Winter Outlook 2011/12

Introduction

1. This document sets out our analysis and views for the coming winter. Previous outlook reports are published on our website[1]. The document is based upon the consultation published in July and the three responses received.

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@uk.ngrid.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/.

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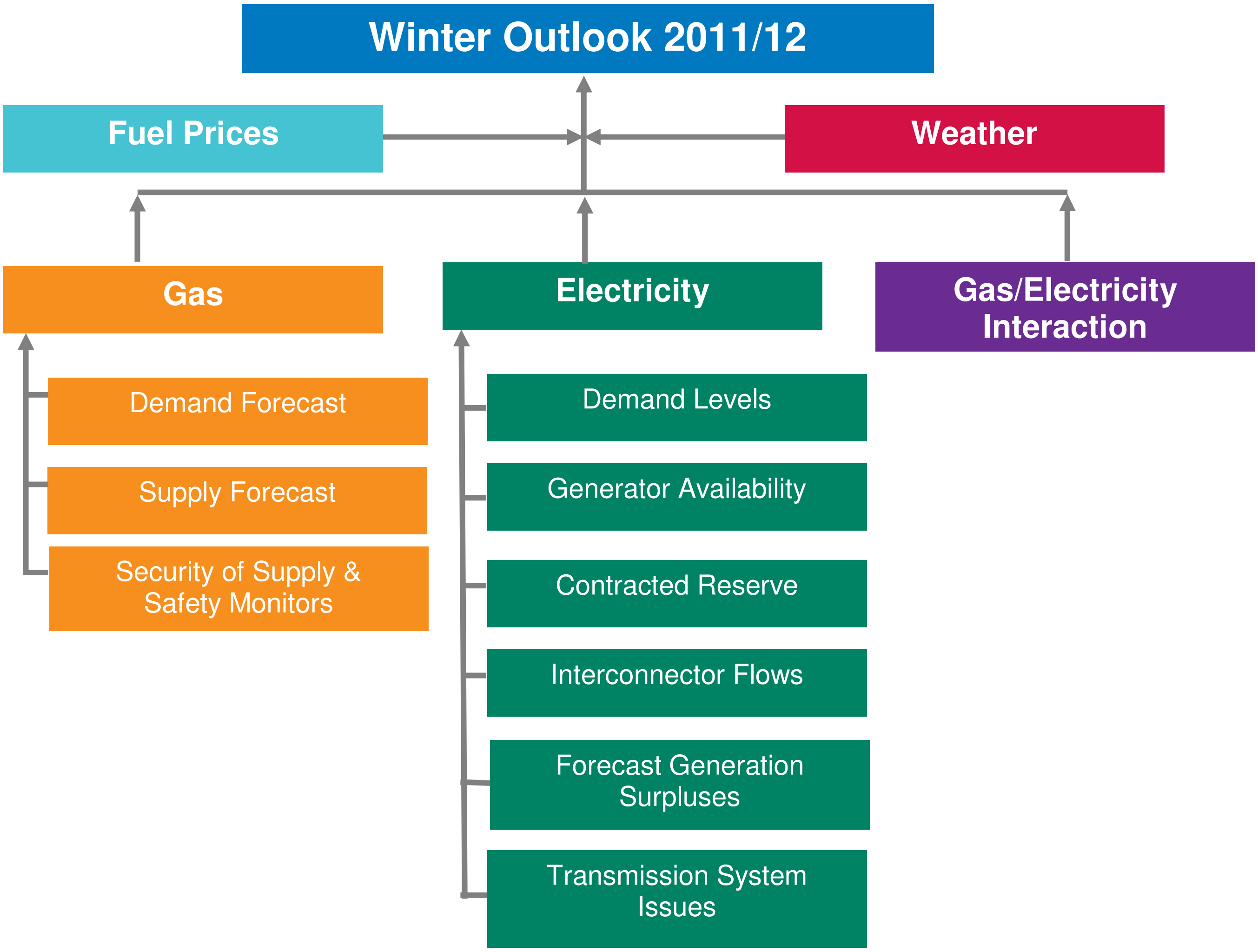
Winter Outlook 2011/12



Winter Outlook 2011/12 - Key Details

Weather

The Met Office have now ceased publication of their long term weather forecast. Their September probability maps for UK and Europe for next winter show a small weighting towards colder than normal temperatures.

Fuel Prices

Forward energy prices for next winter strongly favour coal rather than gas as the preferred source of fuel for power generation.

Gas

Peak gas demand forecast assumes low gas for power generation, this limits any potential demand side response.	474 mcm/d
Little change in winter demand forecast for 2011/12 except for lower gas for power generation.	
2011/12 supply forecasts – lower UKCS, modest increase in LNG despite some uncertainties. Level of non storage supply (NSS) for setting of the GBA trigger level.	374 mcm/d
Storage levels now similar to last winter, but should increase within winter when new facilities are commissioned.	
2011/12 Safety Monitor requirements are similar to 2010/11.	

Electricity

Normal Demand Levels Forecast	55.8 GW
ACS Demand Levels Forecast	57.9 GW
1 in 20 Demand Levels Forecast	59.5 GW
Generator Capacity	81.3 GW
Assumed Generation Availability (Not including Interconnectors)	61.3 GW
Forecast Surpluses based on normal demand	16%

Contents

Weather

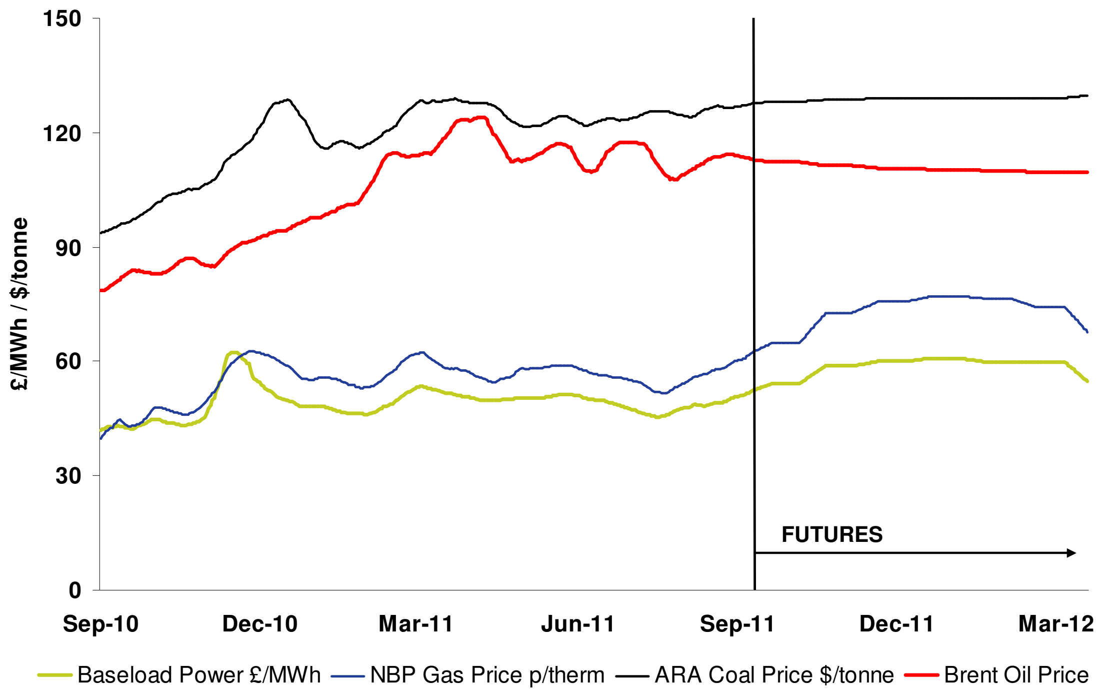
7. The Met Office have now ceased publication of their long term winter weather forecast, however, their website[2] continues to provide long term probability maps. The September maps for Europe for the period of December through to February suggests the following probabilities for the UK and most of Europe:
   - a 0 – 40% probability of above normal temperatures
   - a 20 – 40% probability of near normal temperatures
   - a 20 – 60% probability of below normal temperatures
8. Last winter's weather illustrated the variability of winter weather. It was an average winter, based on in National Grid's 83 year weather history, but contained the coldest December and the 5th warmest February.
9. Early warning of severe weather can be obtained from month-ahead ensemble forecasts. The European Centre for Medium Range Weather Forecasts [3] specialises in producing these forecasts. Products based on them are available from a number of weather service providers. Fifty separate forecasts are produced showing the range of possibilities. The greater the number of forecasts showing the same outcome, the greater the possibility of that outcome. The Met Office web site contains a short description of the weather up to 30 days ahead[4].

[2] http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/glob-seas-prob
[3] (ECMWF http://www.ecmwf.int/)
[4] (http://www.metoffice.gov.uk/weather/uk/uk_forecast_weather.html)

Fuel Prices

10. **Figure F1** shows historic energy prices for the 12 months prior to September 2011 and forward prices through to March 2012.

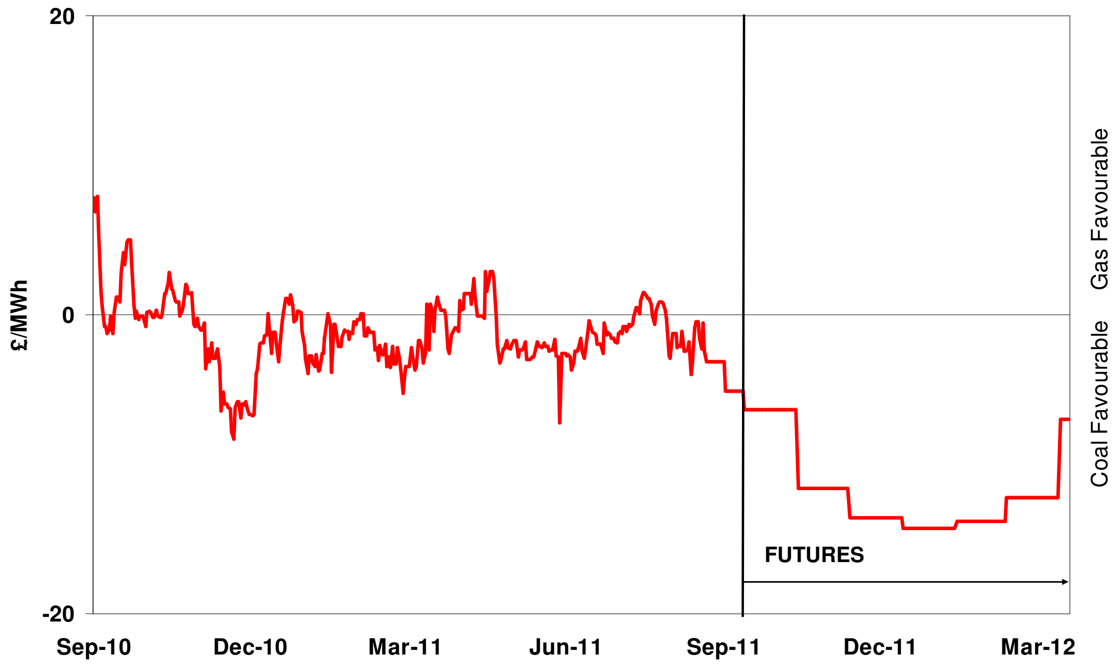
Figure F1 – Historic and Forward Energy Prices



11. The chart shows that all energy prices have increased during the last year.
12. On the back of views of economic growth and the turmoil associated with the 'Arab Spring', oil steadily increased from $80 per barrel in September 2010 to $120 per barrel in May 2011. The price has subsequently fallen to about $110 and the forward price for oil now shows some decline.
13. Coal prices have followed oil and have also been supported by the nuclear restrictions in Germany.
14. UK gas prices showed seasonal increases through to December 2010. Since then prices have remained broadly flat rather than exhibit any seasonal decline. Forward prices for next winter again show a seasonal increase with mid winter prices at near parity with contracted gas at oil indexation. Over the 18 month time period in the chart, the overall relative increase in gas price exceeds that of oil and coal.
15. Electricity prices initially increased in line with the gas price, but have followed a lower trend since January as new power generation has made electricity margins more comfortable.

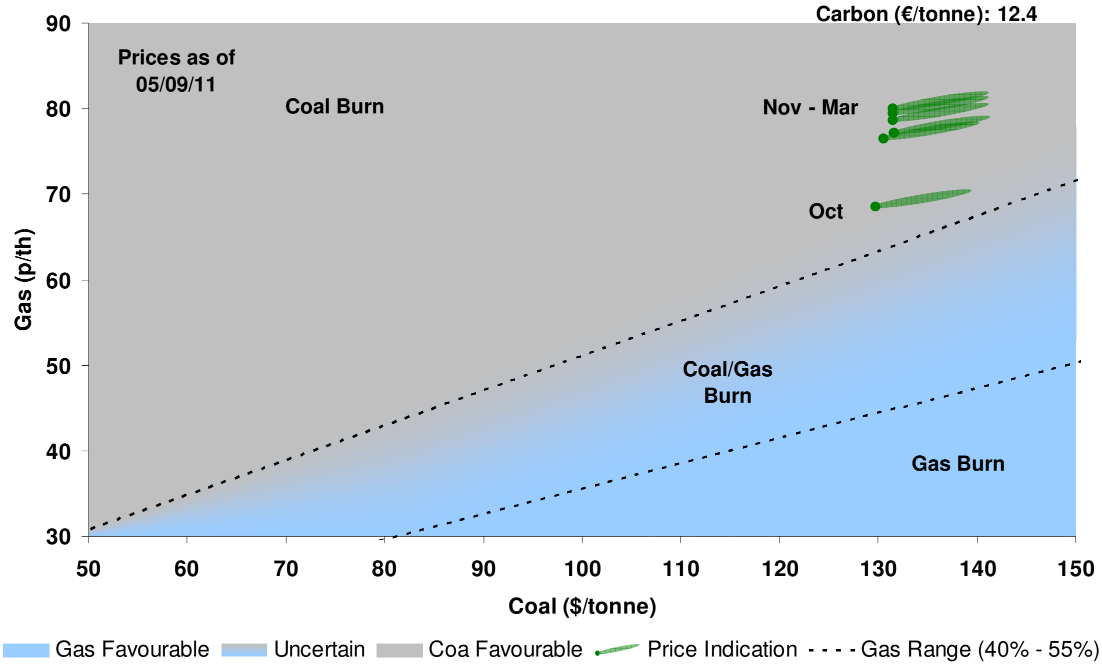
16. **Figure** F2 shows the relative clean dark and clean spark spreads, showing whether gas or coal is favoured for electricity generation. These costs include the costs for carbon

Figure F2 – Relative power generation economics (1)



17. Since September 2010 there has been a gradual shift, for most of the time, to favour the economics of power generation from gas to coal burn. For next winter the forward prices strongly favour coal burn over gas. This is further supported in **Figure F3** where the economics are shown relative to fuel costs and power generating efficiencies.

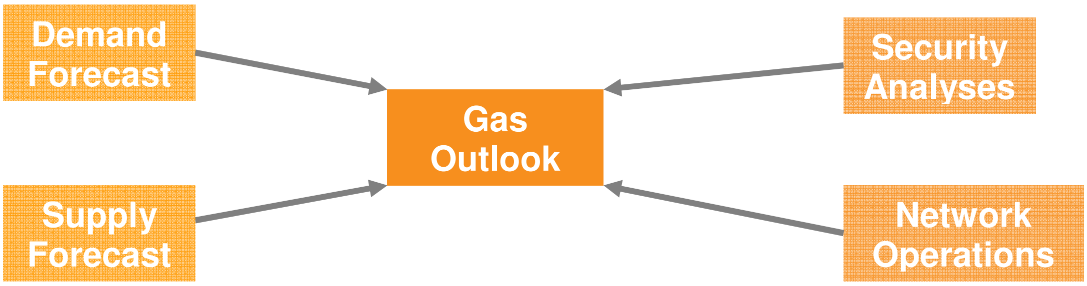
Figure F3 – Relative power generation economics (2)



18. The chart shows how the forward prices for next winter strongly favour coal burn over gas. For gas and coal to be equitable the gas price for winter 2011/12 needs to fall by about 33% or around 25p/therm, alternatively there needs to be a further increase in the coal price by about $70/tonne.

19. Whilst the price of coal and gas are influential in terms of power generation, other factors such as running hours for LCPD, plant availability and generation portfolios will also influence fuel choice.

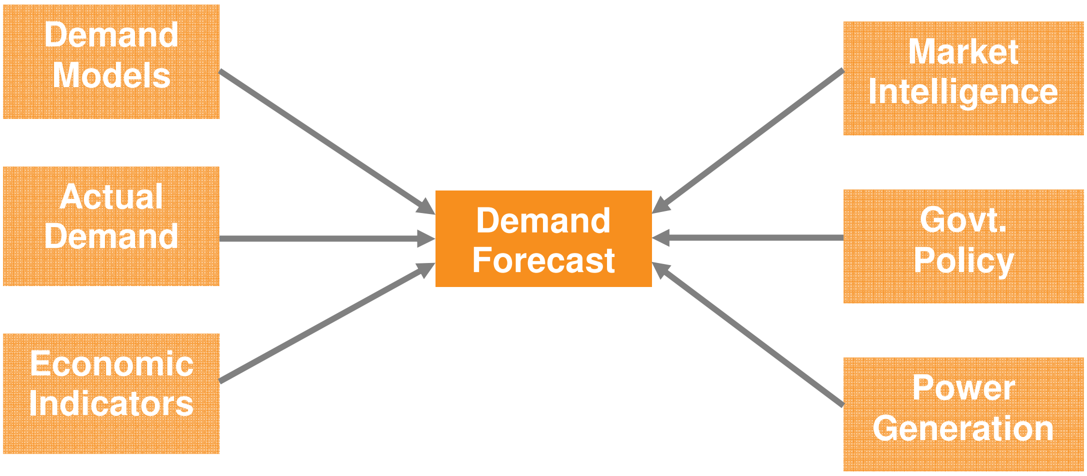
Gas



Overview

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

Demand Forecast

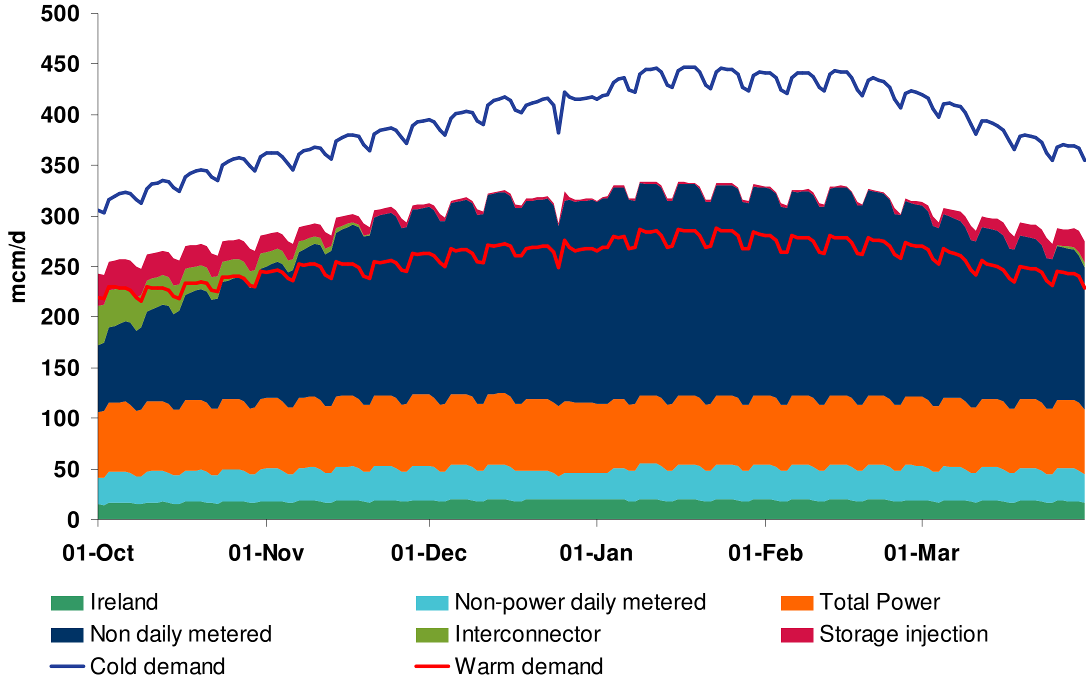


21. The demand forecasts presented in this document are essentially the same as those reported in the Winter Consultation.

