companies Japan (FEPC), National Grid



- 148. The chart shows how LNG has been used to make up most of the loss of Japan’s nuclear generation. Oil burn has also increased significantly. Japan’s final nuclear generator was shut for planned maintenance in early May 2012; the return of their nuclear plant remains uncertain.
- 149. In terms of attracting LNG with competing markets, gas prices in the UK remain much higher than those in the US; other European traded markets tend to be comparable with the UK. Spain may continue its recent trend of higher LNG reloads due to a combination of the economy, more pipeline imports and legislation to increase coal burn for power generation.
- 150. **Table G11** below shows some of the factors which may support higher or lower LNG imports:

Table G11 – Factors affecting LNG imports

| Higher LNG Imports | Lower LNG Imports |
|--|---|
| Increased global production | Higher global LNG demand |
| Return of some nuclear power in Japan | High LNG demand in the Far East, especially Japan |
| Potentially lower LNG demand in the US and Spain | More LNG to Gate (Netherlands) or Zeebrugge (Belgium) |
| Increase in pipeline capacity at Milford Haven | |

151. To manage the supply uncertainty surrounding LNG, a wide range is considered, namely from 30 to 100 mcm/d, with an average winter flow of just 45 mcm/d. This is broadly consistent with the average LNG flow last winter. At times of higher demand, increased flows of LNG are expected; last winter the maximum LNG flow was 86 mcm/d.
152. The range, therefore, identifies periods of both low flow and high flow from Grain and both Milford Haven facilities. Flows of LNG imports through Teesside GasPort provide a further upside to the range.

Storage

153. For next winter, extra storage capacity is expected to become available from the Aldbrough and Holford storage facilities. In addition, further space is expected with the commissioning of Hill Top Farm.
154. In aggregate, storage deliverability for next winter is at 1186 GWh/d, which is slightly higher than last year's. This is mainly due to the start-up of Holford, and should increase further when Hill Top Farm is commissioned later this year. This is expected to add a further 117 GWh/d and is expected to further increase in winter 2013/14. In addition, the completion of the Aldbrough project may add around 170 GWh/d of deliverability.
155. In aggregate, storage space for next winter is also slightly higher; this is primarily due to a higher declared value for Rough space.
156. **Table G12** shows our assumed levels of storage space and deliverability for next winter. Currently, Rough is filled to about 65%, MRS is filled to around 47%, and Avonmouth, the only remaining LNG storage site, to about 49%. This is broadly the same position as this time last year; most storage is expected to be filled before it is required next winter.

Table G12 – Assumed 2012/13 Storage Capacities and Deliverability Levels⁹

| | Space (GWh) | Refill Rate (GWh/d) | Deliverability (GWh/d) | Deliverability (mcm/d) ¹⁰ | Duration ¹¹ (Days) |
|---------------------------|--------------|---------------------|------------------------|--------------------------------------|-------------------------------|
| Short (LNG) ¹² | 677 | 2.5 | 143 | 13 | 4.7 |
| Medium (MRS) | 10181 | 542 | 558 | 51 | 18 |
| Long (Rough) | 40000 | 279 | 485 | 44.1 | 82 |
| Total | 50858 | 824 | 1186 | 108 | |
| Total 2011/12 | 48944 | 632 | 1075 | 98 | |

⁹ This table represents our operational assumptions and is based on proven performance. Reported deliverabilities may be different to 'name plate' capacities. Space includes 814 GWh Operating Margins, excludes Hill Top Farm, this will be included when operational

¹⁰ Assumed a standard CV of 39.6MJ/m³

¹¹ Duration based on Space / Deliverability, excludes within winter refill

¹² Commercial services offered by LNGS for 2012/13

Preliminary View of Supplies Winter 2012/13

157. In the previous sub-sections, we have outlined the basis for the assumptions incorporated into our analysis. **Table G13** summarises the supply range and our supply forecast for when demand exceeds 400 mcm/d. Also shown are the 2011/12 forecasts¹³ and actual flows. We should stress that these 2012/13 ranges and forecasts for supplies when demand exceeds 400 mcm/d should be regarded as provisional with the primary purpose of fostering discussion and comment.

Table G13 – Preliminary View of Non Storage Supplies Winter 2012/13

| (mcm/d) | 2011/12 Range | 2011/12 Top 100 | 2011/12 Highest | 2012/13 Range | 2012/13 400+ |
|--|------------------|--------------------|-------------------------|------------------|-----------------|
| UKCS | 106-132 | 113 | 137 | 96 – 137 | 123 |
| Norway | 70-118 | 103 | 127 | 70 - 115 | 105 |
| BBL | 24-36 | 25 | 35 | 24 - 36 | 30 |
| IUK | 0 – 30 | 0.3 | 10 | 0 – 30 | 20 |
| LNG Imports | 50 – 110 | 48 | 86 | 30 – 100 | 80 |
| Total | 250 – 426 | 289 | 327¹⁴ | 220 - 421 | 358 |
| Total inc. Storage¹⁵ | | | | 328 - 529 | 466 |

158. Based on the supply assumptions detailed in the previous supply sections, **Table G13** suggests that the non-storage supply availability for next winter is again uncertain, notably in terms of deliveries of LNG imports and, to a lesser extent, Norwegian supplies. The availability of each of these supplies is expected to influence IUK imports.

¹³ Forecast range represents our pre-winter assessment, not any subsequent revisions

¹⁴ 327 mcm/d represents the highest daily supply of non storage supplies in 2011/12, this is much lower than the aggregated supply types (395 mcm/d)

¹⁵ Assumes maximum storage of 108 mcm/d

Preliminary Safety and Firm Monitors

159. The safety monitor was introduced in 2004 as a mechanism for ensuring that sufficient gas is held in storage at all times to underpin the safe operation of the gas transportation system.
160. The safety monitor defines the level of storage that must be maintained through the winter period. The focus of the safety monitor is public safety rather than security of supply. It is a requirement of National Grid's safety case that we operate this monitor system and that we take action to ensure that storage stocks do not fall below the defined levels.
161. The firm gas monitor represents the storage level required to support Uniform Network Code (UNC) defined firm demand in a severe winter. The firm gas monitor is published solely for the purpose of providing further information to the market. With the implementation of Modification 0090, 'Revised DN Interruption Arrangements' and Modification 0195AV, 'Introduction of Enduring NTS Exit Capacity', additional demand is being designated as firm. There is, therefore, a risk that the final Firm Gas Monitor for winter 2012/13 will be set at greater than 100% of storage capacity, resulting in an immediate and continued breach. There is no clear value in continuing to publish the Firm Gas Monitor; and potential for confusion and concern if a breach is published when no market response is required or expected. Modification 0411S, 'Removal of the Obligation to Publish Firm Gas Monitor from the UNC' was accepted by the Modification Panel on 21 June 2012 and will be implemented on 13 July 2012. Hence the final Firm Monitor requirement will not be published.
162. This section on the safety and firm monitors is consistent with the industry note we issued in early July as required under the Uniform Network Code (Q5.2.1).
163. There continues to be considerable uncertainty regarding the make-up and aggregate level of non storage supplies. In winter 2010/11, the level of NSS reached record levels in excess of 400 mcm/d as the headroom of import capacity was utilised to a greater extent than in previous winters. Winter 2011/12 saw much lower demands with significantly lower NSS levels. For winter 2012/13, there is considerable uncertainty regarding the level of individual supply components, most notably LNG. The focus of the safety monitors is public safety and hence, it is prudent to ensure that the assumed level of NSS will be available throughout the winter, notably at times of high demand. Our assumption is based upon a weighted rolling average of the last five years of NSS. Analysis of previous winters' data shows that assuming an availability of 95% captures typically 95% of all data points, with those that are still below often the result of short term supply losses. Our final view of supplies for next winter will be detailed in our Winter Outlook Report document to be published in October; these levels will be used as the basis for setting the final safety monitor level by 1 October.
164. The demand background used for the analysis in this section is our demand forecasts for 2012/13 that were produced in June 2012.
165. **Table G14** shows the total safety monitor space requirement on the basis of the assumptions outlined above.

Table G14 – Total Safety Monitor Space Requirement

| | Total storage capacity (GWh) | Space requirement (GWh) | Space requirement % |
|--------------|------------------------------|-------------------------|---------------------|
| Total | 50858 | 2684 | 5.3% |

166. It is our responsibility to keep the safety monitor under review (both ahead of and throughout the winter) and to make adjustments if it is appropriate to do so on the basis of the information available to us. In doing so, we must recognise that the purpose of the safety monitors is to ensure an adequate pressure can be maintained in the network at all times and thereby protect public safety. Ideally the passage of time before next winter and the outcome of this consultation may provide further clarity on expected levels of supply for next winter.
167. As stated previously, the firm gas monitor is published solely for the purpose of providing further information to the market. The firm monitor illustrates the indicative level of gas that would need to be held in storage to supply all “firm” demand in a 1 in 50 winter. The analysis uses the same prudent demand and supply assumptions as used for the calculation of the safety monitor.
168. Modification Proposal 0195AV: Enduring NTS Exit Capacity Arrangements (Mod 0195) was directed for implementation on April 2009. From October 2012, this will also have an impact on the 2012/13 Safety and Firm Monitors in that additional NTS demand will also be considered as “firm”.
169. **Table G15** shows the indicative total level of storage required for the Firm Monitor in a 1 in 50 winter. The total space requirement to support all firm load is 40487 GWh, i.e. approximately 80% of total storage capacity of 50858 GWh (compared to approximately 94% last winter: the reduction is due to slightly lower forecast demands for 2012/13).

Table G15 – Firm Monitor Space Requirement

| | Total storage capacity (GWh) | Space requirement (GWh) | Space requirement % |
|--------------|------------------------------|-------------------------|---------------------|
| Total | 50858 | 40487 | 79.6% |

Winter 2011/12 Update on Provision of New NTS Capacity

170. Emissions related works - Work continues on the new 35MW electric drive compressor unit at Kirriemuir, the two 24MW electric drive units at St Fergus and the 35MW electric drive unit at Hatton as part of National Grid’s drive to reduce compressor station emissions. The new units are anticipated to become operational at the end of 2012.
171. South Wales Expansion Project - This project is part of the overall investment strategy to provide the capacity to transport gas from the two LNG importation

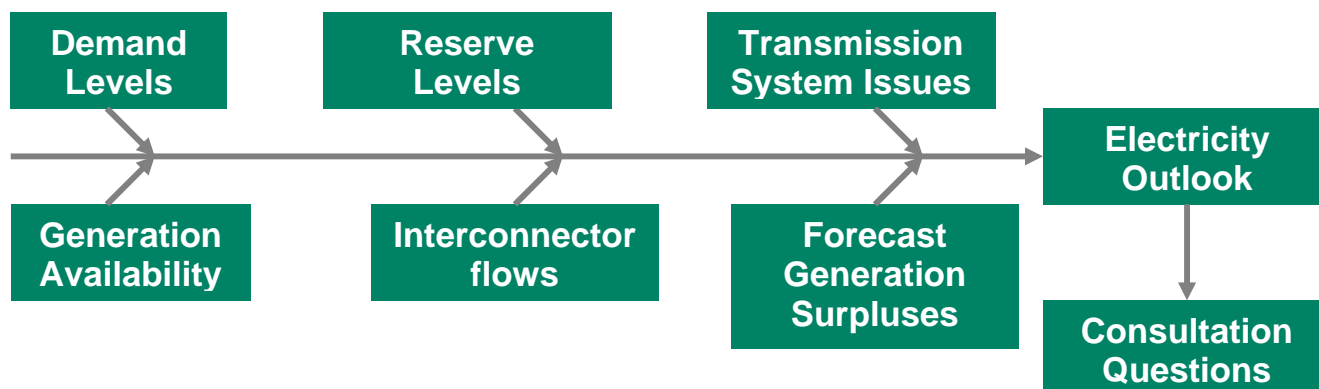
terminals at Milford Haven. Construction work continues on the Pressure Reduction Installation (PRI) at Tirley in Gloucestershire and remains on track for the PRI to become operational by winter 2012/13. On completion, the existing force majeure capacity restriction will be alleviated and Milford Haven entry capacity will increase to the 950 GWh/d release obligation.

172. New Exit Connections - Carrington Power Station will be a new connection to the NTS, with projected first gas to be taken by summer 2013.

Consultation Questions - Gas – Outlook

| Number | Question |
|--------|--|
| GQ8. | In terms of forward prices, oil indexed prices appear to provide a ceiling for UK winter gas prices. Do you agree with this? What sets the UK floor price? |
| GQ9. | Forward UK gas prices displaying some seasonality with summer / winter price differentials of about 10 p/therm. Are these differentials sufficient to develop more UK storage? |
| GQ10. | The relative economics of gas versus coal generation for next winter and beyond strongly favour coal. What factors may result in a higher gas burn? |
| GQ11. | Should 1 in 20 peak demand forecasts include power generation gas demand at high case or base case levels? Should IUK exports at peak also be considered? |
| GQ12. | Despite the numerous new UKCS developments, due to the possible absence of some gas through SEAL, we forecast a further decline in UKCS supplies next winter; do you agree with these views? |
| GQ13. | Our views for all import gas sources next winter are not too different from those experienced last winter. Do you support this view or have an alternative opinion? |
| GQ14. | Like last winter, the biggest uncertainty regarding imports is for LNG. What assumptions should be made for levels of imported LNG to the UK for next winter? Will Japanese LNG demand rise further, will other Far Eastern markets take more LNG or could the new LNG production capacity improve LNG supply? Please consider these issues or comment on other LNG related factors. |
| GQ15. | IUK also provides us with considerable supply uncertainty, in most instances we assume IUK as marginal source of supply more akin to storage. Should we continue with this approach or consider alternatives? |