22. The 2011/12 winter demand forecast is slightly lower than the 2010/11 weather corrected demands. There is a drop in NDM demand due to higher gas prices and continued energy efficiency. Gas for power generation is forecast to be the marginal generation source in 2011/12 with demands similar to 2010/11. These are materially lower than the power generation demands in 2009/10.

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

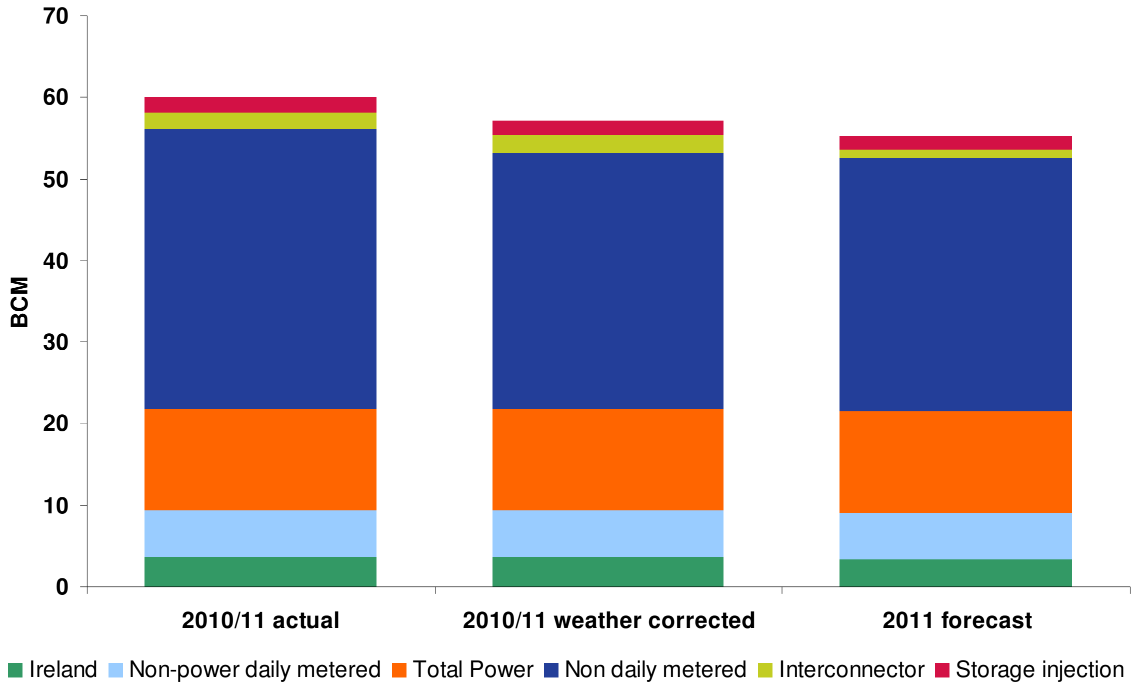
Figure G1 - Forecast Gas Demand Winter 2011/12



24. The chart shows seasonal normal demand peaking at about 330 mcm/d. In reality peak winter demands will be appreciably higher than this as it is likely that winter temperatures may be colder than seasonal normal temperatures.

25. **Figure G2** shows the actual and weather corrected demand for last winter and also the forecast demand for winter 2011/12.

Figure G2 - Forecast Gas Demand October 2011 to March 2012



26. The chart shows:

- The impact of weather correction on the 2010/11 NDM
- Little difference between weather corrected 2010/11 and the winter forecast for 2011/12. The only noticeable difference being the forecasts for IUK exports. These are subject to considerable uncertainty

27. **Table G1** shows the historic actual and weather corrected demand for winters 2008/9 through to 2010/11 and the forecast for winter 2011/12.

Table G1 - Forecast Gas Demand- October to March 2011/12

October to March winter	2008/09		2009/10		2010/11		2011/12
bcm	Actual	weather corrected	actual	weather corrected	actual	weather corrected	forecast
NDM	33.9	32.7	33.6	32.0	34.2	31.4	31.1
DM + Industrial	5.7	5.6	6.0	5.9	5.8	5.8	5.8
Ireland	3.4	3.4	3.6	3.6	3.6	3.6	3.4
Total Power	13.2	13.2	16.6	16.6	12.5	12.4	12.4
Total demand	**56.8**	**55.5**	**60.5**	**58.9**	**56.6**	**53.7**	**53.1**
IUK export	3.0	3.0	1.1	1.1	2.1	2.1	1.0
Storage injection	1.4	1.4	1.2	1.2	1.8	1.8	1.7
GB Total	**61.2**	**59.9**	**62.8**	**61.2**	**60.5**	**57.6**	**55.7**

28. On a weather corrected basis, the table shows some decline (including the 2011/12 forecast) in NDM. DM + Industrial and Ireland show little change. The variation in demand for power generation highlights the changing economics of gas versus coal.

29. **Table G2** shows the daily average demand for last winter and the forecast demand for winter 2011/12. The table also shows the actual range of demand experienced last winter and a forecast range.

30. The low forecast range for weather sensitive loads is based on a very warm early October[5] day, Ireland, IUK and storage on historic data and power on our low gas scenario.

31. 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.

Table G2 - Forecast Daily Gas Demand- October to March 2011/12

October to March winter	Daily average			Actual range		Forecast range	
mcm/d	2010/11 actual	2010/11 weather corrected	2011 forecast	2010/11 low	2010/11 high	2011/12 low	2011/12 high
NDM	188	173	170	66	318	35	340
DM + Industrial	32	32	32	25	37	22	42
Ireland	20	20	18	12	28	12	32
Total Power	68	68	68	51	94	40	100
Total demand	311	295	290	176	465	140	510
IUK export	11	11	5	0	60	0	60
Storage injection	10	10	9	0	59	2	60
GB Total	**332**	**316**	**305**	**252**	**465**	**210**	**510**

32. Error! Not a valid bookmark self-reference. shows a similar table to G2 but is based on the mid winter months of December to February.

[5] For the December to February range in Table G3, the very warm day applies to early December

Table G3 – Forecast Daily Gas Demand – December to February 2011/12

December to February winter	Daily average			Actual range		Forecast range	
mcm/d	2010/11 actual	2010/11 weather corrected	2011 forecast	2010/11 low	2010/11 high	2011/12 low	2011/12 high
NDM	225	206	199	145	318	125	340
DM + Industrial	32	32	32	25	37	22	42
Ireland	21	21	19	15	28	15	32
Total Power	69	69	68	51	94	40	100
Total demand	350	330	321	251	465	238	510
IUK export	1	1	0	0	19	0	60
Storage injection	7	7	2	0	44	2	60
GB Total	**359**	**339**	**323**	**261**	**465**	**240**	**510**

33. 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.

34. The 2011/12 high of 510 mcm/d is above the 2011/12 diversified forecast (**Table G4**) as this assumes higher levels of power generation.

35. From October 2011 LDZ demand is firm only and NTS follows in October 2012. However, there is limited scope for interruption to reduce the total diversified peak day demand because the power generation forecast is towards the low forecast level and can be supplied by firm power stations. Irish gas demand tends to become more weather sensitive on very cold days raising the probability of a slight increase rather than decrease on a peak day.

36. **Figure G3** and **Table G4** show the highest day of demand in winter 2010/11 and the 1 in 20 peak day demand forecasts for winter 2011/12. The biggest difference in the demands is through the accounting methodology for power generation and to a lesser extent Ireland.

Figure G3 - 1 in 20 Peak Day Gas Demand 2011/12

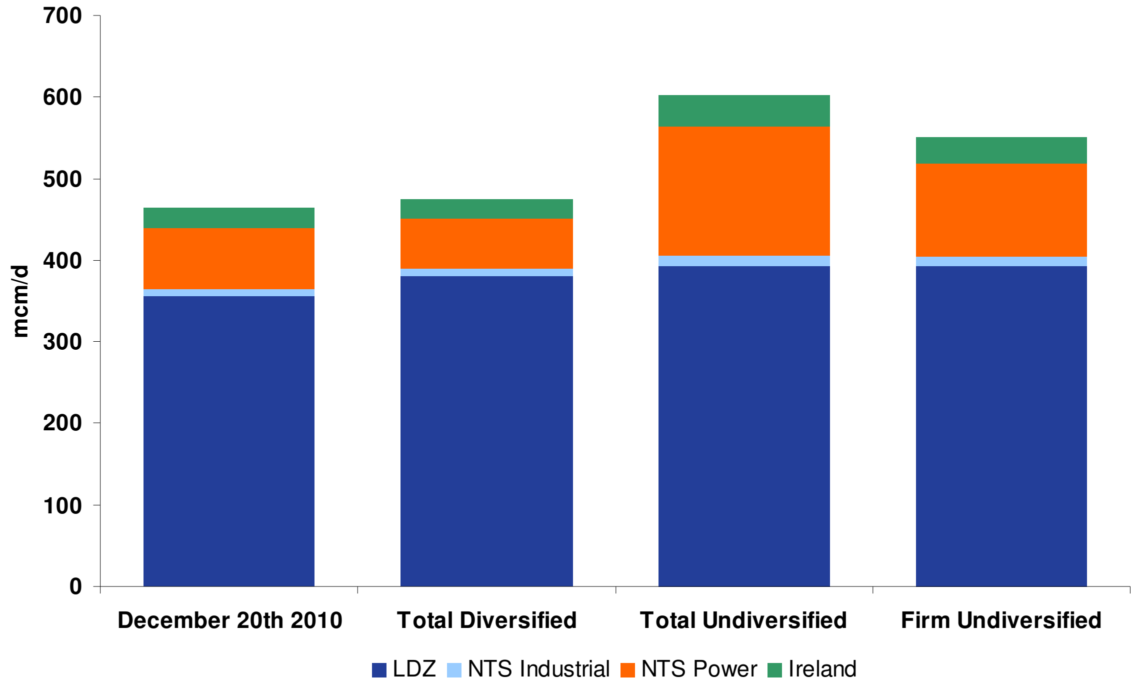


Table G4 – 1 in 20 Peak Day Gas Demand 2011/12[6]

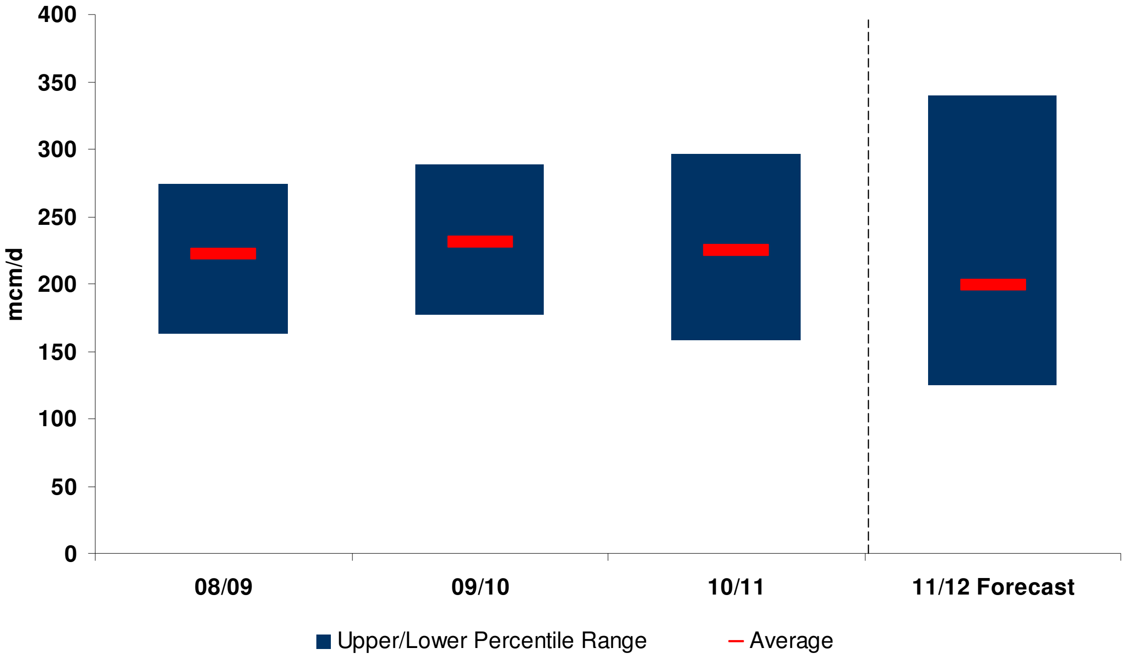
		2011/12 forecast		
Mcm/d	December 20th 2010	Total Diversified	Total Undiversified	Firm Undiversified
LDZ	356	381	392	392
NTS Industrial	9	8	14	12
NTS Power	74	62	158	115
Ireland	25	23	37	32
Total	**465**	**474**	**601**	**551**

37. Due to the price assumptions, the 1 in 20 diversified peak demand forecast assumes relatively low gas demand for power generation. An important consideration of this assumption is a limited demand side response (DSR) from the power generation sector. The precise DSR available from gas demand for power generation will be dependent on many other generating assumptions and the time of year. This is detailed in the gas / electricity interaction section. The undiversified level of gas demand for NTS power generation highlights the potential upside. If more gas is used for power generation, the DSR is higher.

[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 G1, G2 and G3 the LDZ connected power stations at Fife, Derwent, Shoreham, Barry, Severn Power and Fawley are included in the total power category but in G4 they are included in LDZ demand. Grangemouth and Winnington NTS offtakes are included in total power in G1, G2 and G3 but NTS industrial in G4. Immingham and Shotton Paper are classified as NTS power stations for all 3 tables.

38. Figures G4 to G7 show daily demand ranges for the 3 months from December to February for the last 3 winters compared to forecasts for December 2011 to February 2012. The historic data has not been weather corrected.

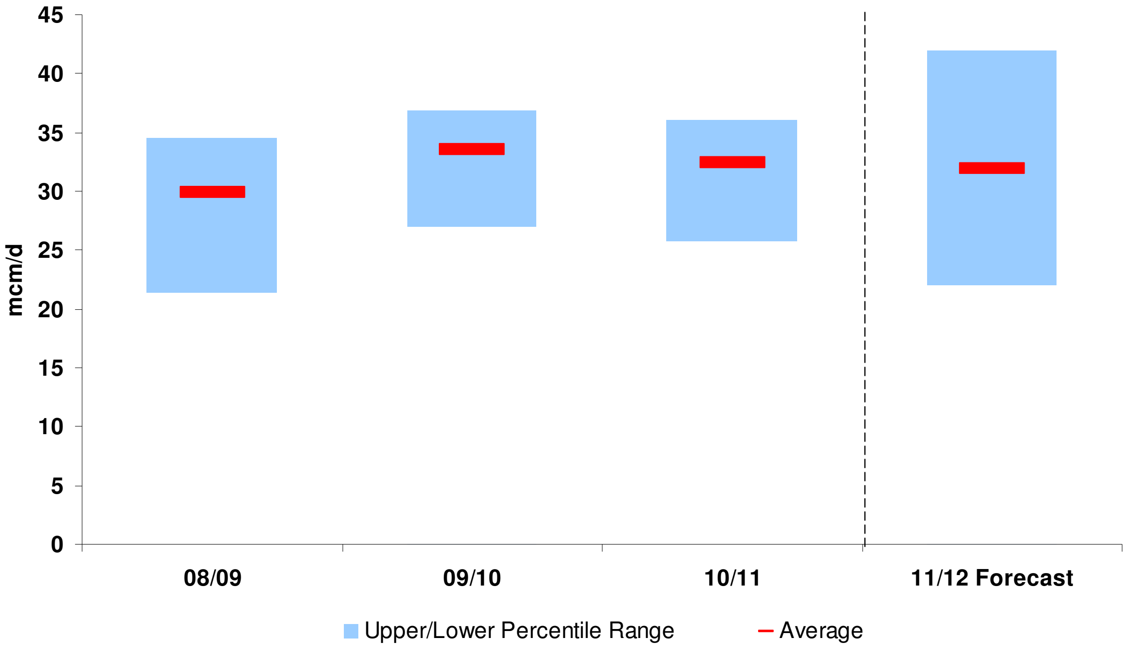
Figure G4 – NDM Historic Demand and 2011/12 Forecast



39. The 2011/12 NDM average forecast is lower than the historic average demands due to the weather[7] and the impact of higher prices and continued energy efficiency. The pronounced variation around this value is driven by the weather.