Electricity

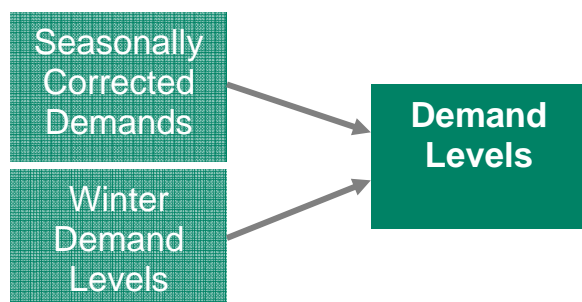


Overview

173. This section sets out the current forecast for the winter 2012/13.

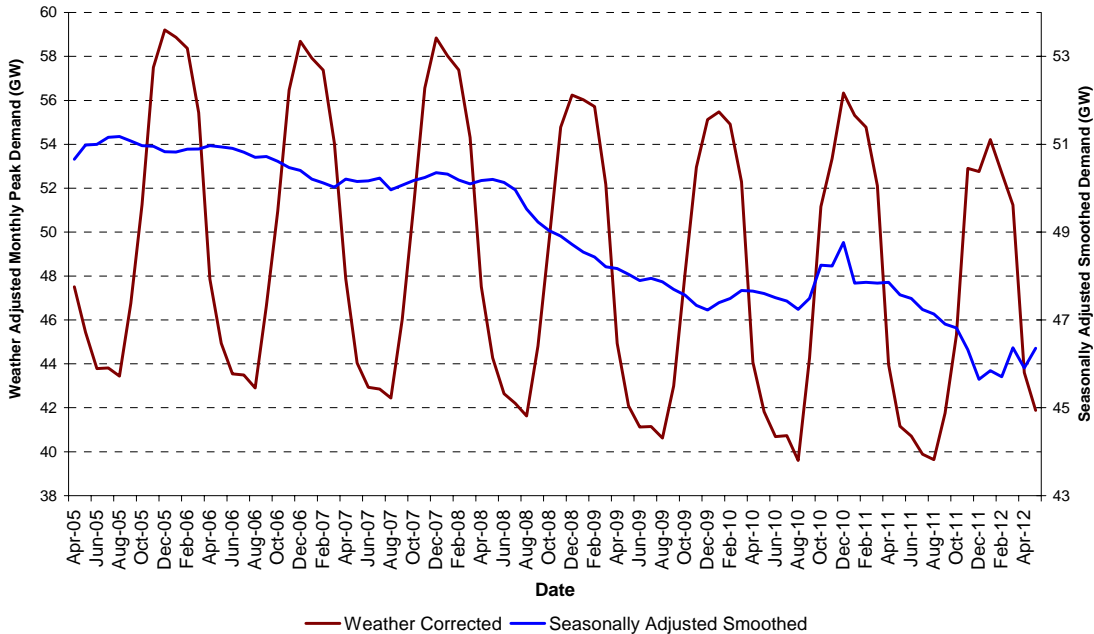
Demand Levels

174. Unless otherwise stated, demand discussed in this report excludes any exports to France, The Netherlands and Northern Ireland but does include station load and exports from the Transmission System to meet GB demand.



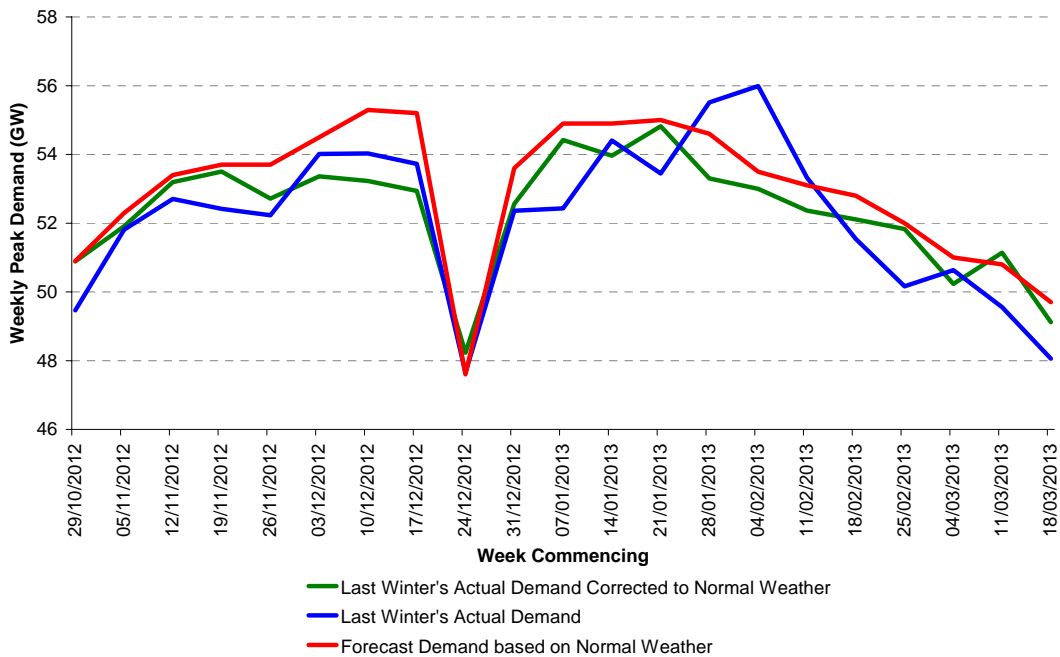
175. **Figure E14** shows the weather and seasonally corrected demand levels for the last seven years. The effect of the economic downturn of 2008-2010 can be clearly seen. A second downturn occurs from October 2011 to February 2012. There is some limited evidence for the beginning of a recovery in demand levels in the period after Easter 2012, but the situation is not clear. As such, forecasts for the coming winter are less certain than normal owing to uncertainties relating to economic factors.

Figure E14 - Weather Corrected and Smoothed Seasonally Corrected Demand



176. **Figure E15** shows the previous years actual demand, weather corrected demand and the demand forecast for the coming winter. The most current forecast at any time is given on the **BRMS**¹⁶.

Figure E15 - Previous year's outturn and forecast for 2012/13



¹⁶ www.bmreports.com

Winter Consultation

- 177. The weather corrected demand peak forecast for winter 2012/13 is currently at 55.3 GW. This is compared to the forecast last year of 55.8 GW and the weather corrected demand outturn of 54.8 GW.
- 178. 1 in 20 conditions are a particular combination of weather elements which give rise to a level of peak demand within a Financial Year which has a 5% chance of being exceeded as a result of weather variation alone. The 1 in 20 demand peak is forecast to be 58.7 GW.

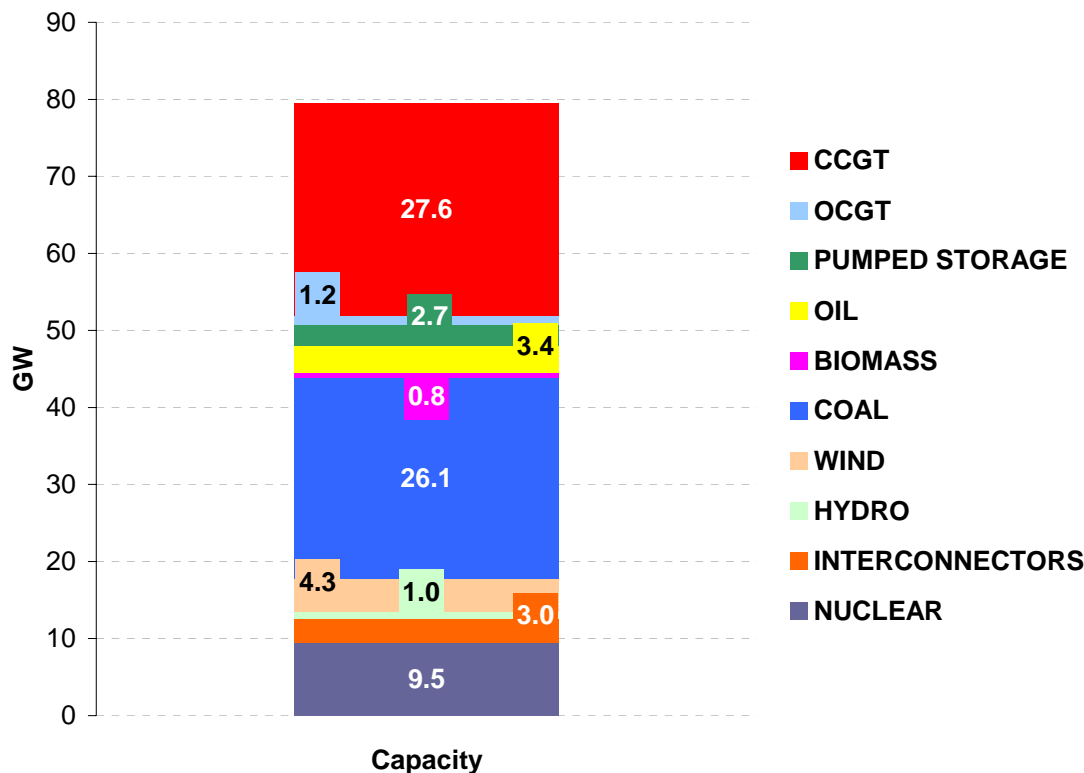
Generator Availability



Generation Capacity

- 179. Based on the observed output of power stations, National Grid’s current operational view of generation capacity anticipated to be available for the start of winter 2012/13 is 79.6 GW as shown in **Figure E16**. This is an increase of 400 MW from the capacity available at the start of the summer as reported in the Summer Outlook Report, which is mainly due to an increase in wind farm capacity and an increase in the output at Alcan following the closure of the aluminium smelter. The generation capacity will rise further once commissioning of the new units at Pembroke and West Burton B is completed. The new 500 MW East-West Interconnector with Ireland has not been included as it is still to be commissioned but it is planned to be in commercial operation by the start of the winter.

Figure E16 - Generation Capacity Operational View 2012/13



Generation Availability Assumptions

180. **Table E3** shows the assumed losses based on the average of previous winters. The losses take account of breakdowns, shortfalls and any reduction in primary energy source such as wind and water. They do not allow for planned outages as these have already been accounted for in the notified availability. The assumed losses are applied to the notified availability and this data is then used to calculate the forecast generation surplus.

Table E3 - Assumed Losses of Generation Availability for Winter 2012/13

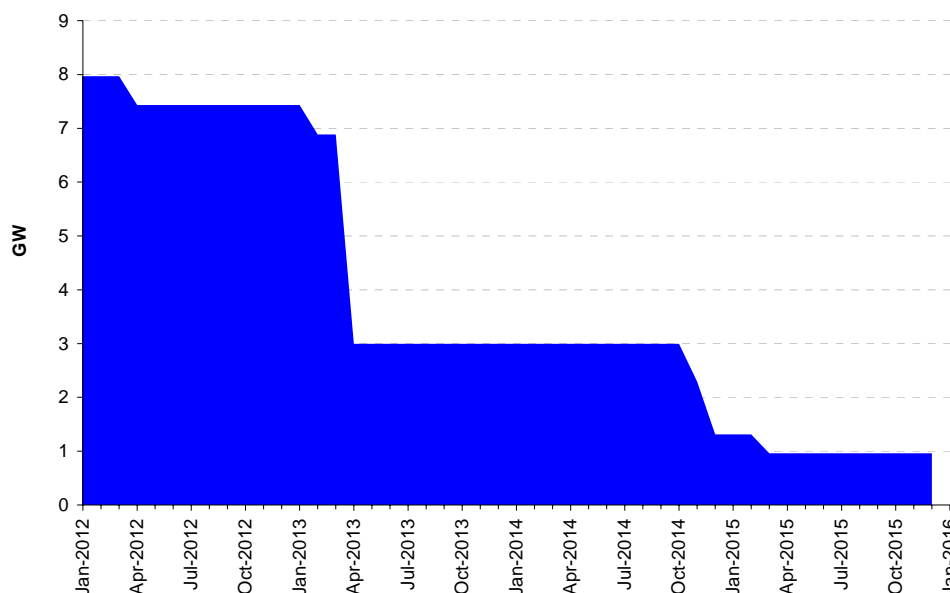
| Power Station Type | Assumed losses |
|--------------------|----------------|
| Nuclear | 16% |
| Interconnectors | 0% |
| Hydro generation | 25% |
| Wind generation | 90% |
| Coal + biomass | 15% |
| Oil | 15% |
| Pumped storage | 2% |
| OCGT | 6% |
| CCGT | 13% |



Effect of LCPD on generation capacity

181. Limited running hours under the Large Combustion Plant Directive, LCPD, for opted out plant will begin to have an affect this winter with at least 500 MW already lost and the potential to lose another 4500 MW before the end of March 2013. Based on current TEC values the current loss would be higher at 1000 MW. LCPD opted out plant has 20,000 hours allowed operation until December 2015. Two stations are expected to have used all their allocated hours by the end of March 2013 and another station is now expected to close by then even if all its available running hours have not been used. The latest view of estimated closure dates for opted out coal units is shown in **Figure E17**.