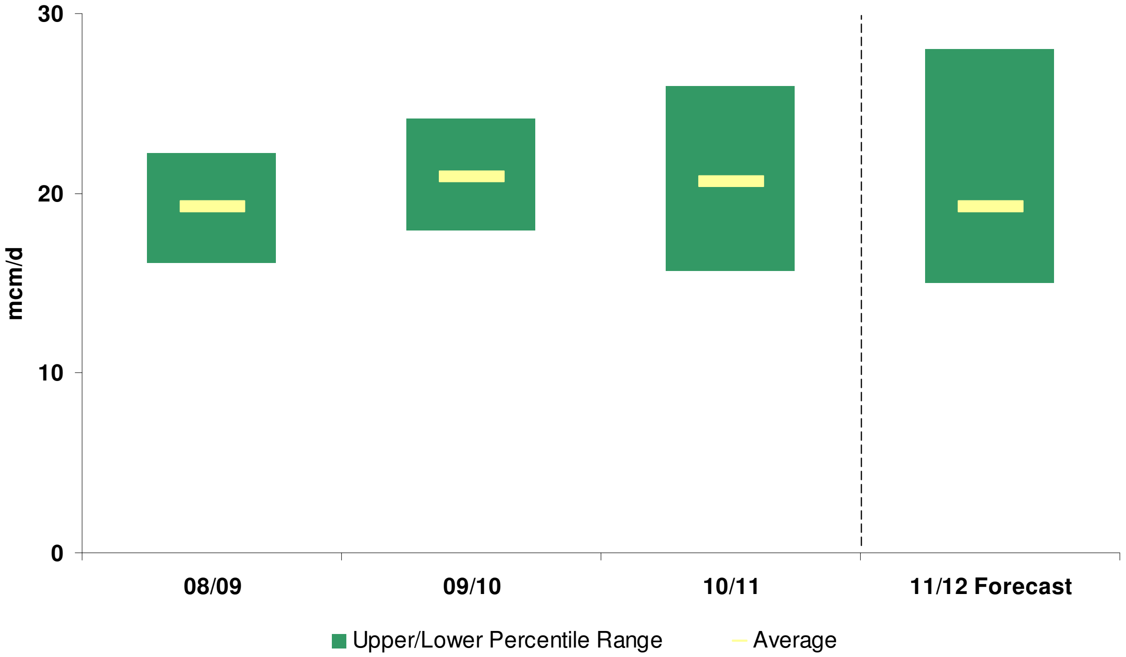
[7] 2010/11 was an average winter based on the long term average since 1928/29 but cold relative to the climate change adjusted seasonal normal

Figure G5 – Historic DM & Industrial[8] Demand and 2011/12 Forecast



40. The Non-power daily metered demand is expected to be similar to previous years.

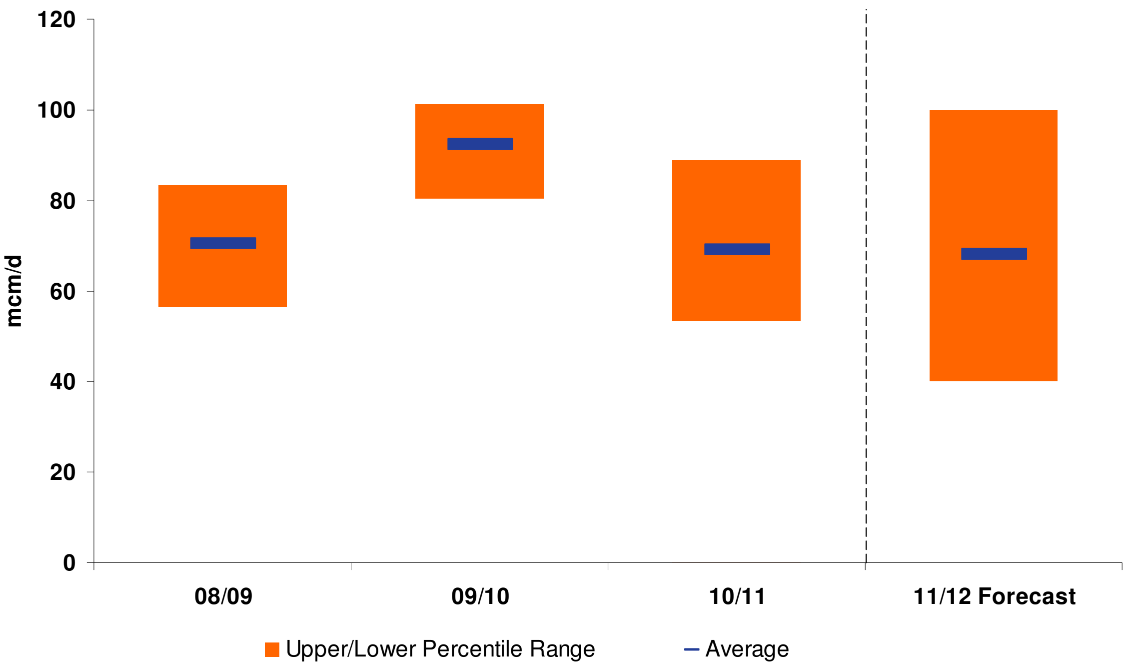
Figure G6 – Historic Moffat Exports and 2011/12 Forecast



[8] Excludes power generation

41. Exports through Moffat are predicted to be slightly lower than previous years due to the Irish economy and comparatively high cost of gas for power generation. The Moffat interconnector has the potential to export higher levels than the upper range shown should the need arise

Figure G7 – Historic Power Generation Demand and 2011/12 Forecast



42. Power generation is expected to be at a similar level to 2010/11 but if prices switch in favour of gas generation then daily demand for power generation could reach 100 mcm/d.

Supply Forecast

43. 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 the winter. Our final view is influenced by our experience last winter and feedback through TBE and Winter Consultations.

44. **Table G5** shows various measures of non storage supply as experienced in winter 2010/11 and used for operational planning.

Table G5 – Winter 2010/11 Non Storage Supplies by Supply Source

mcm/d	UKCS	Norway	BBL	IUK	LNG	Total
Winter Outlook (Oct 2010)	166	101	30	10	60	367
Highest day (each supply)	160	116	37	38	130	479
Highest day (total supplies)	134	112	36	38	96	415
Top 10	131	108	34	26	95	394
Top 100	133	88	28	10	79	338
Av Dec-Feb	130	89	28	11	76	334
Winter Planning (post Jan 2011)	154	101	30	20	77	382

45. At the start of winter 2010 the Winter Outlook Base Case assumed a non storage supply of 367 mcm/d. This represented a sustainable level of supply during high demand conditions and was used in the initial setting of the Safety Monitors and GBA trigger level. As the winter progressed this was updated to reflect operational performance, with the final change in January 2011 to 382 mcm/d.

46. Whilst 382 mcm/d was representative of the average level of non-storage supplies at high demand conditions (i.e. 380 mcm/d for the 21 days of demand above 400 mcm/d) this value did not reflect the range of supply from the individual supply sources. This is shown in the table for the highest day of non storage supplies (415 mcm/d) and the aggregation of the highest day for each supply type (479 mcm/d). By contrast the average flow of non storage supplies between December and February was just 334 mcm/d.

47. Consequently for this publication of the winter outlook we are identifying a range for each supply component. We are also showing for each supply component a winter average forecast for December to February and a forecast of supply for higher levels of demands (in excess of 400 mcm/d). These forecasts (relationships) have also been used for the Safety Monitor calculations and the initial setting of the GBA trigger level.

UKCS Gas Supplies

48. Feedback from the Winter Consultation was broadly supportive of our post winter analysis of UKCS flows and our preliminary forecast for winter 2011/12.

49. The data in the Winter Consultation provided an initial view of UKCS supplies based on 2011 TBE forecasts and the most recent data regarding new UKCS developments.

50. The **Table G6** shows a final view of the UKCS supplies, these have been reassessed following recent flow data and additional market intelligence. All the terminal forecasts are similar except for St Fergus where the forecast is reduced by 5 mcm/d due to field decline and ongoing offshore 'issues'.

Table G6 - 2011/12 UKCS Maximum Forecast by Terminal

Peak (mcm/d)	2010/11		2011/12		
	UKCS	Terminal	Initial View	Final View	Changes
Bacton	56	58	49	51	+2
Barrow	13	14	12	11	-1
Burton Point	2	3	2	2	
Easington	5	10	9	9	
St Fergus[9]	50	52	46	41	-5
Teesside	20	26	22	20	-2
Theddlethorpe	13	15	13	13	
Total	**160**	**178**	**153**	**147**	
90% Op. Forecast			138	132	

51. **Table G6** shows a provisional UKCS maximum supply forecast of 147 mcm/d for Winter 2011/12. This represents an 8% decline against the highest flow of UKCS observed last winter and a far greater 20% decline against the equivalent forecast for Winter 2010/11. In previous years reported declines have been typically between 5% and 10%. The decline in 2011/12 is forecast to be greater due to:

- General field decline
- An assumption that Rhum (~5 mcm/d) will not be flowing due to EU sanctions
- An end to various swing contracts

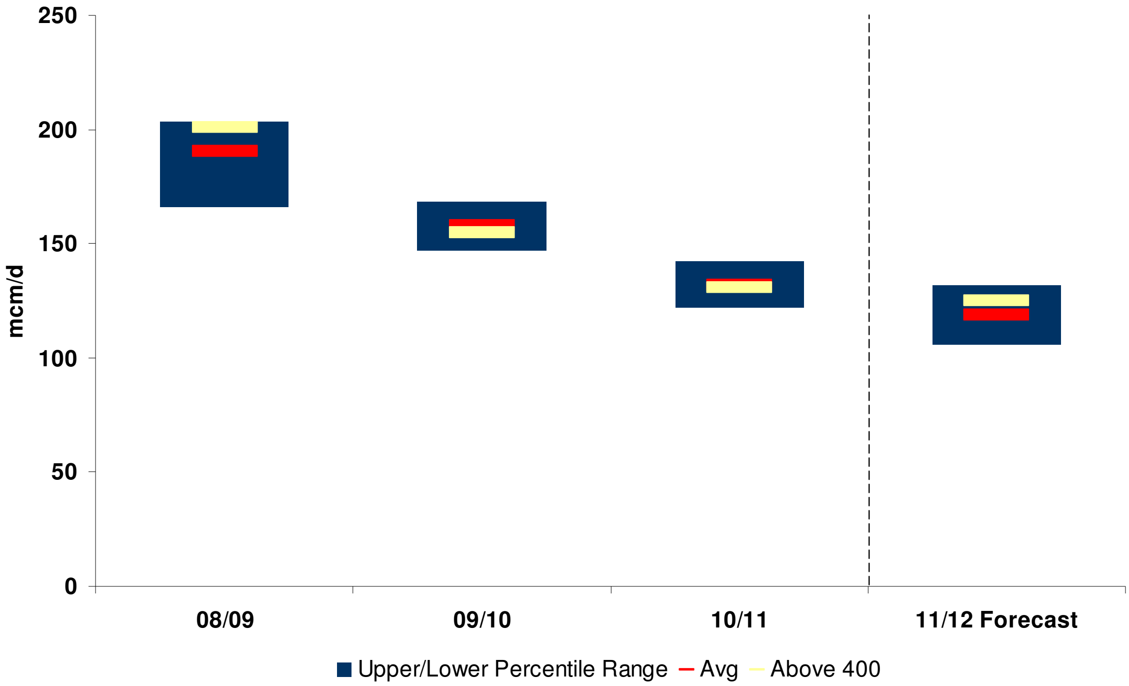
[9] Excludes estimates for Vesterled and Tampen

- A limited number of new fields forecast to come on-stream over the 2011/12 winter. This includes some slippage of fields previously expected in winter 2011/12

52. 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 90% is used, resulting in a maximum UKCS planning assumption for next winter of 132 mcm/d.

53. Figure G8 shows historic UKCS flows for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12. The historic data is from the peak winter months of December to February, the range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G8 – UKCS Historic Flows and 2011/12 Forecast



54. The chart shows very tight ranges for winters 2009/10 and 2010/11, this illustrates the limited flexibility of UKCS supplies. The forecast for winter 2011/12 follows the declining trend over the recent winters.

55. The 2011/12 forecast range for UKCS is shown as 106 to 132 mcm/d. The January to February winter average forecast is 119 mcm/d with a marginally higher forecast of 125 mcm/d for when demands exceed 400 mcm/d.

Norwegian Imports

56. Feedback from the Winter Consultation was broadly supportive of our post winter analysis of Norwegian flows and that at times Norwegian deliveries were prioritised towards the Continent rather than the UK.

57. 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.

58. In order to forecast Norwegian flows to the UK for next winter an estimate of total Norwegian production is made. This estimate has not changed since the publication of the Winter Consultation. However there is now improved reported data for German imports and Norwegian domestic use and consequently the flow forecasts from Norway have been updated.

59. The forecast for Norwegian production for next winter is approximately 320 mcm/d. Flows to the UK are determined by difference from the net production and flow estimates for domestic use and flows to the Continent.

60. 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 2011/12 our forecast of Norwegian supplies to the UK is within a range from 70 to 118 mcm/d.

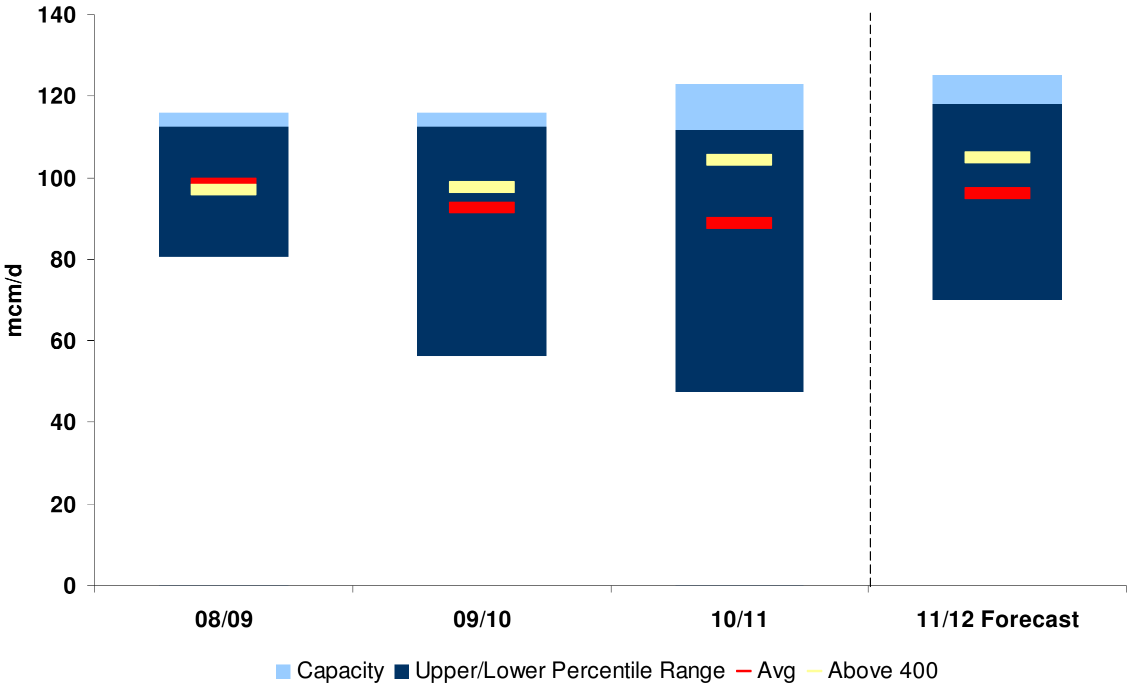
61. **Table G7** shows the forecast range of Norwegian exports for winter 2011/12. Also shown is a higher estimate of Norwegian flows for the mid-winter period to account for supply seasonality.

Table G7 – Winter 2011/12 Estimates of Norwegian Exports

(mcm/d)	High flows to Cont	Low flows to Cont	Central	Mid Winter	Capacity
Norway	*25*	*25*	*25*	*25*	
Belgium	40	35	38	40	41
France	50	45	47	49	52
Germany	135	97	120	125	151
UK	70	118	90	96	124
Total	**320**	**320**	**320**	**335**	**368**

62. **Figure G9** shows historic Norwegian flows for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12 and the capacity for Norwegian exports to the UK. The historic data is from the peak winter months of December to February, the historic range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G9 – Norwegian Historic Flows and 2011/12 Forecast



63. The chart shows quite broad ranges for winters 2009/10 and 2010/11, this reflects the supply losses that have been experienced for the past two winters. The forecast for winter 2011/12 is similar to recent winters.

64. The 2011/12 forecast range for Norway is shown as 70 to 118 mcm/d. The January to February winter average forecast is 90 mcm/d with a marginally higher forecast of 96 mcm/d for when demands exceed 400 mcm/d.

Continental Imports - BBL

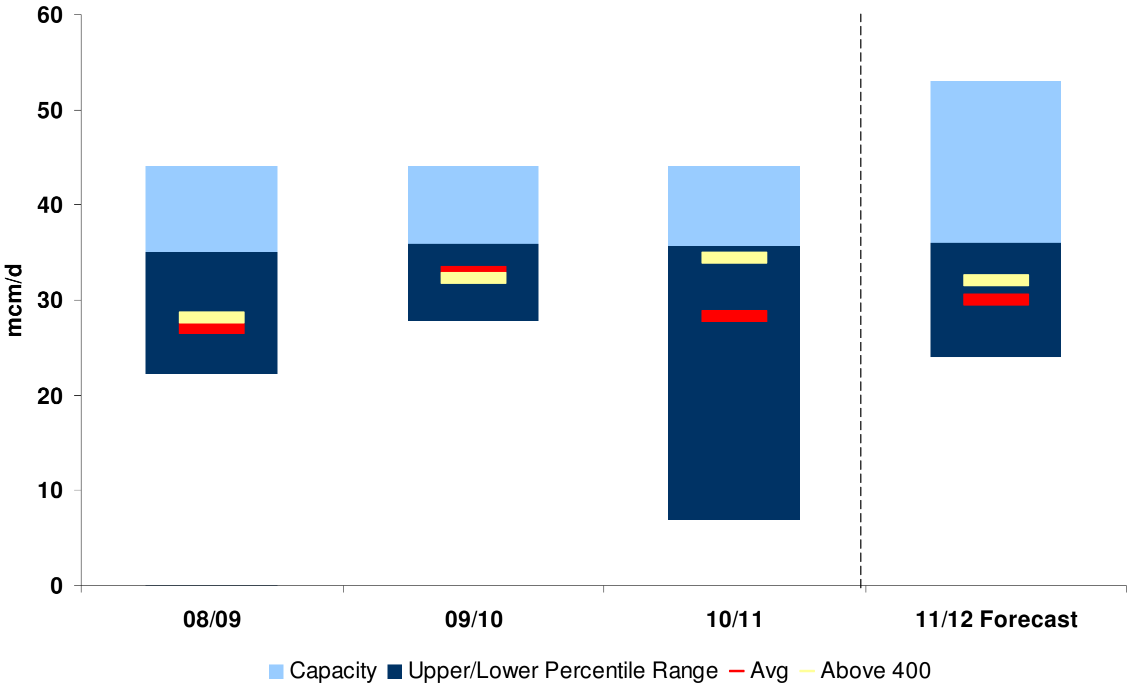
65. As reported in the winter consultation, commercial arrangements for interruptible non physical reverse flow (i.e. non-physical exports) are now in operation for BBL as is the increase in capacity from approximately 40 to 50 mcm/d.

66. Despite this, winter consultation feedback on BBL flows for next winter all anticipated similar flows to those experienced last winter, namely relatively stable flows of around 30 mcm/d.

67. For planning purposes the forecast for BBL flows for next winter is revised a little to reflect a range of supplies around 30 mcm/d, this is the same as last years forecast and that experienced last winter.

68. **Figure G10** shows historic BBL flows for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12 and the capacity for BBL. The historic data is from the peak winter months of December to February, the historic range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G10 – BBL Historic Flows and 2011/12 Forecast



69. The chart shows some low flows for last winter. This was due to the mild weather in February, until then BBL was flowing close to 30 mcm/d on most days. Despite the increase in BBL capacity for winter 2011/12, the forecast is similar to recent winters.

70. The 2011/12 forecast range for BBL is shown as 24 to 36 mcm/d. The January to February winter average forecast is 30mcm/d with a marginally higher forecast of 32 mcm/d for when demands exceed 400 mcm/d.

Continental Imports - IUK

71. Winter Consultation feedback on the potential upside of IUK imports was mixed, though most parties supported the view that IUK was a flexible / marginal source of supply responsive to market dynamics.

72. Last winter as in most previous winters, IUK imports responded to numerous factors, these included:

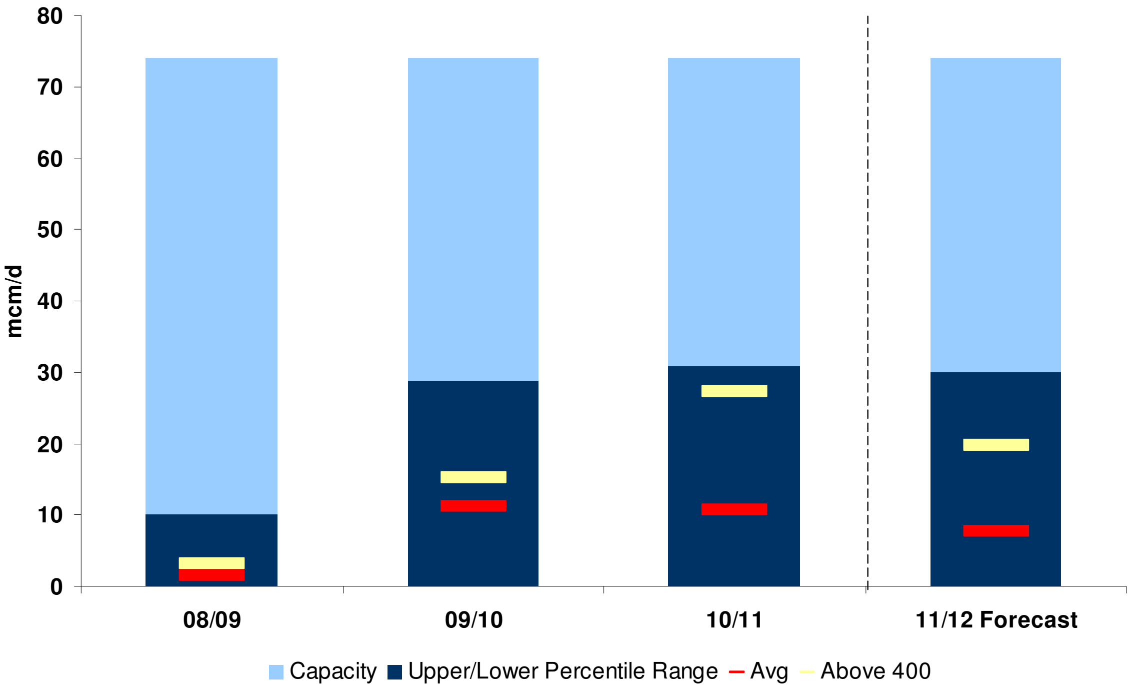
- Gas price
- UK demand
- Availability or rather non-availability of other non-storage supplies
- Storage flows / stocks

73. 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.

74. The forecast for IUK imports for next winter is changed a little from the Winter Consultation to reflect the range of flows.

75. **Figure G11** shows historic IUK flows for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12 and the capacity for UK imports. The historic data is from the peak winter months of December to February, the historic range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G11 – IUK Historic Flows and 2011/12 Forecast



76. The chart shows broad ranges for winters 2009/10 and 2010/11 from 0 to about 30 mcm/d. The upper range is much lower than the capacity of 74 mcm/d and the occasional day of higher flow. For last winter, the difference between the average flow and the flow for demands above 400 mcm/d highlights how IUK responded to higher demands. The forecast for winter 2011/12 is similar to recent winters.

77. The 2011/12 forecast range for IUK is shown as 0 to 30 mcm/d. The January to February winter average forecast is just 8 mcm/d with a higher forecast of 20 mcm/d for when demands exceed 400 mcm/d.

LNG Imports

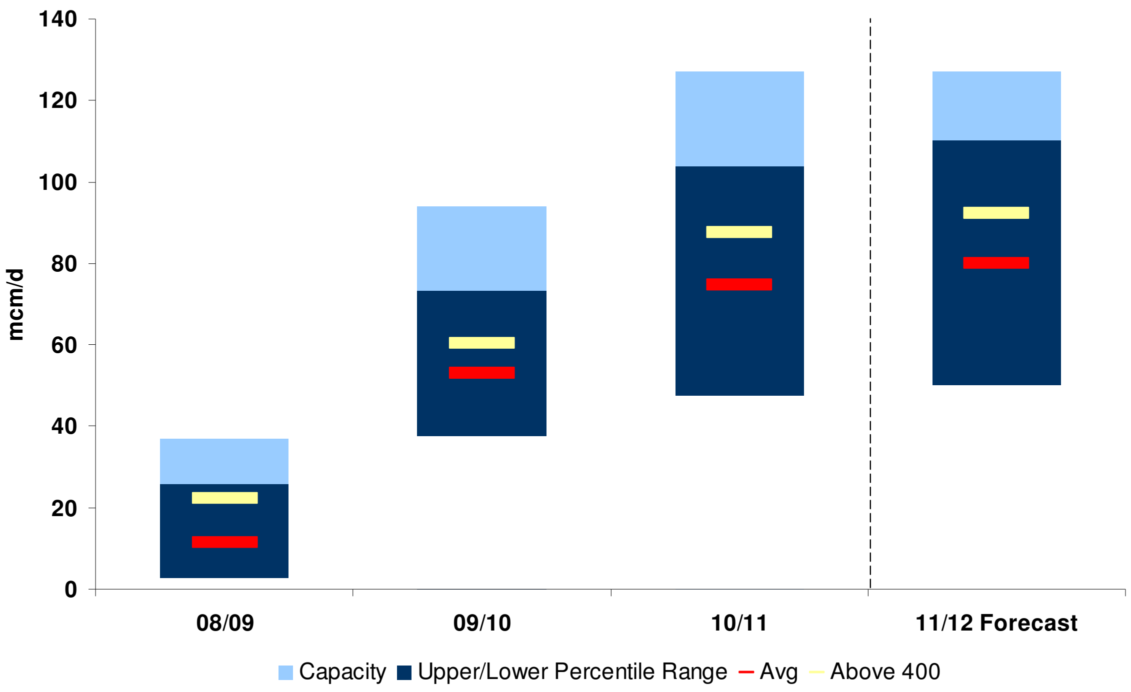
78. Feedback from the winter consultation highlighted the flexibility that LNG imports can now provide. Regarding next winter, all responses highlighted uncertainties associated with LNG imports. Compared to the Winter Consultation range of 50 to 120 mcm/d, responses were both in agreement or suggested a lower range

79. For next winter there are factors that support higher and lower LNG imports:

Higher Imports	Lower Imports
Increased global LNG production	Higher global LNG demand
Lower LNG demand in Spain	Increased LNG demand in Japan
UK gas prices higher than US	UK gas prices lower than Far East
Increased availability of gas supply to Germany through Nord Stream	Possible increased gas demand in Germany due to Nuclear closures
	Commencement of Gate LNG

80. **Figure G12** shows historic LNG imports[10] for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12 and the build up of capacity for LNG imports. The historic data is from the peak winter months of December to February, the historic range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G12 – LNG Historic Flows and 2011/12 Forecast



81. The chart highlights many interesting features:

- The build up LNG capacity albeit not all has been fully utilised
- The rapid increase in deliveries

[10] Excludes Teesside GasPort

- The broad range of deliveries highlighting supply flexibility
- The higher level of supply at demands above 400 mcm/d compared to the average for December to February highlighting responsiveness to higher demands

82. The forecast for winter 2011/12 is marginally higher than for last winter. The 2011/12 forecast range for LNG is shown as 50 to 110 mcm/d. The January to February winter average forecast is 80 mcm/d with a higher forecast of 92 mcm/d for when demands exceed 400 mcm/d.
83. Flows of LNG imports through Teesside GasPort provide a further upside to the LNG forecasts.
84. Due to the delayed construction of the Tirley pressure reduction installation (PRI) the entry capacity at Milford Haven remains restricted to 750 GWh/d (approximately 68 mcm/d).

Storage

85. For next winter further storage capacity is expected to become available from the Aldbrough storage facility and through Holford, a new storage facility in the Cheshire area. In addition further space is expected at Hole House Farm[11].
86. Existing storage capacity has been reduced through the decommissioning of Partington LNG whilst no NTS shipper stock will be available at Glenmavis LNG.
87. In aggregate storage deliverability for next winter is a revised 1075 GWh/d, this is slightly lower than last year's figure of 1189 GWh/d. This is mainly down to the closure of Partington, but should increase when Holford is commissioned. This is expected to add a further 88 GWh/d and will further increase in winter 2012/13.
88. Following an increased declaration of space in Rough, aggregate storage space for next winter is now revised to be marginally higher than last winter.
89. **Table G8** shows our assumed levels of storage space and deliverability for next winter. Currently[12] Rough is filled to about 98%, MRS is filled to around 71%, and Avonmouth to about 89%. This is ahead of the position for this time last year; most storage is expected to be filled before it is required this winter.

[11] The increased space at Hole House Farm is from the transformation of salt caverns at Hill Top Farm. Dedicated facilities at Hill Top Farm are expected in the future.
[12] As of 7th September 2011.

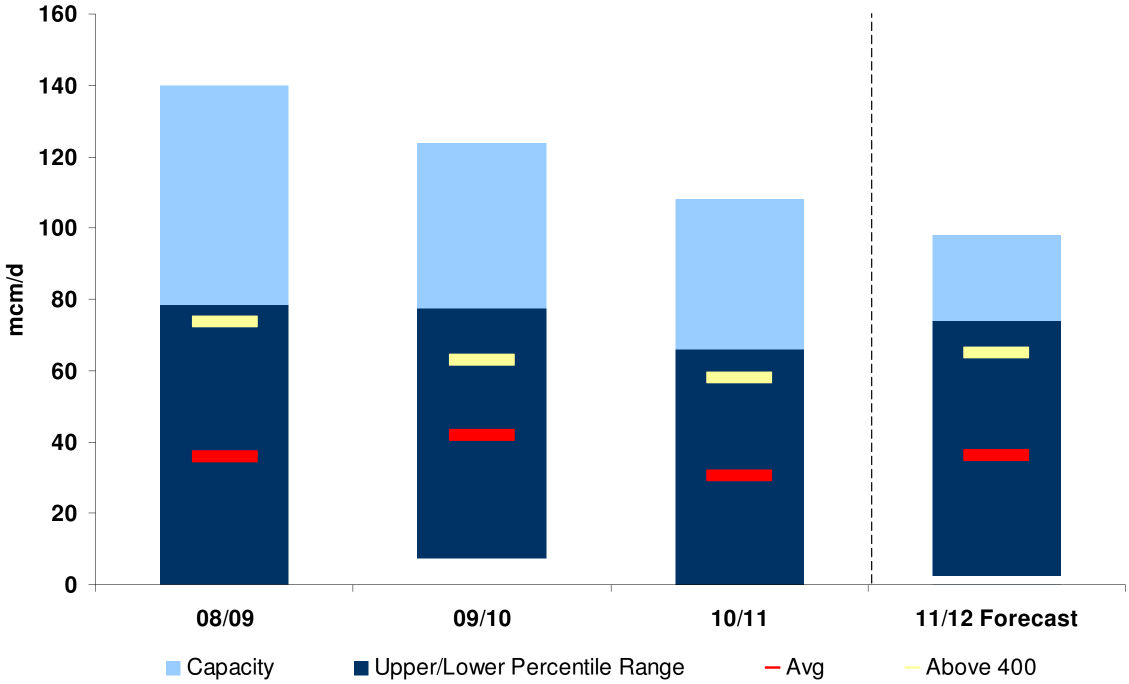
Table G8 – Assumed 2011/12 storage capacities and deliverability levels[13]

	Space (GWh)	Refill Rate (GWh/d)	Deliverability (GWh/d)	Deliverability (mcm/d)	Duration[14] (Days)
Short (LNG)[15]	677	3	143	13	4.7
Medium (MRS)	8767	390	457	42	19[16]
Long (Rough)	39500	240	476	43	83
Total	**48944**	**632**	**1075**	**98**	
Total 2010/11	48181	617	1189	108	

90. As of early September, European storage is also filled to a greater extent than last year at 90% full. The reporting of European storage stocks has also increased to represent 73.6 bcm of capacity compared to the UK's 4.4 bcm.

91. **Figure G13** shows historic storage flows for winters 2008/9 through to 2010/11, together with the winter forecast for 2011/12 and changes to aggregated storage deliverability. The historic data is from the peak winter months of December to February, the historic range represents all but the highest and lowest 5% of flows i.e. the 5 - 95%ile. Also shown is the average flow for all three months and the flows for all 56 demand days when demand exceeded 400 mcm/d.

Figure G13 – Storage Historic Flows and 2011/12 Forecast



[13] This table represents our operational assumptions and is based on proven performance. Reported deliverabilities may be different to 'name plate' capacities. Space includes 763 GWh Operating Margins, excludes Holford. Holford space and deliverability will be included when operational
[14] Duration based on Space / Deliverability, excludes within winter refill
[15] Commercial services offered by LNGS for 2011/12
[16] 19 days represents an average. Actual range of specific sites is far greater

92. The chart highlights many interesting features:

- The reduction in storage deliverability as reported in winter outlook publications
- Across the winters relatively little change in the values for either average flows or for flows when demands exceed 400 mcm/d
- Not surprisingly the broad range of deliveries highlighting supply flexibility
- As to be expected, the higher level of supply at demands above 400 mcm/d compared to the average for December to February highlighting responsiveness to higher demands

93. The forecast for winter 2011/12 is similar to last winter. The 2011/12 forecast range for storage is shown as 2 to 74 mcm/d. The December to February winter average forecast is 36 mcm/d with a higher forecast of 65 mcm/d for when demands exceed 400 mcm/d.

94. Flows from Holford provide a further upside to the storage forecasts.

Final View of Supplies Winter 2011/12

95. The previous sub-sections outlined the basis for the assumptions incorporated into the forecasts. **Table G9** summarises the 2011/12 forecasts in terms of a supply range and our forecasts for December to February and for demands above 400 mcm/d. The table also compares these with the 2010/11 forecasts[17].

Table G9 – Preliminary View of Non Storage Supplies Winter 2011/12

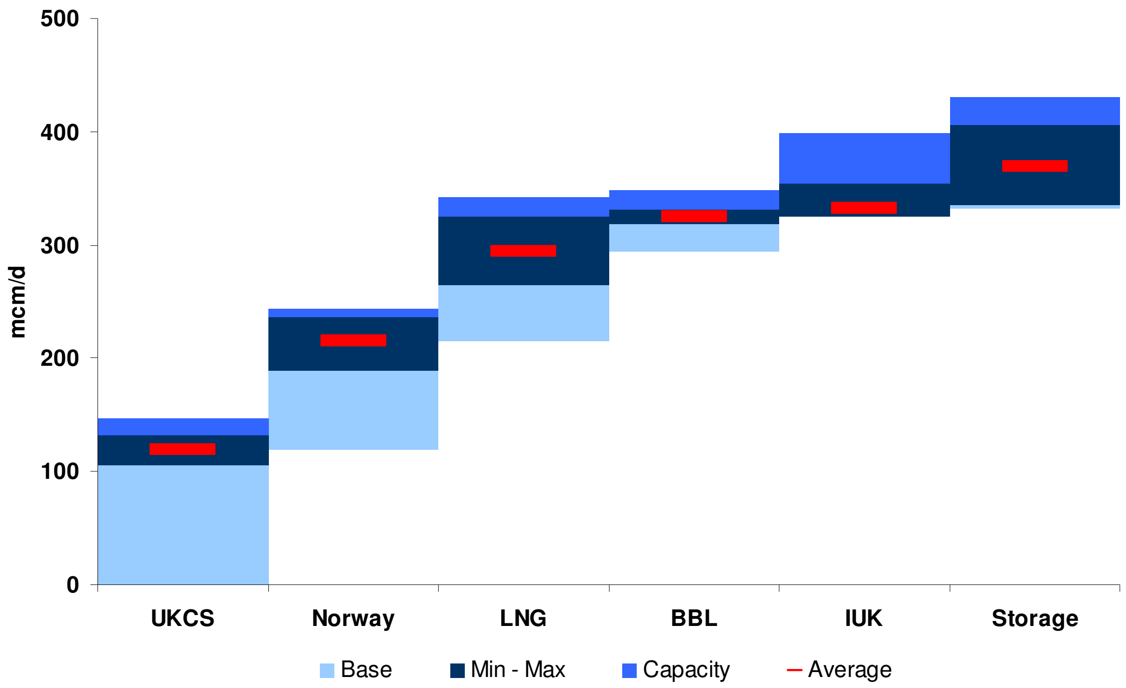
(mcm/d)	2010/11 Range	2010/11 Base Case	2011/12 Range	2011/12 Dec – Feb	2011/12 400+
UKCS	154	154	106 – 132	119	125
Norway	86 – 116	101	70 – 118	96	105
BBL	30	30	24 – 36	30	32
IUK	30 – 0	20	0 – 30	8	20
LNG Imports	30 – 100	77	50 – 110	80	92
Total	342 – 412	382	250 – 426	333	**374**[18]
Storage[19]		108	2 – 74	36	65
Total inc. Storage		**490**	**252 - 500**[20]	**369**	**439**

[17] Forecast range represents our final within winter assessment (January 2011)
[18] The 374 mcm/d non storage supply (NSS) for demands above 400 mcm/d is used in the initial setting of the GBA trigger level
[19] Storage capacity is 98 mcm/d, lower values represent assessment of flows under stated conditions
[20] The approach in aggregating each supply component overstates the anticipated supply range

96. The table highlights some supply uncertainty in all components, notably for LNG, Norway and IUK. The supply forecasts for December to February and for when demands exceed 400 mcm/d form the basis for the subsequent security of supply analyses, the initial setting of the GBA trigger level and the Safety Monitors. As the winter progresses, all these values are subject to change based on operational performance and the expectation of the commercial availability of additional storage facilities.

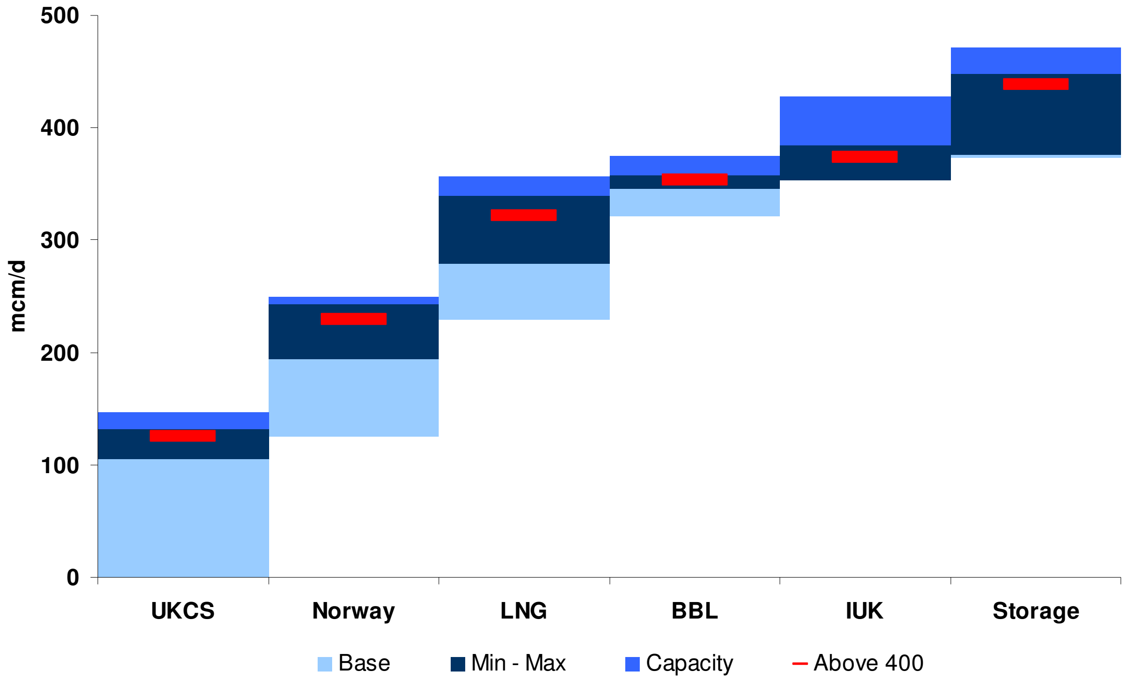
97. **Figure G14** shows an assessment of average supplies for the December to February period as a supply stack. Each supply source is stacked at the level of the 'average' position. Theoretically each stack could commence at higher or lower positions.