Figure E17 - Estimated Generation Capacity for LCPD Opted Out Coal Plants



Merit Order

182. The focus of this report is for meeting electricity demand and less attention is given to which types of generation are likely to be at base load, two-shifting or marginal. This issue is determined to a large degree by the market and therefore is subject to some uncertainty as market prices for winter change over time.
183. As discussed earlier in the report, forward prices are still strongly in favour of coal, indicating that coal fired power generation will continue to run at a higher load factor than gas throughout next winter.

Reserve Levels

Reserve Levels

184. In order to achieve the demand-supply balance, National Grid procures reserve services from either generation or demand side providers to be able to deal with actual demand being greater than forecast demand and to cover last minute plant breakdowns. This requirement is met from both synchronized and non-synchronized sources.
185. There is also an additional reserve requirement to meet wind generation output uncertainty. This reserve held by National Grid specifically to manage the additional variability brought about by wind generation output being lower than expected. Its value varies based upon a function of the expected wind output through each period of the day and the requirement is mainly met from both synchronized sources.
186. We procure the non-synchronized requirement from a range of service providers which include both Balancing Mechanism (BM) participants, and non-BM participants. This requirement is called Short Term Operating Reserve (STOR) and is procured on an open market tender basis that runs three times per year. National Grid encourages greater participation in the provision of reserve and engages with potential providers to tailor the service to meet their specific technical requirements.
187. For winter 2012/13, our present level of contracted STOR reserve is approximately 2.4GW, approximately 1.4 GW from BM participants and 1 GW from non-BM generating plant and demand reduction (all of which is unlikely to be available over the winter darkness peak).
188. Prior to the winter, there will be two further STOR tender rounds covering services for the winter 2012/13 darkness peak; the results of which will be published at the beginning of August and early November. Communications regarding this will be through electricity operational forums and on our website.¹⁷
189. National Grid expects to contract more STOR to provide reserve service over the winter. Last winter we contracted about 3.9 GW of STOR over the darkness peak period in all, but much of that was not available over weekday peak demands, and dependent on providers contracted position or availability. Total availability at the time of the top 20 winter peak demands last winter was about 2.3GW. This winter the expectation is to contract about 3.0 GW and allowing for seasonal influences and any one-off events, the amount of contracted STOR that will actually contribute to the operational reserve requirement at the winter 2012/13 darkness peak is expected to remain consistent with last winter (2011/12).
190. In addition to STOR, there is a continual requirement to provide frequency response on the system. This can be either contracted ahead of time or created on synchronized sources within the BM. If all response holding was created in the BM, then approximately 1.5GW of reserve would be required to meet the necessary

¹⁷ <http://www.nationalgrid.com/uk/Electricity/Balancing/services/STOR/>

response requirement. 0.6GW of this 1.5GW reserve requirement has already been contracted, with 0.14GW from demand-side providers.

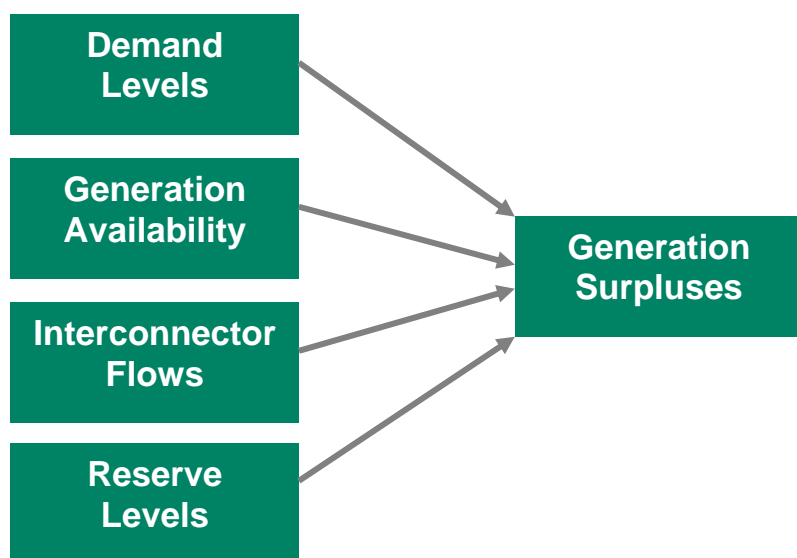
- 191. National Grid continues to have Maximum Generation contracts in place for Winter 2012/13, which provides potential access to 1 GW of extra generation in emergency situations. This is a non-firm emergency service and generation operating under these conditions normally has a significantly reduced reactive power capability (which in turn can have a significant impact on transmission system security). Hence, it is not included in any of our generation capability and plant margin analysis. This service was available pre-NETA and similarly was never included in margin analysis.

Interconnector Flows

Interconnector Flows

- 192. The new 500 MW East-West interconnector with Ireland is due to be commissioned over the summer but at this stage it has not been taken into account for the import and export capabilities as it has not yet been proved. However, it should come into commercial operation before the start of the winter.
- 193. Interconnector flows on Britned and the French link are expected to continue to follow the price differentials between the different markets but the forecasts of price differential between markets for the coming winter are not suitable at this stage to be able to create an accurate forecast of flows. Hence a detailed and up to date forecast will be included in the final Winter Outlook Report.

Forecast Generation Surpluses

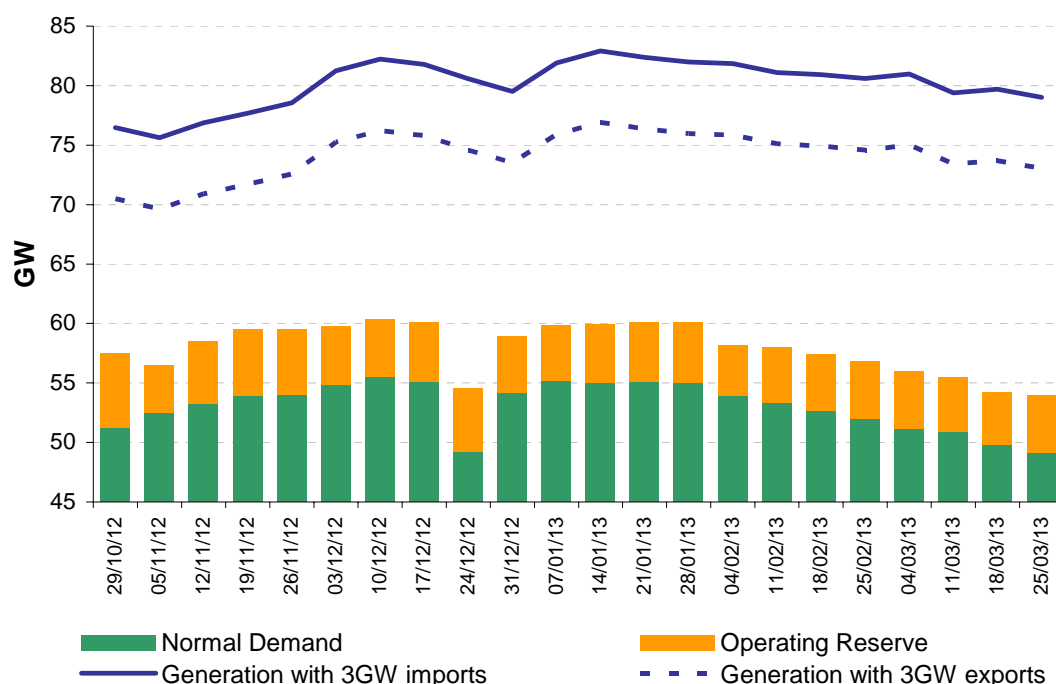


- 194. This section looks at the amount of Generation Surplus available through the main scenarios of interest. Each chart has an amount of demand (green bars) and the required operational reserve (orange bars). The solid line is the generation availability

with 3GW of imports and the dotted line includes 3GW of exports. (The East-West interconnector has not been included as it has yet to be commissioned although it may start commercial operation before the start of the winter).

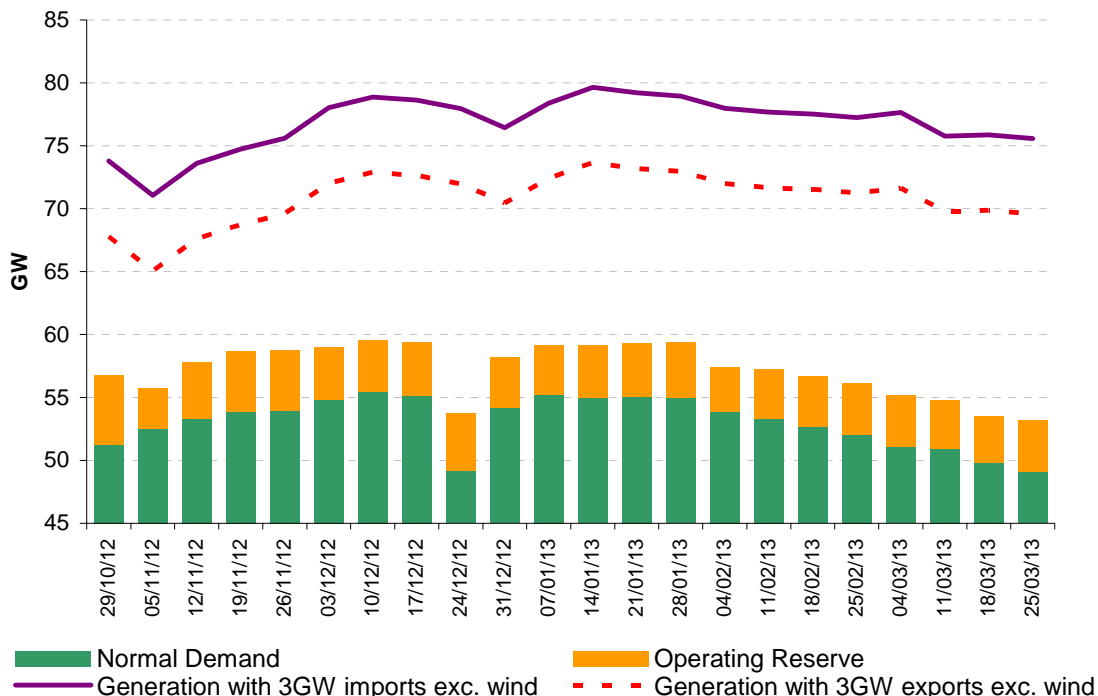
- 195. The normal demand is based on average weather conditions, where as the 1 in 20 demand is for a winter with severe weather that would only be expected in 1 winter out of 20.
- 196. The notified generation availability is the currently declared availability which is submitted to National Grid through the requirements of Operational Code 2 in the Grid Code. The assumed generation is derived from the assumed losses set out in **Table E3** and the notified generation availability.
- 197. The Moyle interconnector flow is not considered in the margin analysis as any export will allow for a greater amount of generation in Scotland. It can be seen from previous winters that Moyle generally exports during the winter.
- 198. **Figure E18** shows Normal Demand and the notified generation availability. This chart shows that there is adequate margin under these conditions.

Figure E18 - Normal Demand and Notified Generation Availability



- 199. From this chart it is also possible to calculate the minimum generation surplus, which is 18%. The surplus is the amount of generation available above the amount required to meet the demand and reserve requirements. It is represented as a percentage of the total available generation.
- 200. **Figure E19** shows Normal Demand and the notified generation availability excluding wind. This shows that there is adequate margin without wind generation available, although the minimum surplus on this basis drops to 14%.

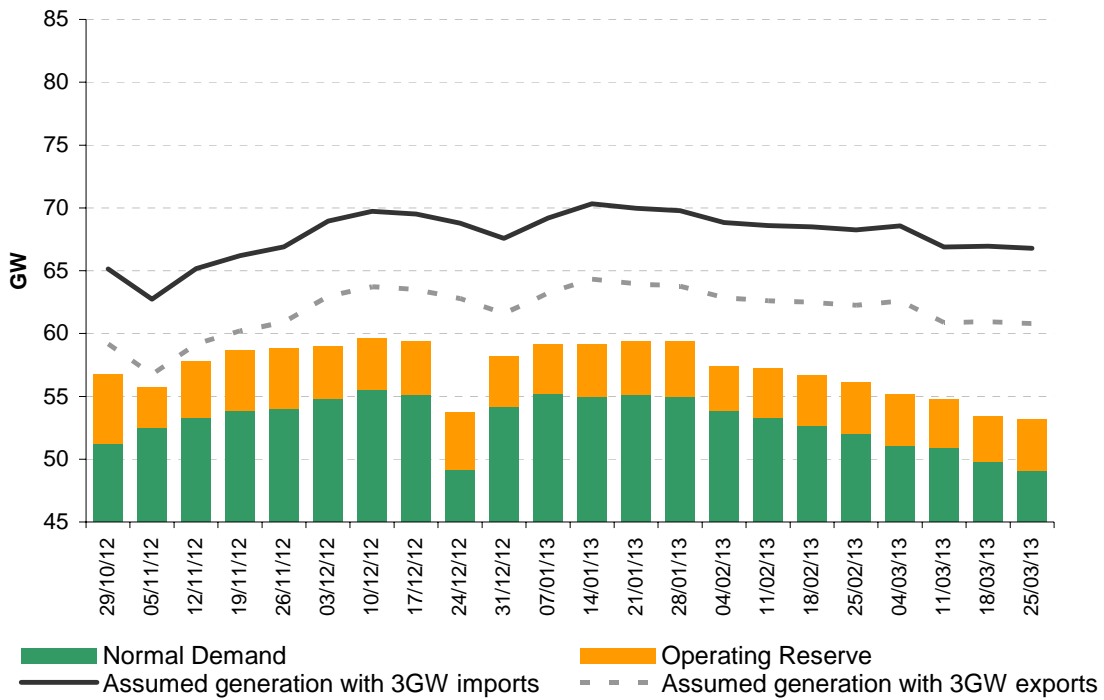
Figure E19 - Normal Demand and Notified Generation Availability Excluding Wind



201. **Figure E20** shows Normal Demand and the assumed generation availability. The surplus on this basis drops to 11% at the time of the forecast peak demand with a minimum of 7% in November. However, the chart shows that even with 3 GW of exports there would still be sufficient generation to meet demand and reserve. This is consistent with the margin analysis for the first of the five years covered in the Capacity Assessment Report¹⁸.