Figure G14 – Winter 2011/12 Assessment for December to February



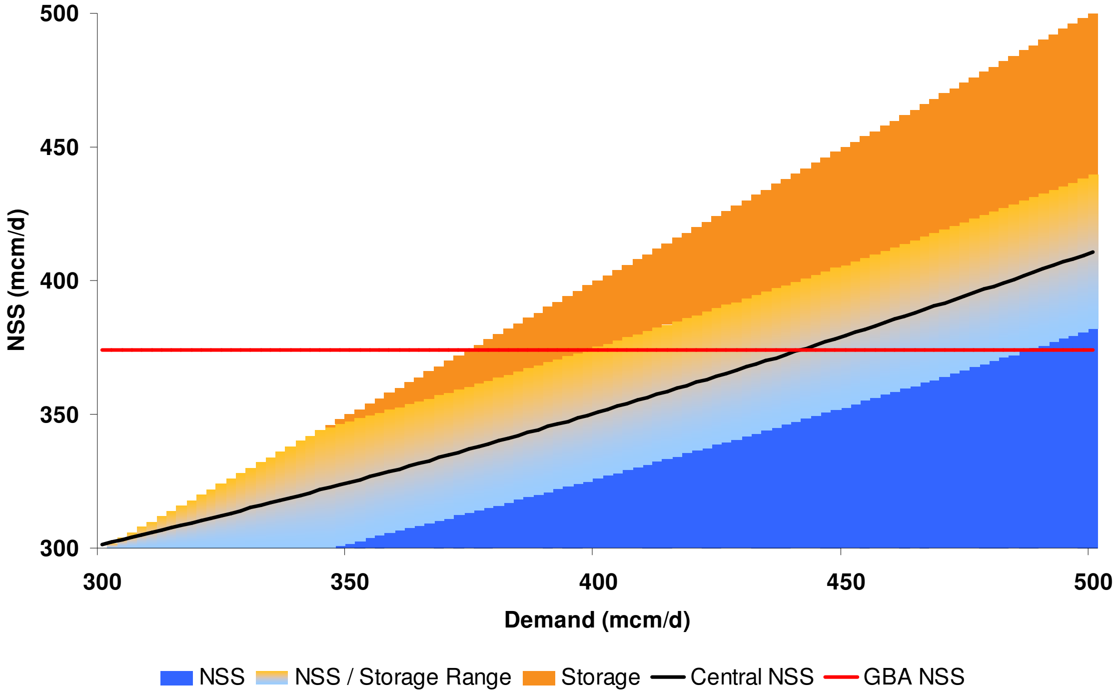
98. **Figure G15** shows an assessment of the supplies for when demand exceeds 400 mcm/d as a supply stack. Each supply source is stacked at the level of the '400 mcm/d' position. Theoretically each stack could commence at higher or lower positions to enable higher demands to be met.

Figure G15 – Winter 2011/12 Assessment for Demands above 400 mcm/d



99. **Figure G16** shows a simplified representation of how supply is forecast to meet demand next winter. The data set to create this chart is from the past 5 winters with a weighting towards the most recent winters. The supply is broken down into three discreet areas, one of non storage supply (NSS), one of storage and an area in between where storage and NSS are both expected to contribute to some extent.

Figure G16 – Winter 2011/12 Simplified Representation of Supply



100. The chart shows the contribution of NSS in setting the GBA trigger level. This is initially set at 374 mcm/d based on the forecast performance of NSS for demands above 400 mcm/d as shown in Table G9.

101. Also shown in the chart is a line that represents the best view of NSS. Historically this line used to approach a plateau. However last winter's experience of LNG and IUK imports suggested that these and other imports competed with storage at high demands. For last winter 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.

102. In the subsequent sections that describe winter security and the Safety Monitors, the data presented in this chart is used extensively. For the winter security analysis the central view on NSS is used as the basis of supply whilst the 50 mcm/d range that represents the band where NSS and storage both contribute is used to reflect a range of supply (+/- 25 mcm/d).

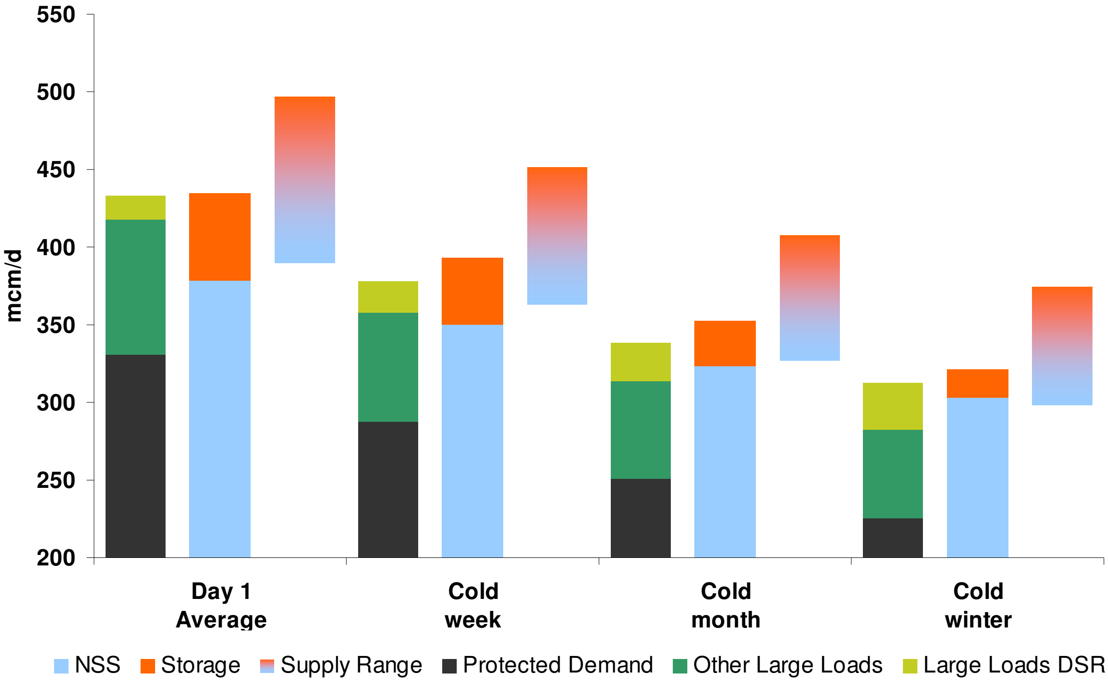
103. In setting the Safety Monitors a more prudent approach to NSS is needed, hence the top of the 'Low NSS' area is used i.e. the minimum forecast level of NSS

Winter Security Assessment

104. **Figure G17** shows a cold spell analysis for **average** demand conditions for 4 durations:

- The coldest day typically -2℃
- The coldest week of the winter at about 1℃
- The coldest month at about 3℃
- The coldest 3 months of the winter at about 5° C

Figure G17 – Cold spell analysis for average conditions



105. The chart shows 3 bars for each level of demand. The first bar shows demand as 3 components:

- Protected demand namely all loads protected by monitor in the Safety Monitor calculation. These demands include non daily metered (NDM), Ireland and priority customers
- Large loads that are not expected to respond to a short term increase in gas price. These are defined in the chart as 'other large loads'
- Large loads that are expected to respond to a short term increase in the gas price and therefore provide a demand side response (DSR.) These are defined in the chart as 'large loads DSR'

106. The DSR is shown as a range from 15 - 30 mcm/d. Approximately 5 - 25 mcm/d of this response is assumed from gas fired power stations, arising through increasing

prices during a period of either high demand, a supply shortage or a combination of both. For weekdays at high gas demand, the DSR could be as low as 0 – 10 mcm/d.

107. The low assessment for DSR from power generation arises as coal fired power stations rather than gas is assumed for base load power generation. Other generating assumptions also limit the response, namely low wind (8%), relatively low nuclear availability (83%) and some electricity interconnector exports.

108. For each additional GW of non gas generating plant available, the DSR increases by about 4.5 mcm/d. Though not shown an additional DSR of typically 10 mcm/d may be possible for a limited time through use of distillate.

109. The second bar represents supply shown as non storage supply (NSS) and storage as shown by the representation in **Figure G16** (central NSS line). The third bar shows the range of supply for NSS (**Figure G16**) and from an assessment of storage use. The wide range of the NSS and storage highlights the significant amount of supply flexibility that is available within the UK. Flexible supplies include storage, LNG imports, IUK and to a lesser extent Norway and BBL

110. The analysis shows that for average conditions, all demand is met by central case supplies for all demand conditions evaluated.

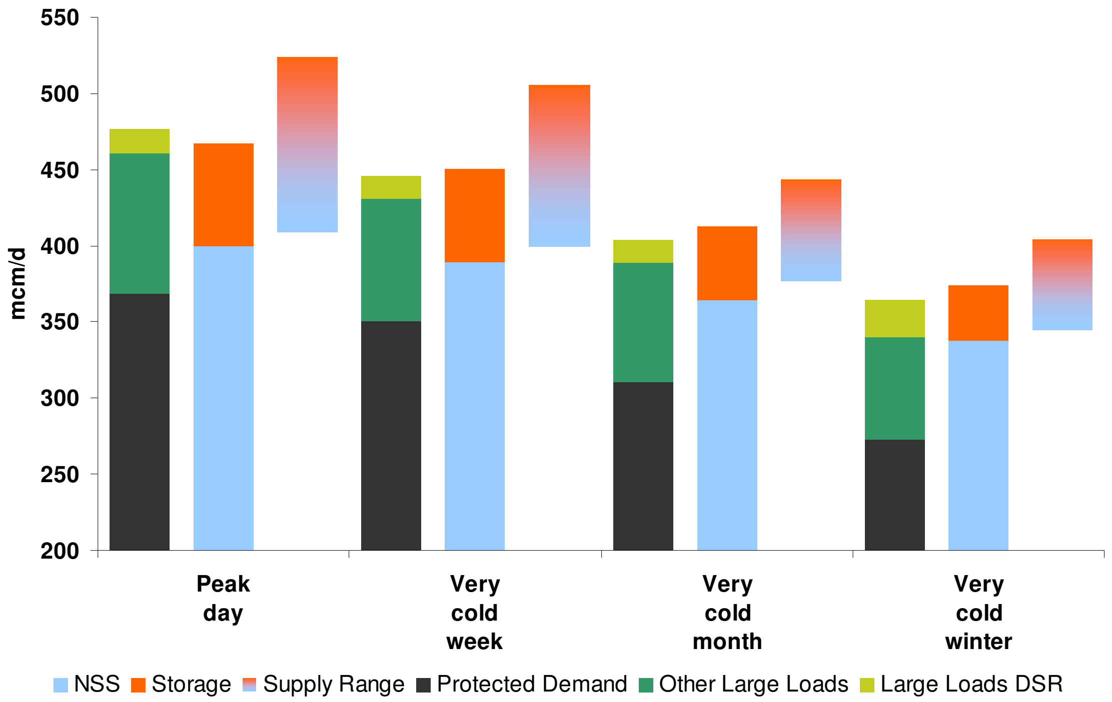
111. Protected demand is readily met by NSS for all demand conditions.

112. **Figure G18** shows a similar cold spell analysis for **severe**[21] demand conditions:

- The peak day[22] (1 in 20), typically -5℃
- The coldest week of the winter at about -3℃
- The coldest month at about -1℃
- The coldest 3 months of the winter at about 1.5℃

[21] Severe conditions are based on 1 in 50 demand conditions. For security analysis we use diversified demands.
[22] Peak day conditions are based on 1 in 20 demand conditions. A peak day does not always occur in a severe year. The coldest day in the last 80 years, January 13th 1987, was in a 1 in 3 cold winter.

Figure G18 - Cold spell analysis for severe conditions



113. Apart from a 10 mcm/d requirement for either additional NSS or storage or an equivalent demand side response for a peak day, all demand could be met by the central case supply assumptions for all demand conditions evaluated. The wide range of the NSS and storage at peak and the potential for a demand side response indicates that a requirement for 10 mcm/d should in principle, be achievable.

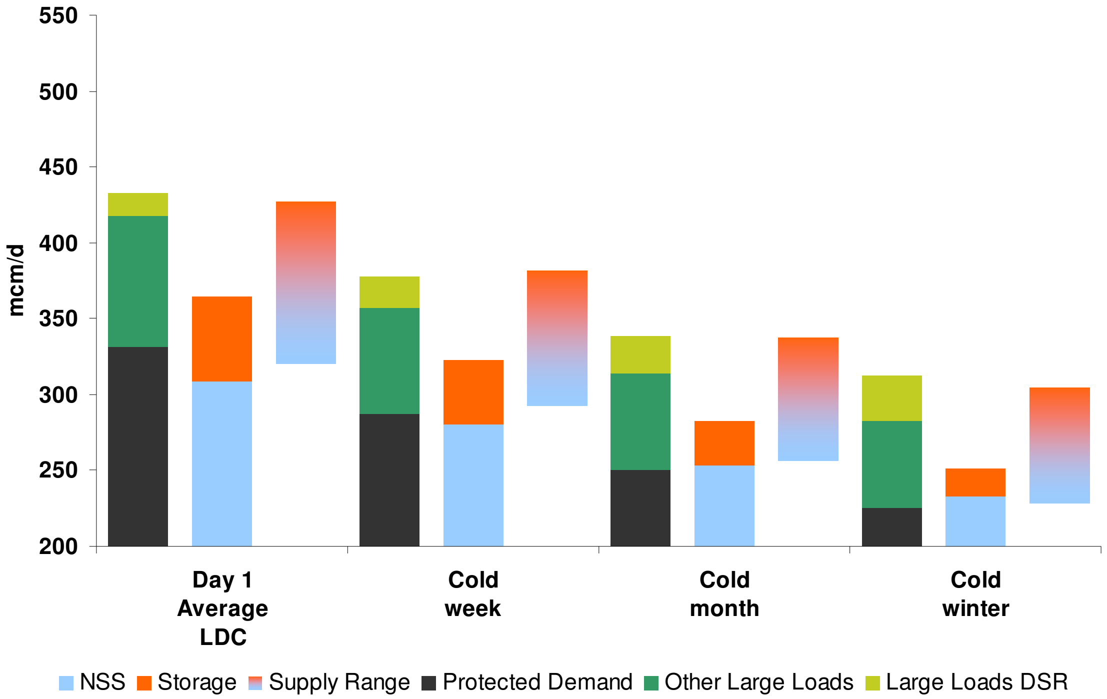
114. Protected demand is readily met by NSS for all demand conditions

Supply loss analysis

115. The analysis presented this year includes the impact of a 70 mcm/d supply loss within the cold spell analysis. The 70 mcm/d supply loss is shown as a reduction in NSS. The 70 mcm/d supply loss applies to the day, week, month and winter (3 month) periods, i.e. from a single day supply loss to a winter-long loss. A 70 mcm/d supply loss would be broadly consistent with the loss of the current largest source of imports, namely the Langeled pipeline or close to capacity of IUK.

116. **Figure G19** shows the cold spell analysis for average demand conditions and a 70 mcm/d supply loss.

Figure G19 – Cold spell analysis for average conditions and 70 mcm/d supply loss

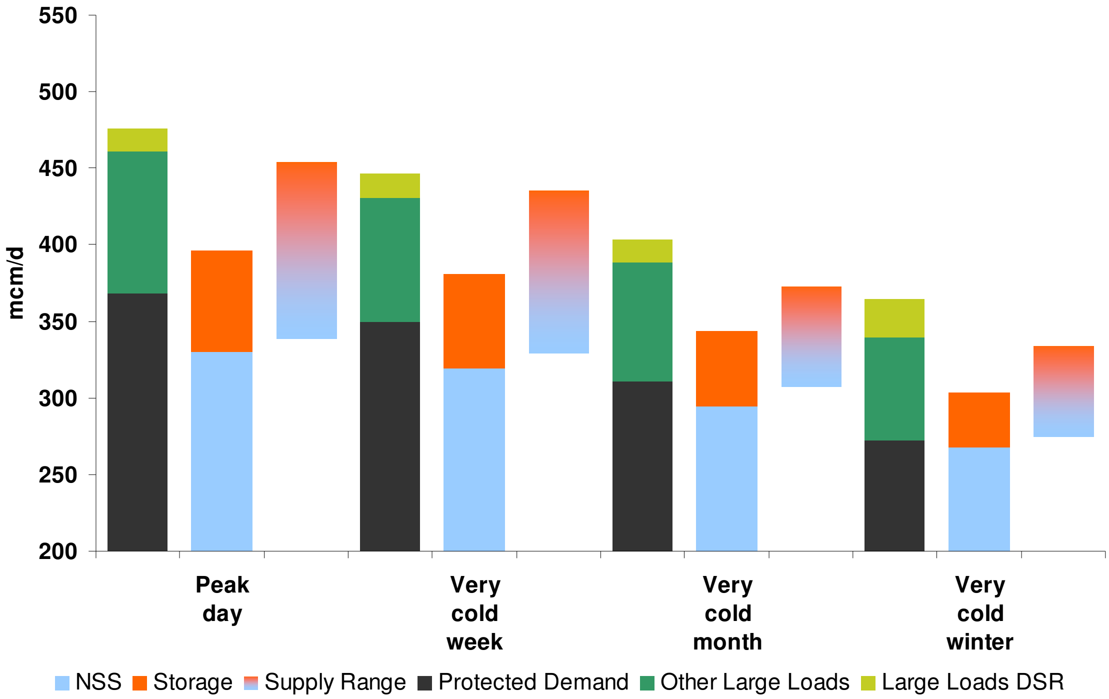


117. Not surprisingly, the resulting analysis shows a requirement for an increase in NSS and storage and potentially a demand side response.

118. Protected demand is met by central case NSS and storage for all demand conditions.

119. **Figure G20** shows the cold spell analysis for severe demand conditions and a 70 mcm/d supply loss.

Figure G20 – Cold spell analysis for severe conditions and 70 mcm/d supply loss



120. Not surprisingly, the resulting analysis shows a requirement for an increase in NSS and storage and potentially a demand side response. Even with these responses further supplies or more demand response may be needed.

121. Protected demand is met by central case NSS and storage for all demand conditions.

Safety Monitors

122. On 6th June 2011, the preliminary view of initial Safety Monitor levels was published for 2011/12 as required under the Uniform Network Code (Q5.2.1).

123. It is National Grid's responsibility to keep the monitors under review (both ahead of and throughout the winter) and to make adjustments if it is appropriate to do so. It should be noted that the purpose of the Safety Monitors is to ensure an adequate pressure can be maintained in the network and thereby protecting public safety. It is therefore appropriate that a prudent approach is adopted in setting the Safety Monitor levels.

124. **Figure G16** shows the NSS versus demand assumption for winter 2011/12, based on an analysis of the last five winters. This continues the approach adopted last year of using a variable NSS assumption which is demand dependent. This more accurately reflects the flexible supply options available within the UK. It is important that the assumed level of NSS used for calculating the Safety Monitors is available throughout the winter, notably at times of high demand. Hence in calculating the Safety Monitors, NSS at minimum forecast levels are used.

125. The current Safety Monitor methodology considers all storage types equitably, by grouping all storage types/facilities together such that there is only one aggregated

monitor for space. Hence operational storage space is apportioned equitably across all storage sites, including those with high cycling rates.

126. There is one Safety Monitor for space and one Safety Monitor for deliverability. This provides greater clarity for market participants and operational decision making.

127. The resulting Safety Monitor levels for winter 2011/12 are detailed below. These are lower than the 2010/11 Safety Monitors. This is primarily due to the higher NSS assumptions which reflect the potential for additional NSS supplies during periods of high demand.

- 2011/12 Assumed storage space = 48944 GWh
- 2011/12 Safety Monitor space = 731 GWh (1.5%), (2010/11 = 1164 GWh)
- 2011/12 Safety Monitor deliverability = 518 GWh/d, (2010/11 = 702 GWh/d)

128. Safety Monitor levels and the associated winter profiles (i.e. how the monitors reduce later in the winter) will be published on or before 1st October 2011.

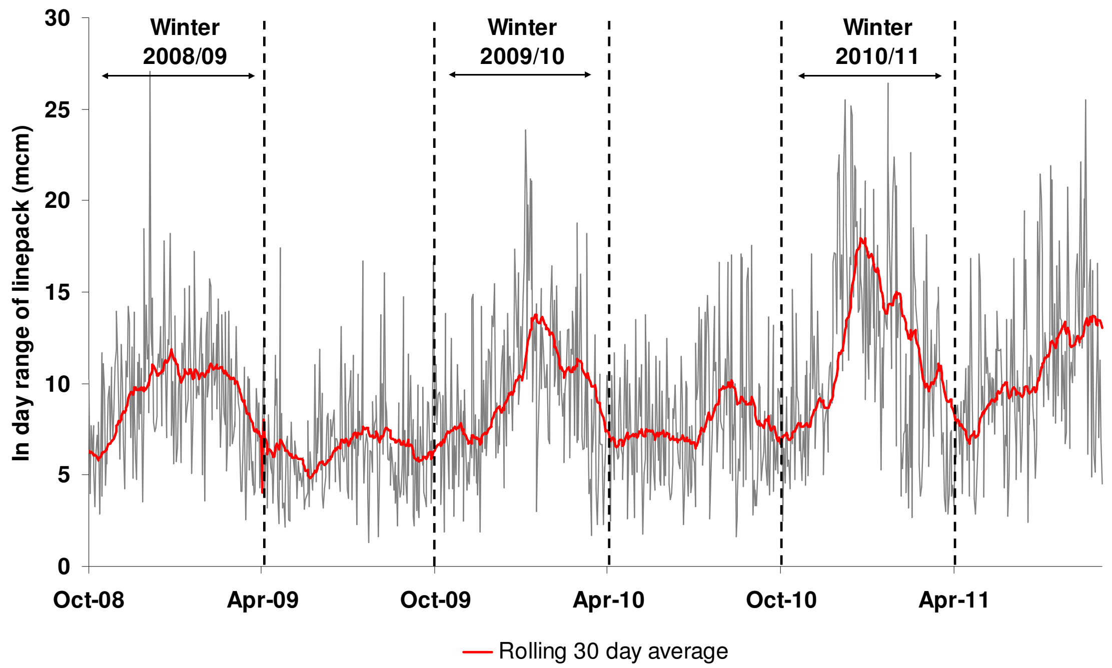
Operational Overview

Operational Challenges

129. The key operational challenges for this winter are to set up and manage the NTS in an increasingly unpredictable supply demand environment.

130. In recent years a trend has emerged towards increased within-day volatility of supply. This has led to increased linepack variations as shown in **Figure G21**. The continuance and amplification of this trend has led to increased operational challenges in the management of within-day linepack in order to keep NTS pressures within safe and agreed operational tolerances.

Figure G21 – Within-day Linepack Variations



131. The chart clearly shows the increased frequency and magnitude of linepack variations over the last three years.

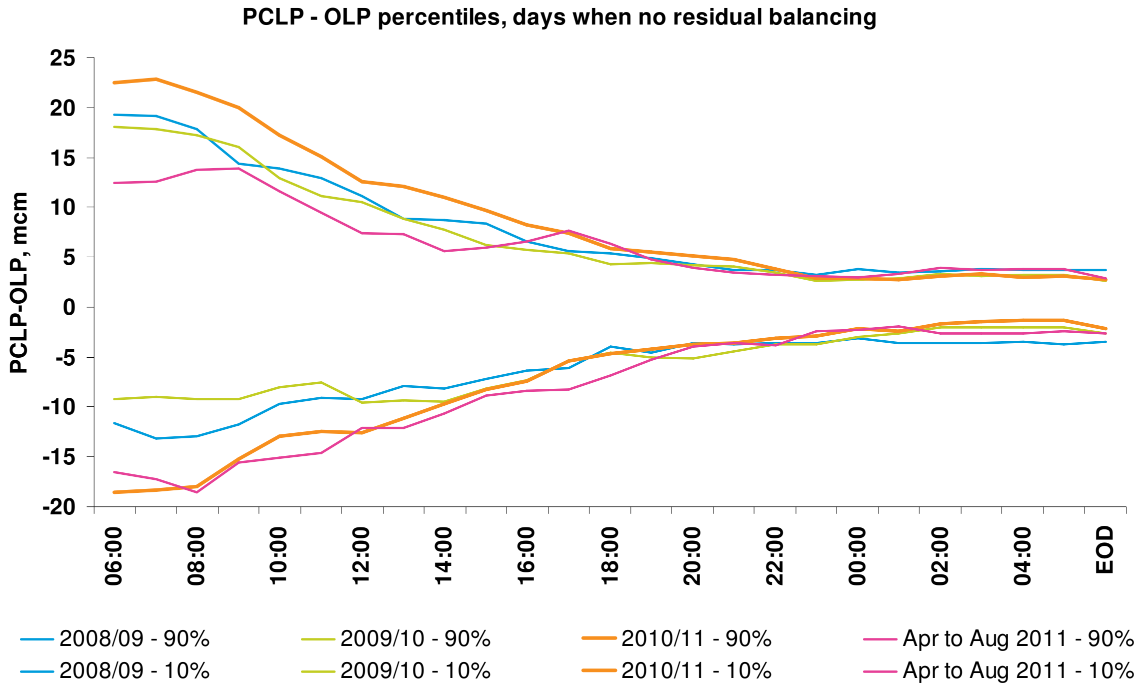
132. Large linepack reductions are caused when the rate of supply entering the network is less than the demand being withdrawn. This usually occurs at the start of the gas day; supplies then tend to increase later on in the day, and as long as the rate of supplies is above demand, linepack recovers.

133. Large linepack variations increase the risk that Offtake Capacity Statement (OCS) pressures will not be met, because if a supply shock occurs when the level of linepack is low, it is harder to return to a situation when supply outstrips demand and therefore linepack is less likely to be restored. Under these conditions pressures around the network can be reduced, and at times these may not be recovered for a matter of days.

134. It is also likely to compromise the efficiency and effectiveness of capacity optimisation, with reduced opportunity to release discretionary capacity.

135. A connected trend can be seen on shipper input nominations that feed into terminal notifications and in turn into the end-of-day market indicator of Projected Closing Linepack (PCLP). In recent years there has been a notable trend towards a deterioration of forecast performance of this vital balancing requirement indicator, as shown in **Figure G22**.

Figure G22 – PCLP Performance



136. The chart shows (by removing days impacted by National Grid balancing actions) the underlying market information performance. During 2010 to 2011 more than 10% of days indicated an initial PCLP that was either 22 mcm greater than the opening linepack (an approximate indicator of the desired balance) or 17 mcm less.

137. August 2011 saw a period of sustained low opening PCLP figures, driven primarily by low initial supply figures feeding into the calculation before increasing to provide an end-of-day balance to within historically normal levels.

138. The operational impact of this can be considered in terms of system planning and optimisation. The biggest difference between opening linepack and PCLP during summer 2011 was a deficit of 40 mcm. At 06:00 on this day National Grid was not being notified of where approximately 25% of the total supply was to be delivered to meet the forecast demand on the day. Leading into the winter if this pattern continues, these operational challenges in how to configure the system are likely to become even more acute. This will need flexible operations with compression running to ensure the gas is moved to the right places within the network to avoid reduced pressures.

139. Last winter included periods of high demand, a number of significant supply disruptions, periods where LNG stocks were relatively low and changing supply profiles within day leading to significant changes in linepack.

140. All of these events can be expected to occur again in the coming winter. In order to manage the NTS safely and efficiently, it is essential that information provision to the system operator is timely and accurate, with market participants operating in accordance with the information they have submitted.

Gas Security of Supply Significant Code Review

141. As part of the revised governance arrangements implemented at the start of 2011, Ofgem have the powers to initiate a Significant Code Review (SCR) where they believe a co-ordinated development of governance arrangements is required.

142. In January 2011, Ofgem initiated their first Significant Code Review on Gas Security of Supply to consider the effectiveness of the current arrangements in managing a gas supply deficit emergency.

143. Ofgem are due to publish their draft decision in autumn 2011 outlining the proposals they have developed to address the following main SCR objectives:

- Minimise the likelihood of an emergency occurring, by encouraging gas shippers / suppliers to take out sufficient insurance
- Minimise the severity and duration of a gas emergency if one were ever declared, by sharpening incentives to attract and purchase imported gas
- Appropriately compensate firm consumers if they were ever interrupted

144. Ofgem's final proposals are due to be published in spring 2012. Therefore, any proposed changes will not impact winter 2011/12.

Gas Balancing Alert (GBA)

145. The GBA arrangements have been in place for five years. In conjunction with industry comments raised at Ofgem's Gas SCR initial proposals workshops, National Grid believe that it is timely to undertake a review of the current arrangements. National Grid has therefore initiated a review under the governance of the UNC, to discuss the potential development of the current GBA arrangements.

146. Working with the industry, the aim is to develop proposals to improve the current arrangements, with the earliest potential implementation for winter 2012/13 (dependant on the extent of the proposed changes and corresponding system development requirements).

Market Information Provision

147. National Grid's Gas Operational Data[23] details extensive data and real time information. As physical and regime changes occur, the industry will see these developments incorporated into the existing suite of reports and data items.

148. The EU council agreed the 3rd package of EU energy market legal obligations (715/2009) on 3 September 2009 which detailed the requirements on EU transporters for the transparency and publication of specified data. To ensure compliance, National Grid implemented (Winter 2010/11) the latest phase of the Gas Market Reporting System to publish a new day ahead & intra day nomination report, a new NTS entry physical flow report, and a new storage & LNG report, along with some enhancements to existing reports.

149. Changes to the Exit Capacity regime will result in a further release to enhance and improve the publication of NTS Exit Capacity information. Some older, preformatted

[23] http://www.nationalgrid.com/uk/Gas/Data/

reports will cease to be published and will be replaced instead by searchable data items which Users can download and interrogate in their own systems.

150. Information on the supply / demand forecast, storage & LNG Importation stock levels and GBA trigger levels can be found at: http://marketinformation.natgrid.co.uk/gas/frmPrevalingView.aspx

151. Information on the supply / demand forecast, storage stock levels, storage deliverability and GBA trigger levels have been consolidated at: http://www.nationalgrid.com/uk/Gas/Data/GBA/

152. Users can also subscribe to receive notification via email or text that news items have been published on the National Grid Information Provision pages by signing up at this address: http://www.nationalgrid.com/uk/Gas/Data/subscribe

Update on Provision of new NTS Capacity for Winter 2011/12 & 2012/13

Emissions related works

153. Work continues on the new 35MW electric drive compressor unit at Kirriemuir and the two 24MW units at St Fergus as part of National Grid's drive to reduce compressor station emissions. The new units are anticipated to be operational during 2012.

Storage

154. A new feeder has been constructed to provide additional capacity for the Hill Top Farm storage facility in Cheshire. The 3km x 900mm pipeline will be constructed from Warmingham to tie into an above ground installation at Wheelock. The feeder is anticipated to operational by late autumn / early winter 2011/12.

South Wales Expansion Project

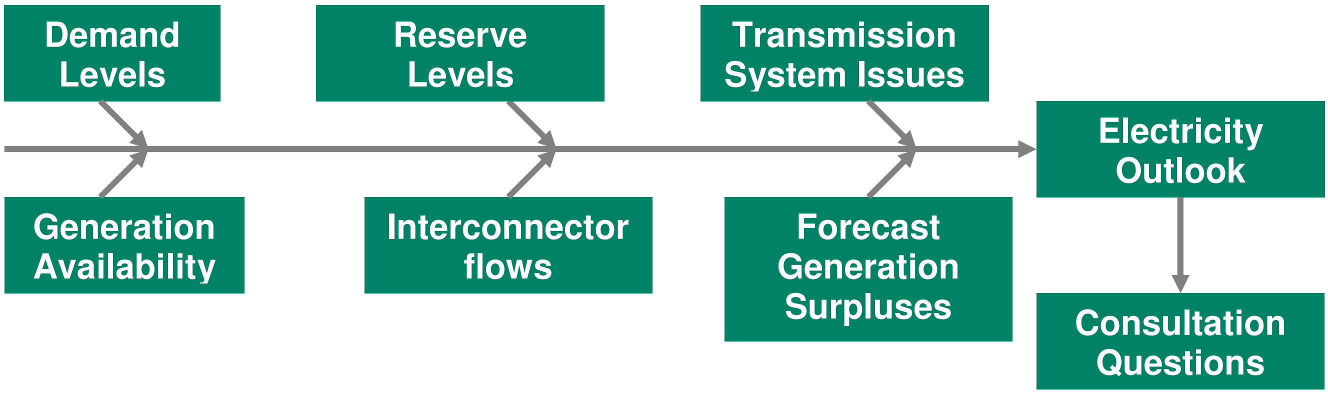
155. This project is part of the overall investment strategy to provide the capacity to transport gas from the two LNG importation terminals at Milford Haven.

156. Construction has commenced on the tie-in of the Pressure Reduction Installation (PRI) at Tirley in Gloucestershire. The successful completion of this key asset for winter 2012/13 will alleviate the existing force majeure capacity restriction and increase Milford Haven entry capacity to the 950 GWh/d release obligation.

New Exit Connections

157. Completed in time for this winter, there will be a number of new connections to the NTS, including a network offtake point at Burnhervie on Feeder 13 between St Fergus & Aberdeen and a connection for a salt cavern storage facility at Stublach in Cheshire. Commissioning works are currently ongoing at both sites in readiness for first gas flows.

Electricity

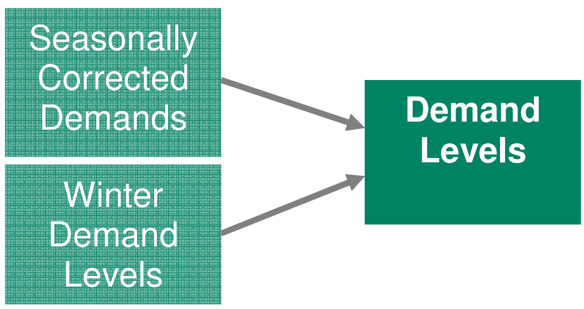


Overview

158. This chapter sets out the current electricity forecast for the winter 2011/12.

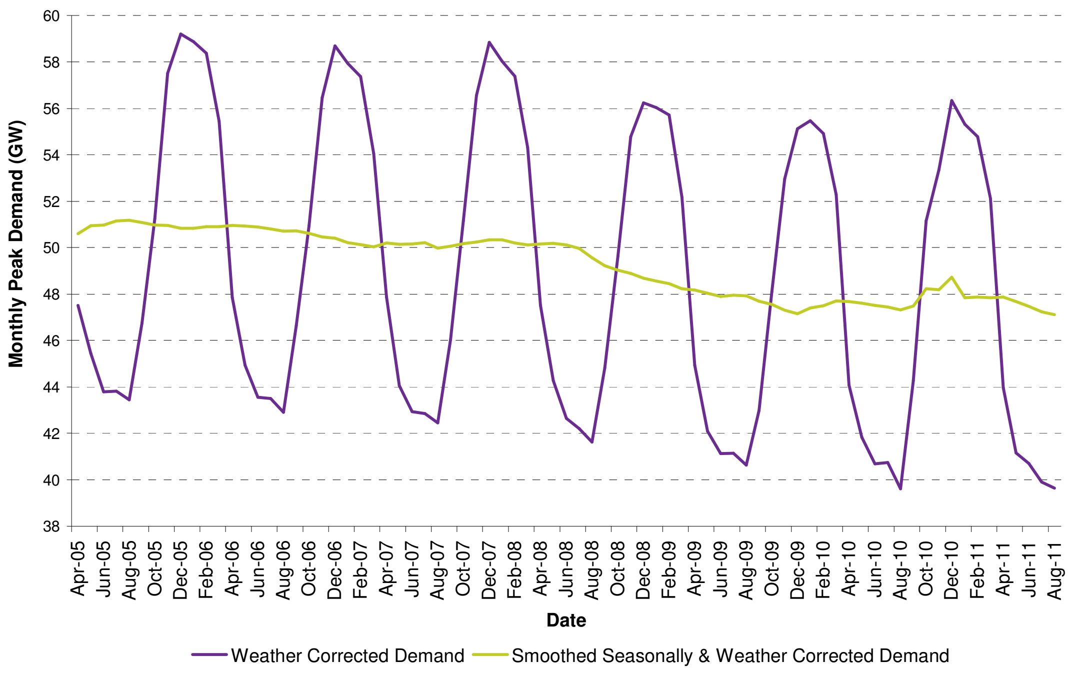
Demand Levels

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



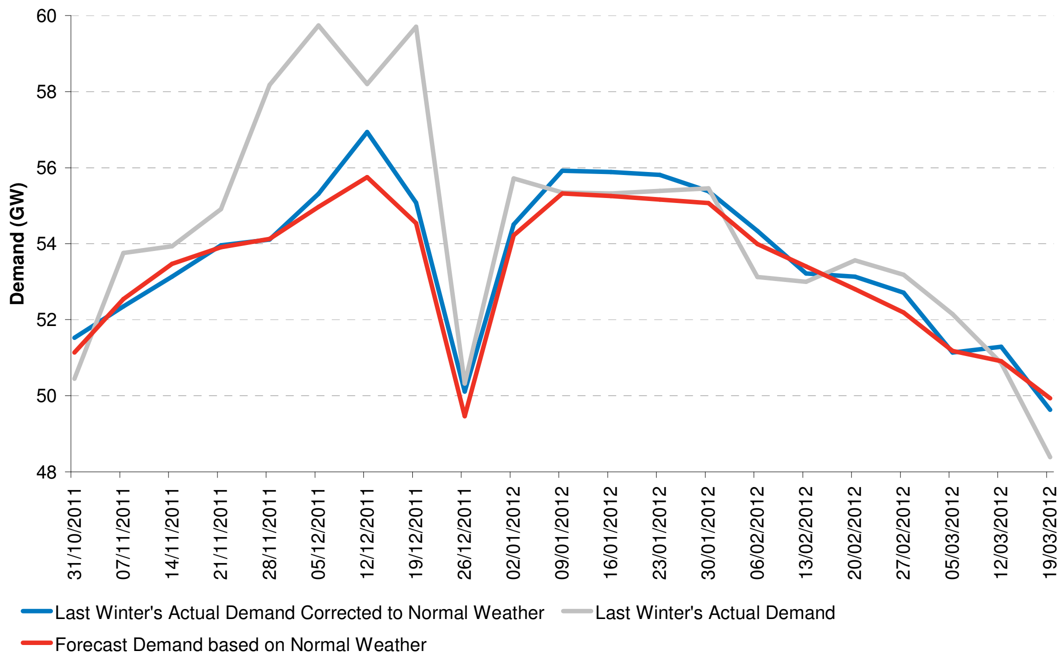
160. Previous demand level forecasts for the winter have been based around the assumed growth/decline in consumption relative to previous years. Following the decline that occurred during the economic downturn there has been a small amount of growth which levelled during 2010 and early 2011. There has been a drop in the seasonal and weather corrected demands since April of this year. This shown in **Figure E1** the weather and seasonally corrected demand level for the last six years. The effect of the economic downturn can be clearly seen. The sharp rise in the demand during the winter of 2010/11 can be attributed to the 'snow effect'.