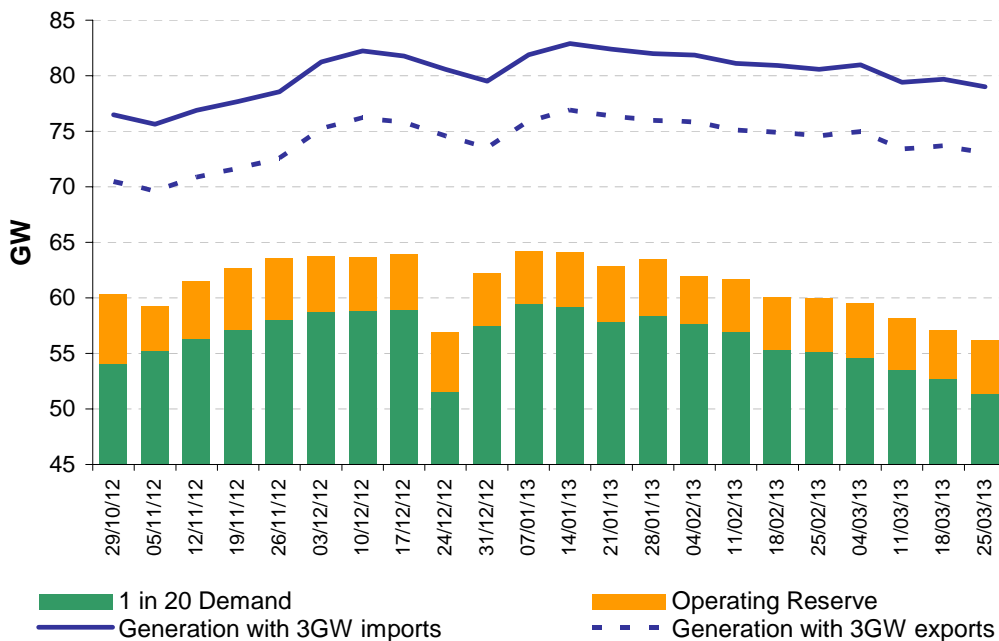
¹⁸ Ofgem are due to submit this to the Secretary of State by September

Figure E20 - Normal Demand and Assumed Generation Availability



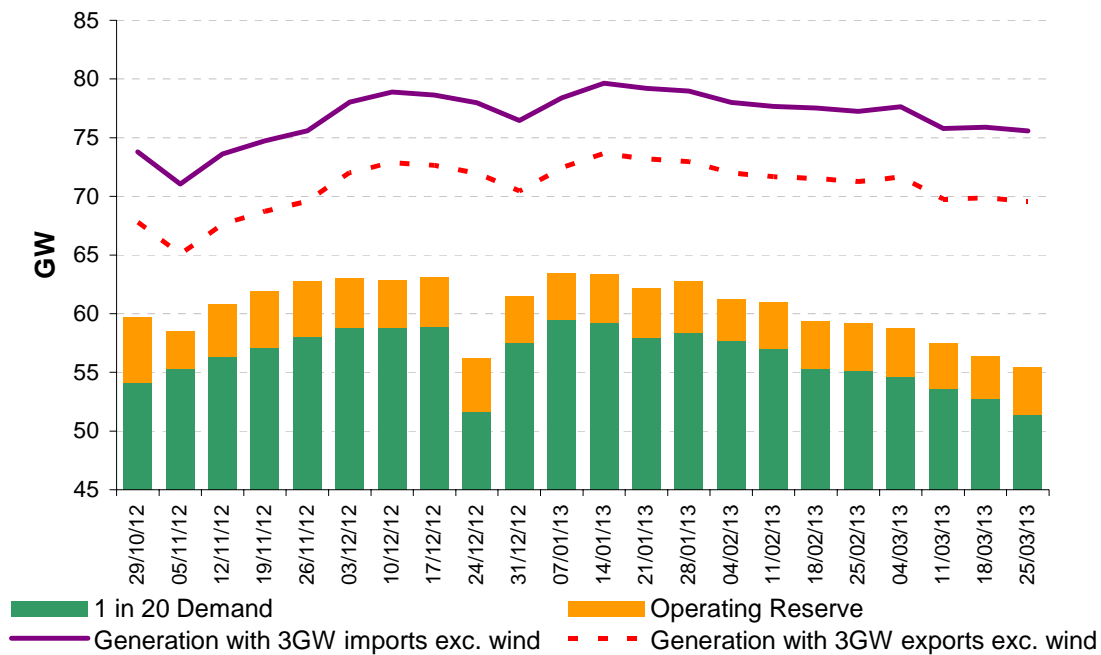
202. **Figure E21** shows 1 in 20 Demands and the notified generation availability, and again shows adequate margins.

Figure E21 - 1 in 20 Demands and Notified Generation Availability



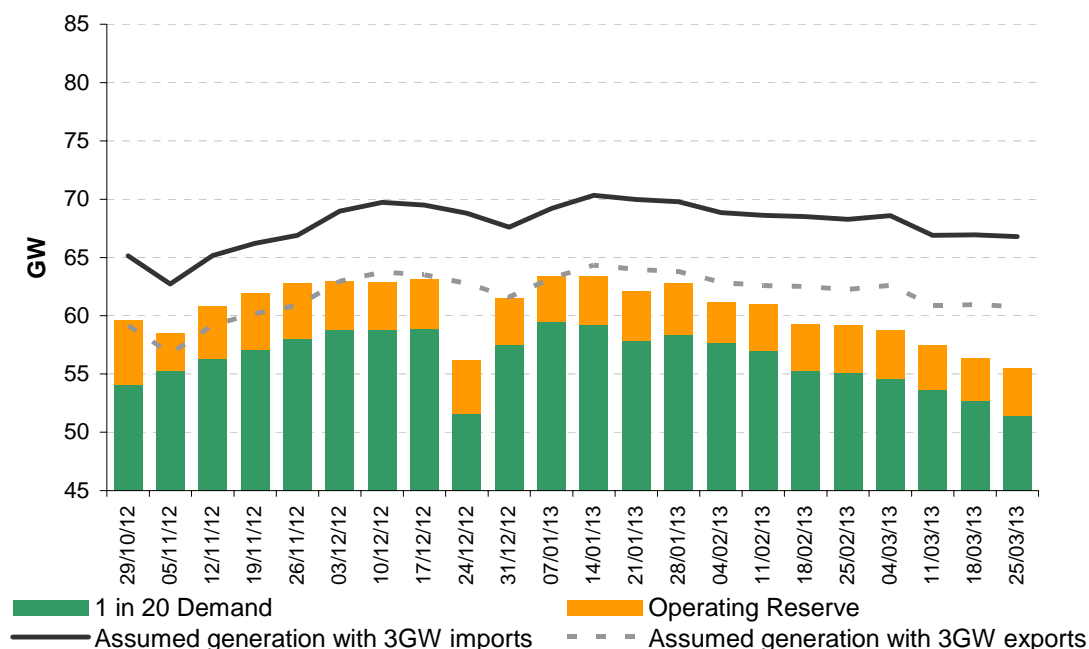
203. **Figure E22** shows 1 in 20 Demands and the notified generation availability excluding wind, which again still indicates there would be adequate margins available.