Figure E1 - Smoothed Weather and Seasonally Corrected Normal Demand



161. **Figure E2** shows the previous years actual demand, weather corrected demand and the demand forecast for the upcoming winter. The most current forecast at any time is given on the **BRMS**[24].

Figure E2 - Previous years outturn and forecast for 2011/12



24 www.bmreports.com

162. The Normal demand peak forecast is 55.8 GW compared to the normal demand forecast from the Winter Consultation of 56.1 GW. The Average Cold Spell demand peak forecast for winter 2011/12 is currently at 57.9 GW this is down from 58.1 GW in the Winter Consultation. The differences in the demand forecast between the consultation and this report are due to recent experiences of a slight reduction in the seasonally and weather corrected demands.

163. 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 59.5 GW an increase of 200 MW from the Winter Consultation and 200 MW lower than the outturn peak of 59.7 GW last year.

Embedded Wind Generation

164. Through the consultation responses, the effect of embedded generation, mainly from embedded wind generation, on National Grid's demand forecast was raised. There is an increasing volume of wind generation that is not connected to nor metered by National Grid. This wind generation has the same effect as negative demand for the System Operator. Processes are currently being further developed and refined to predict and hence remove the effect of this wind generation from the demand forecasts.

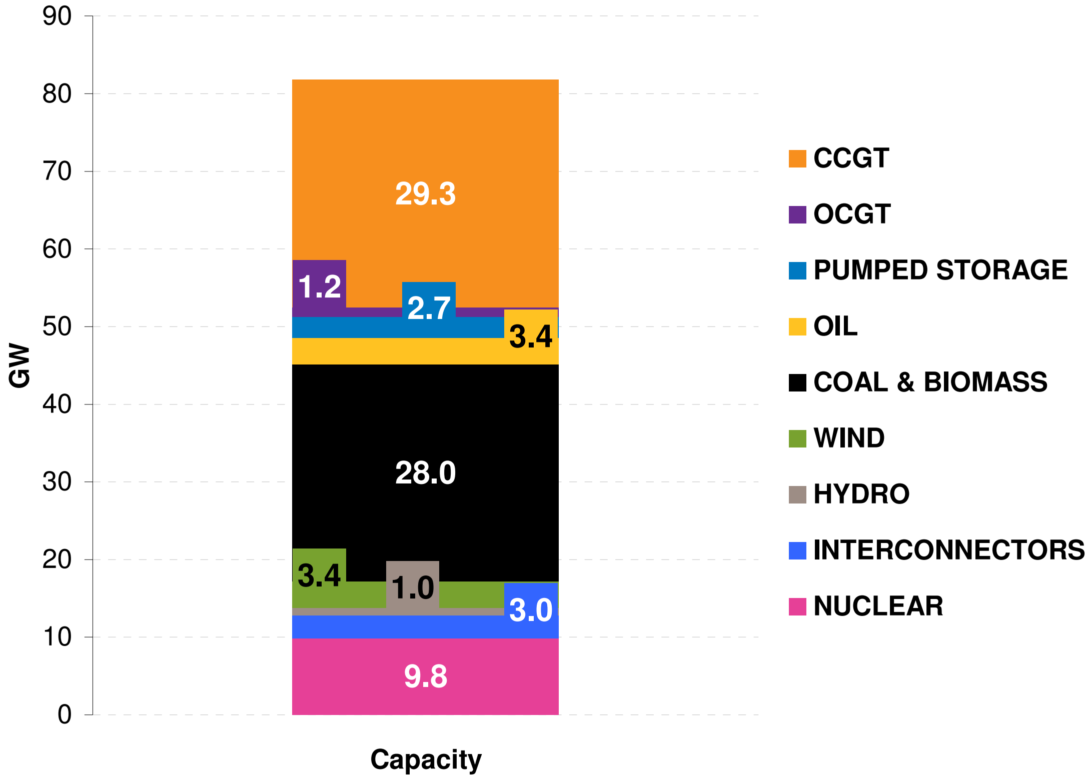
165. National Grid will be consulting on some of the issues regarding demand forecasting and embedded wind generation in the new year. More information will be provided through the Operational Forums and future Summer/Winter Outlook reports.

Generator Availability

Generation Capacity

166. 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 2011 is 81.8 GW. A breakdown of this capacity is shown in **Figure E3**. The Operational Capacity figure from the Winter Consultation has increased from 80.9 GW due to an increase of around 500 MW in wind generation capacity. There has been small downward variation in nuclear capacity. Overall the operational view of capacity for the forthcoming winter is currently very similar to that of the Summer Outlook Report and Winter Consultation.

Figure E3 - Generation Capacity Operational View 2011/12



167. Potential upside exists in the capacity from commissioning plant that is expected to commence commissioning during the winter period.

Generation Availability Assumptions

168. **Table E1** shows the assumed losses based on previous winters losses, including; breakdowns, shortfalls and any reduction in primary energy source such as wind and water. This data is then used in the forecast generation surpluses on page 50.

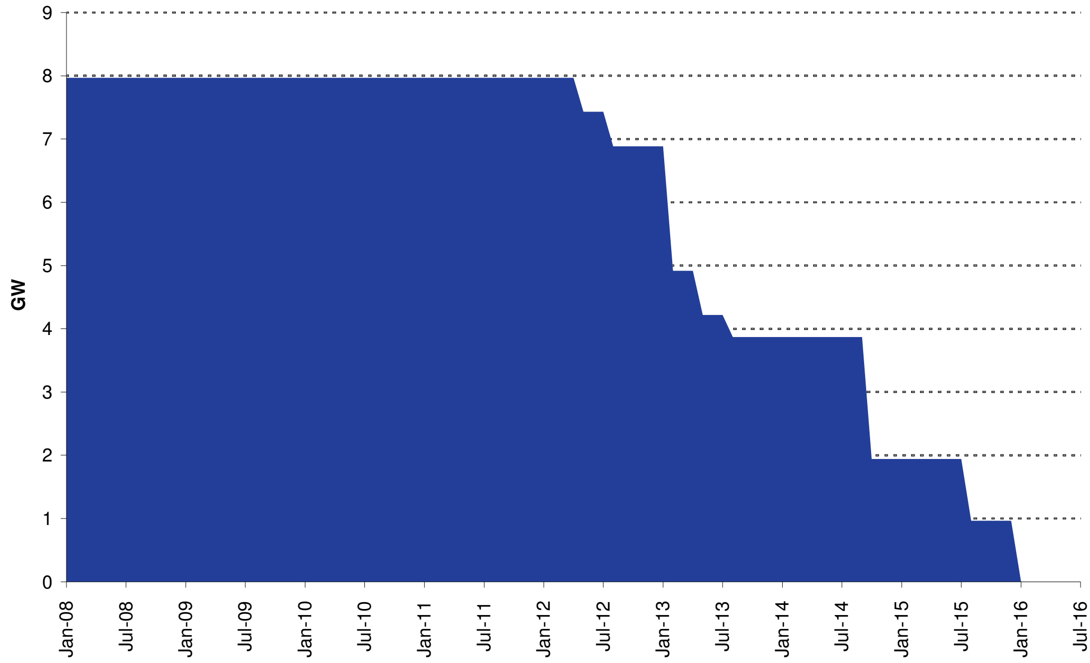
Table E1 - Assumed Losses of Generation Availability for Winter 2011/12

Power Station Type	Assumed losses
Nuclear	17%
Interconnectors	0%
Hydro generation	30%
Wind generation	92%
Coal & Biomass	14%
Oil	30%
Pumped storage	4%
OCGT	2%
CCGT	11%
Total	**16%**

Generation Side Risks

169. Issues related to the limited hours under LCPD for opted out plant are unlikely to affect this winter but are likely to affect the following winter. LCPD opted out plant has 20,000 hours allowed operation until December 2015. At current observation rates of utilisation of the allowed hours, there is an implication of early closure of some units. The latest view of National Grid, based on running patterns to date projected forward for opted out coal units is shown in **Figure E4**.

Figure E4 - Indicative Total Generation Capacity For LCPD Coal Opted Out Plants



Mothballed Generation

170. National Grid is aware of at least 2 GW of generation that was available to run during the winter 2010/11 that has been declared unavailable for the winter 2011/12. At the winter outlook seminar hosted by ofgem, 3.4 GW of generation was stated as being mothballed, however, 1.4 GW of generation has since made itself available for the winter.

171. Not all of the 2 GW generation will be accessible during the winter, however, it is expected in the event of higher electricity prices some of this generation may become available to the market.

Merit Order

172. 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 changes over time.

173. As discussed on page 9 forward prices suggest that coal fired power generation could be the base load plant from November through to March.

Reserve Levels

Reserve Levels

174. 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.

175. There is 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 also met from both synchronized and non-synchronised sources.

176. National Grid procures 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.

177. For winter 2011/12, the present level of contracted STOR reserve is approximately 4GW, over 2.2 GW from BM participants and nearly 1.8 GW from non-BM generating plant and demand reduction (of which, about 0.3 GW is unlikely to be available over the winter darkness peak).

178. National Grid expects to contract more STOR to provide reserve service over the winter. Last winter 2.7 GW of STOR was contracted 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 to 20 winter peak demands last year was only about 1.75GW.

179. 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 response requirement. 0.7 GW of this 1.5 GW reserve requirement has already been contracted, with 0.3GW from demand-side providers.

180. National Grid continues to have Maximum Generation contracts in place for Winter 2011/12, 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

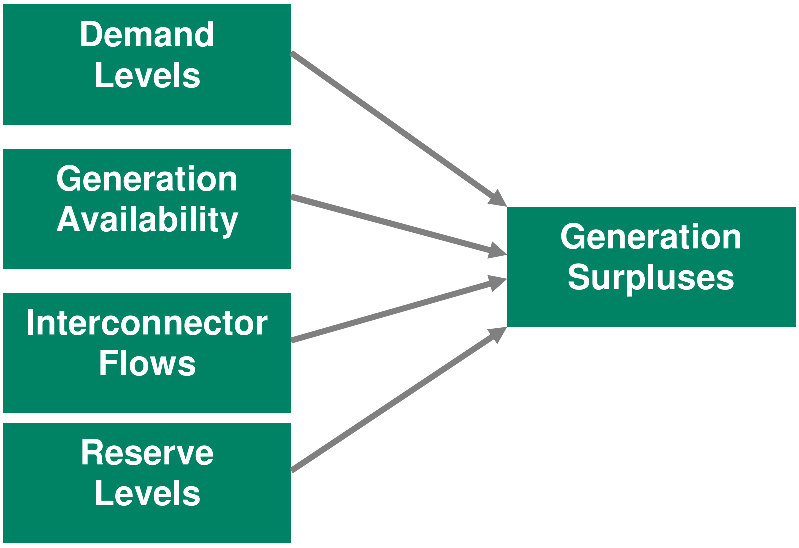
181. There is uncertainty around the interconnector flows going forward. As in previous reports it is expected that the interconnector flows will follow the price differentials between the different markets. Germany's recent decision to close 8.3 GW of nuclear plant immediately and put in place a phased closure of all nuclear plant by 2022 is expected to have impacts during this winter.

182. Using the forward prices for the winter, the differential between GB power prices and continental prices give an indication of exports from the GB market to Europe for the majority of the day. The forward prices for Q4 also reflect French nuclear outages planned for October. The forecast for flows is given in **Table E2.**

Table E2 – Forecast Weekday Interconnector Flows

Time	Forecast Flow minimum (+ve to GB)	Forecast Flow maximum (+ve to GB)
07:00 – 19:00	-3GW	-3 GW
19:00 – 23:00	-3GW	0 GW
23:00 – 07:00	0 GW	+3 GW

Forecast Generations Surpluses



183. This sections looks at the amount of Generation Surplus available through the main scenarios of interest. Each chart has an amount of demand (green bars) the required operating reserve (orange bars). The solid line is the generation availability with 3GW of imports and then the dotted line includes 3GW of exports.

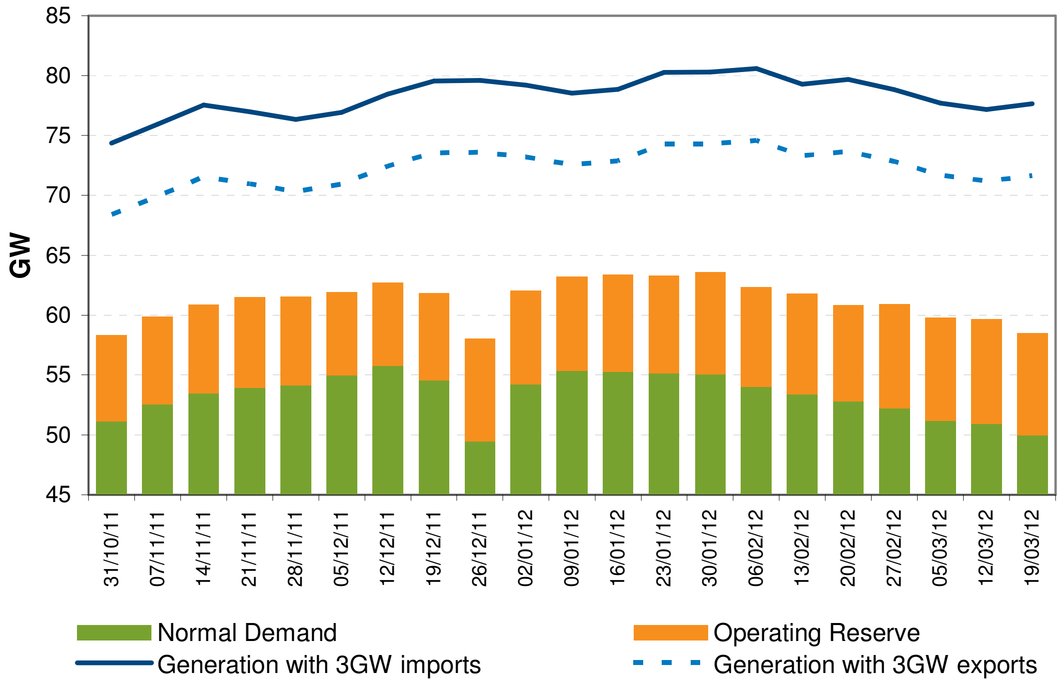
184. The normal demand is based on average weather conditions, where as the 1 in 20 demand is for a winter with severe weather that would only be expected in 1 winter out of 20.

185. The declared generation availability is the currently declared availability which is declared to National Grid through the requirements of Operational Code 2 section of the Grid Code. The assumed generation is derived from the assumptions set-out on page 46 and the declared generation availability.

186. 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.

187. **Figure E5** shows, Normal Demand and the declared generation availability. This chart shows that there is adequate margin under optimum declared conditions.

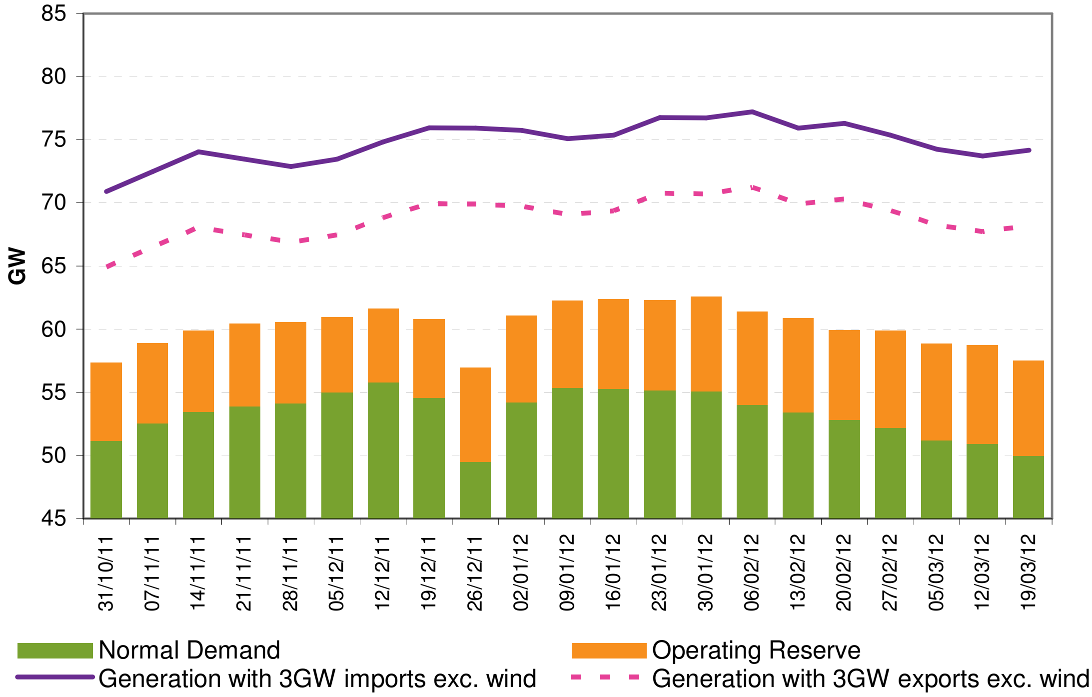
Figure E5 - Normal Demand and Notified Generation Availability



188. From this chart it is also possible to calculate the minimum generation surplus which is 16%. The surplus is the amount of generation available above the amount required to meet the demand and operating reserve requirements. It is represented as a percentage of the total available generation.

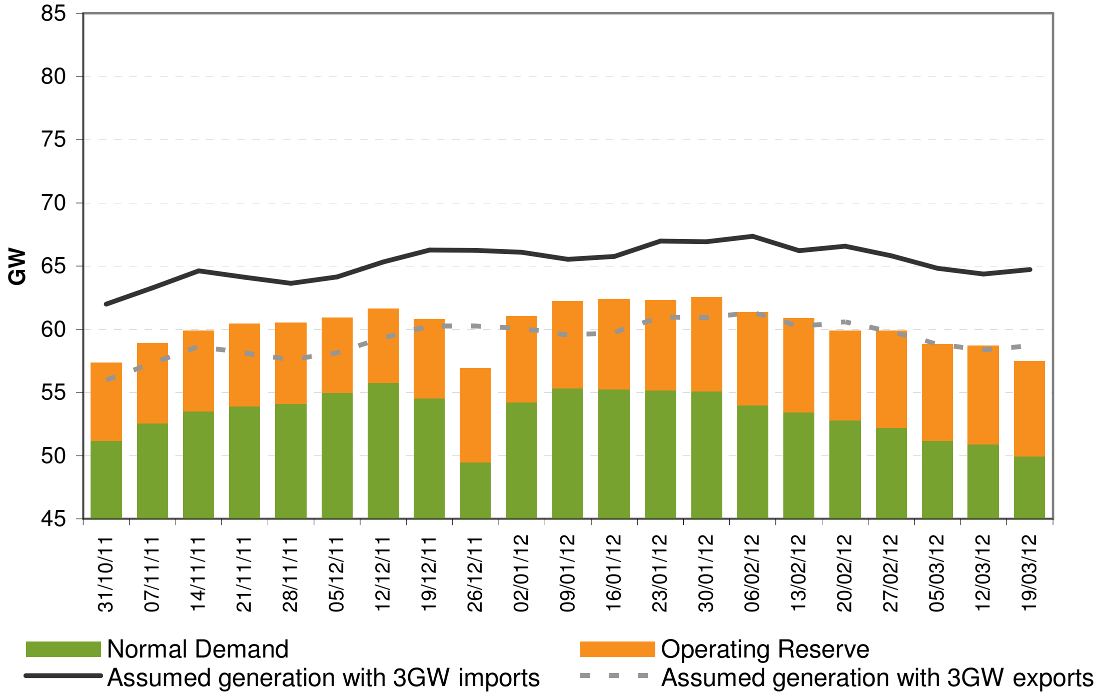
189. **Figure E6** shows, Normal Demand and the declared generation availability excluding wind. This shows that there is adequate margin without wind generation available under optimum declared availability.