Figure E22 - 1 in 20 Demands and Notified Generation Availability Excluding Wind



204. **Figure E23** shows 1 in 20 Demands and the assumed generation availability. In this scenario there would be adequate system margin under import conditions but there would be a small erosion of reserve during export conditions in November and early January. Steps would be taken in this eventuality to try and increase available generation by issuing a Notice of Insufficient Margin and, if necessary, trading on the interconnectors to reduce exports.

Figure E23 - 1 in 20 Demands and Assumed Generation Availability



Forecast Generation Surpluses – Key Risks

205. The key risks to the forecast surpluses being lower than forecast are:

- Normal demand being higher than forecast
- Weather being colder than 1 in 20
- Availability losses being higher than assumed
- Uncertain timing of LCPD plant closures
- An increase in the volume of mothballed plant.

206. The full range of interconnector flows from maximum import to maximum export has been covered in the forecasts with maximum exports being the most onerous case. However, the new East-West Interconnector going into commercial operation could increase the total export flow by another 500 MW.

207. Wind generation for the winter peak has been assumed to be 10% of the maximum but it could be lower. However, this would result in only a small reduction in the surplus.

208. There is a potential upside that could increase forecast surpluses and off set the downside risks, which is a higher total plant capacity than assumed due to the commissioning of new CCGT units at Pembroke and West Burton B.

209. Utilising interconnector capacity to reduce exports or increase imports through trading would provide a means of absorbing a significant level of any reduction in surplus that might arise through any of the key risk areas identified.

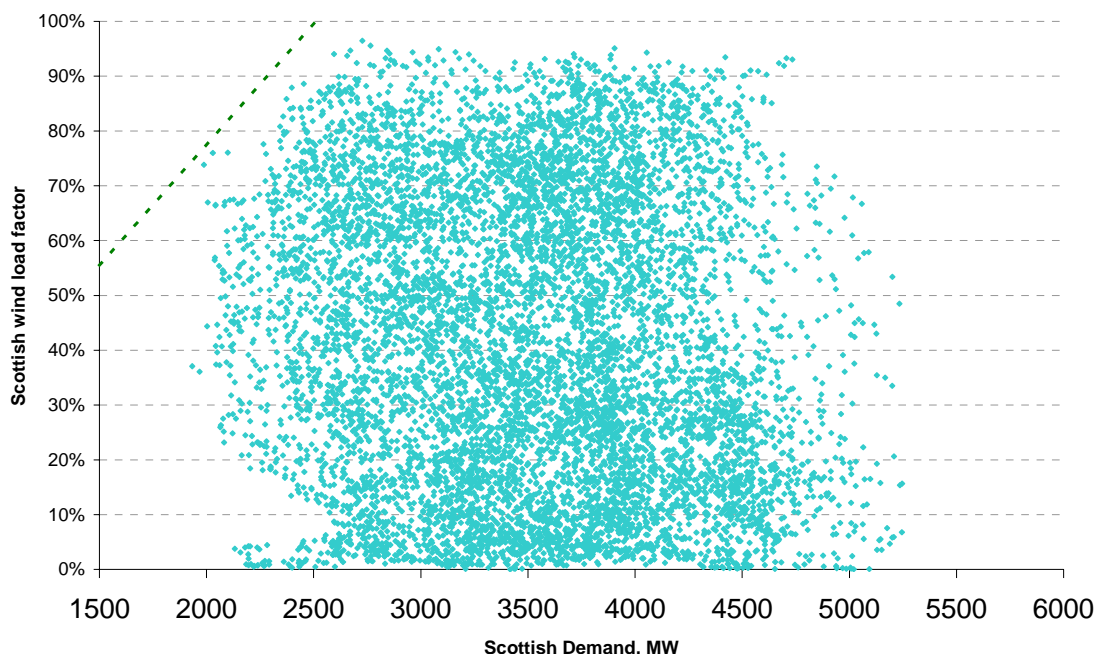
Transmission System Issues

Transmission System Issues

210. A small level of curtailment of output from wind farms is expected as per last winter. **Figure E24** shows a plot of Scottish demand against the load factor of the Scottish wind farms for last winter, 2011/12, with the forecast curtailment line for the coming winter, 2012/13, based on a Scottish export limit of 2,500 MW. The curtailment line shows the maximum load factor for wind that could be accommodated for the corresponding range of Scottish demand.

211. Further forecasting of the likelihood of this occurring will be given in the Final Winter Outlook.

Figure E24 - Scottish Half hourly wind and demand levels for winter 2011/12 and forecast curtailment line for 2012/13



Consultation Questions - Electricity - Outlook

212. National Grid would welcome comments on anything contained in the consultation report. In particular comments on the following questions would be most welcome

| Number | Question |
|--------|--|
| EQ5. | What is your current expected growth in demand levels? |
| EQ6. | What are the differences (if any) between National Grid's Generation Capacity and your forecast generation capacity? Please include details of any generation plant that is in a mothballed state. |
| EQ7. | What other methods could be used for understanding the short-term unavailability of Generation Plant other than using historic performance data? |
| EQ8. | What other factors should be taken into consideration when approaching generation availability over the winter? |
| EQ9. | What additional Generation maybe placed into a mothballed state that will affect generation availability for the winter? |
| EQ10. | What load factor would you apply to intermittent generation - i.e. wind for consideration over the winter peak? |
| EQ11. | What is your expectations regarding the interaction between the French and Dutch Interconnectors? |
| EQ12. | What is your expected flow and direction of the French and Dutch Interconnectors? |
| EQ13. | What other specific scenarios of either demand or generation availability should be added to the analysis in the final report and which scenarios do you think would be most credible? |
| EQ14. | What further analysis, detail and scenario work would be beneficial around the transmission system issues? |
| EQ15. | Looking at the overall document - which sections provide the most value and which provide little value to your analysis? |