Figure E6 - Normal Demand and Notified Generation Availability Excluding Wind



190. **Figure E7** shows, Normal Demand and the assumed generation availability. This chart shows that with 3 GW of exports there would be some erosion of the operating reserve. In a scenario where erosion of operating reserve was possible system warnings would be issued ahead of time as usual and it would then be expected that the market would respond accordingly.

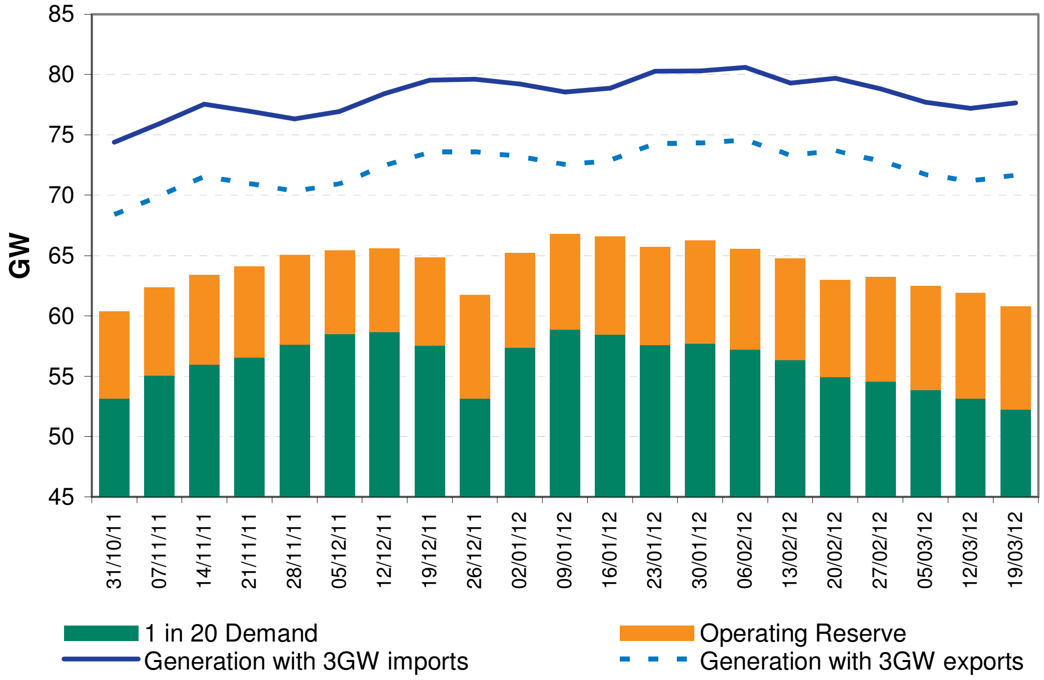
Figure E7 - Normal Demand and Assumed Generation Availability[25]



191. **Figure E8** shows, 1 in 20 Demand and the declared generation availability, and again shows adequate margins.

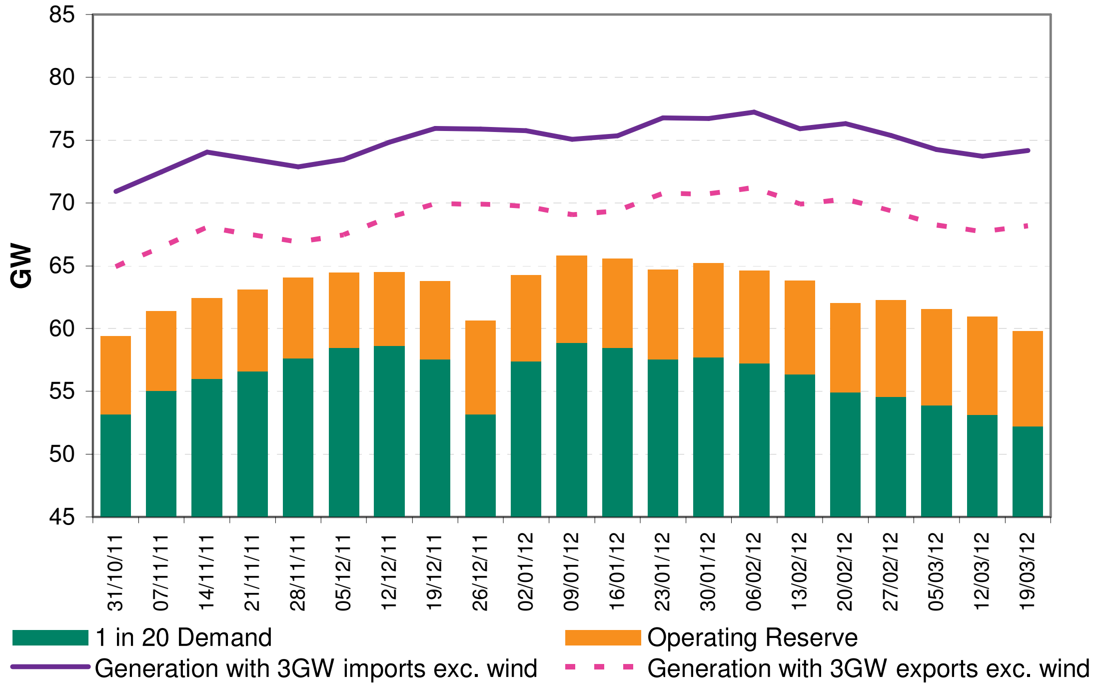
[25] For definition of Assumed Generation Availability please see page 46

Figure E8 - 1 in 20 Demands and Notified Generation Availability



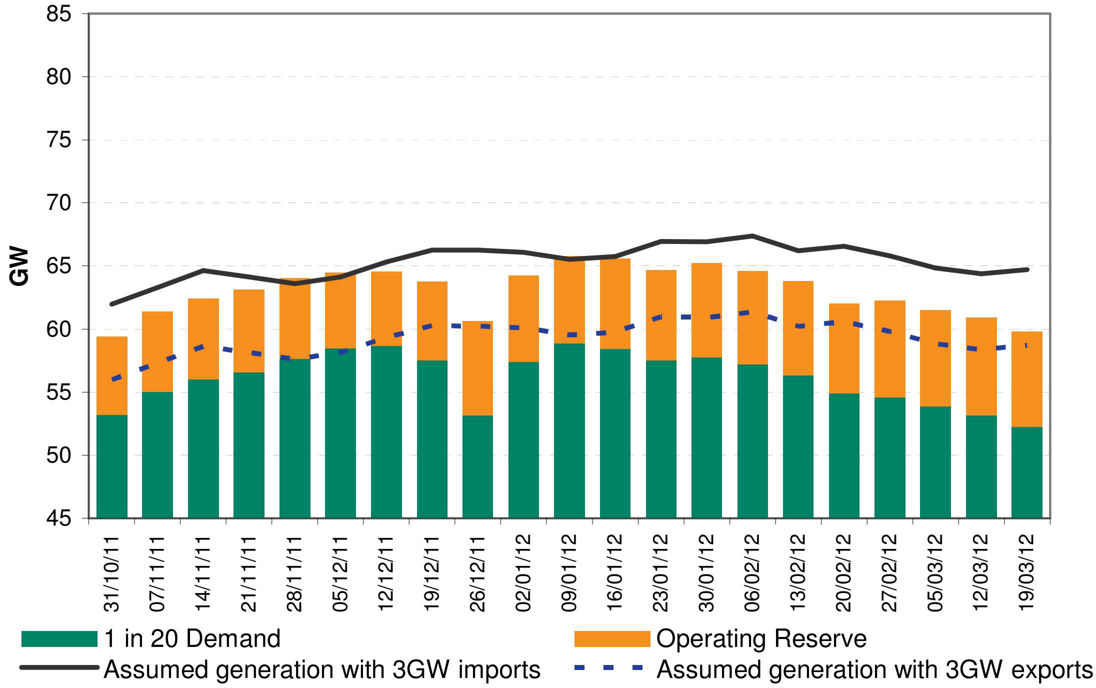
192. **Figure E9** shows, 1 in 20 Demand and the declared generation availability excluding wind with adequate margins available.

Figure E9 - 1 in 20 Demands and Notified Generation Availability Excluding Wind



193. **Figure E10** shows, 1 in 20 Demand and the assumed generation availability, where there is system margin under import conditions and again the possibility of erosion of operating reserve during export conditions. As mentioned previously system warnings would be issued ahead of time in this scenario and it would be expected that the market would respond accordingly.

Figure E10 - 1 in 20 Demands and Assumed Generation Availability



194. The levels of surplus are lower for the upcoming winter when compared to previous winters. In the event of a scenario with high demands during 1 in 20 weather combined with low wind generation volumes it may be difficult for the market to manage full exports to the continent. System warnings, such as Notification of Insufficient System Margin, would be used to inform the market. However, as previously indicated there is 2 GW of mothballed plant and it is anticipated that some plant will commission across the winter

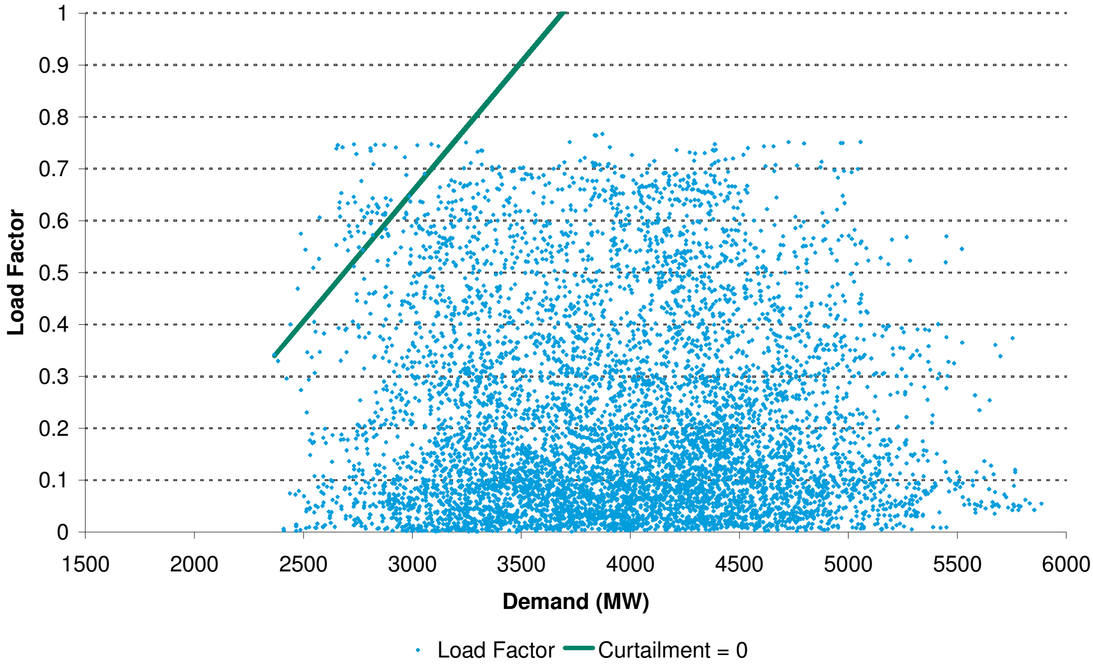
Transmission System Issues

Transmission System Issues

195. Following on from the actions taken on wind to secure the transmission system during the spring, **Figure E11** shows a reduced data set - winter 2010 - and now includes a curtailment line. In the worst case scenario of maximum availability of generation and wet and windy conditions the points above the curtailment line are

where actions would have been required. There are approximately 60 points above the line representing 30 hours where actions would have been required last winter. This data includes a fixed value for the constraint boundary between Scotland and England and also includes a fixed capacity for Scottish wind generation of 2 GW

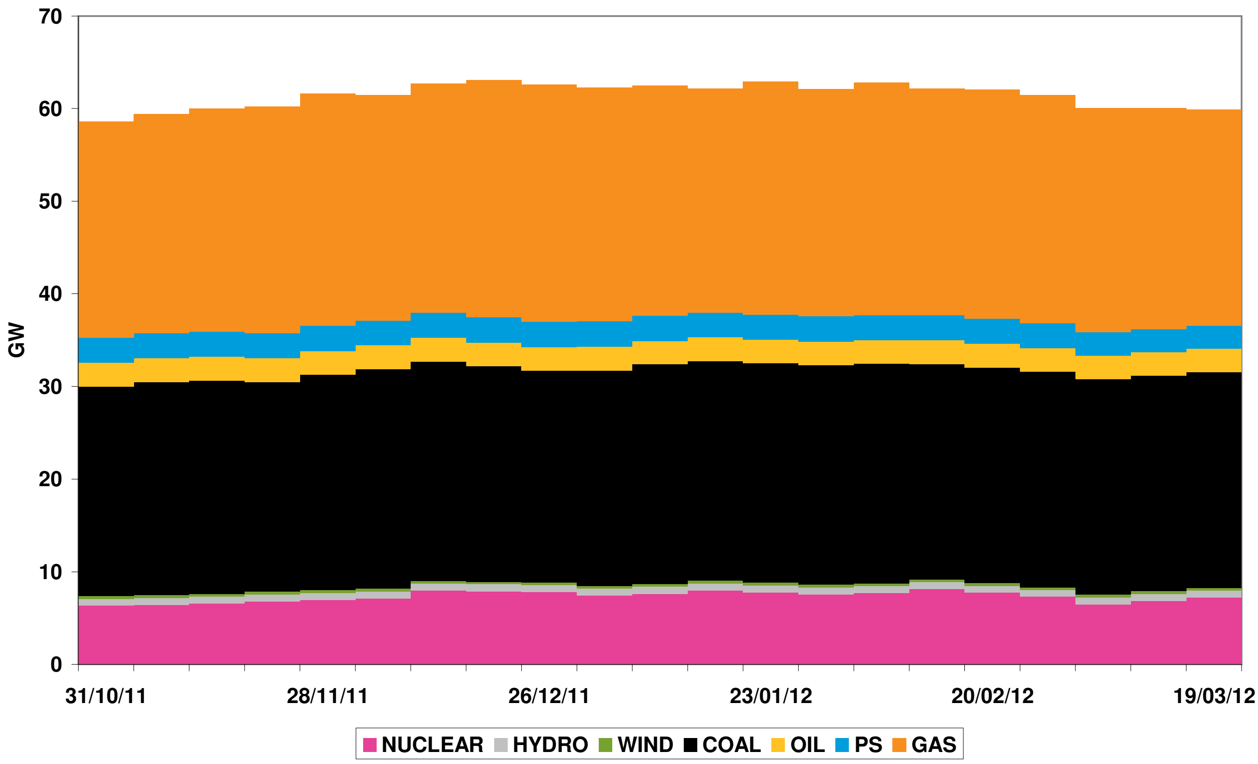
Figure E11 - Scottish Half hourly wind and demand levels for winter 2010 and curtailment line



Gas/Electricity Interaction

196. This section evaluates the interaction between the electricity and gas markets. Simulations of historical winters have been used to evaluate the amount of demand response required. These simulations assume that **most** gas fired power stations are used as the marginal source for power generation. The gas and electricity forecasts used in this analysis are consistent with those in the gas and electricity sections. Assumed electricity generation availability shown in **Figure GE1**, is based on the assumed availability in **Table E1** applied to weekly forecasts of capacity and not the total capacity figures in **Figure E3**.

Figure GE1 – Electricity generation availability

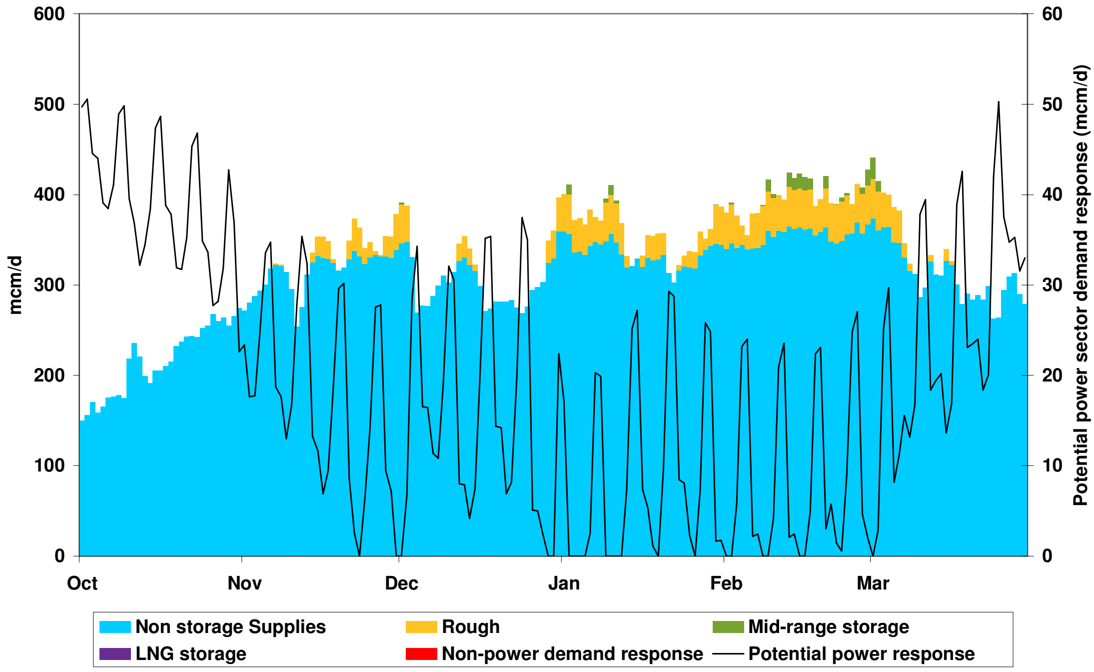


197. With **most** gas power stations assumed as the marginal source for generation, the demand forecasts for gas power generation are at the lower end of the possible range. Lower gas demand and therefore a demand side response (DSR) can only be achieved if **all or nearly all** gas power stations operate as the marginal source for generation or the **availability of other generating plant is higher**.

198. Consequently and most noticeably at high gas demands, there are limited options to reduce gas demand for power generation any further. For gas demand above 400 mcm/d the potential for DSR (from power generation) is typically only between 0 and 10 mcm/d with many days at 0 mcm/d where there is very high gas demand.

199. This is illustrated in **Figure GE2** where the make-up of gas supplies for a 1 in 10 cold winter (1985/86) is shown together with the potential DSR that the power generation sector could provide if **all** gas power stations operate as the marginal source of power generation.

Figure GE2 – Demand side response & gas supplies, 1985/86 winter

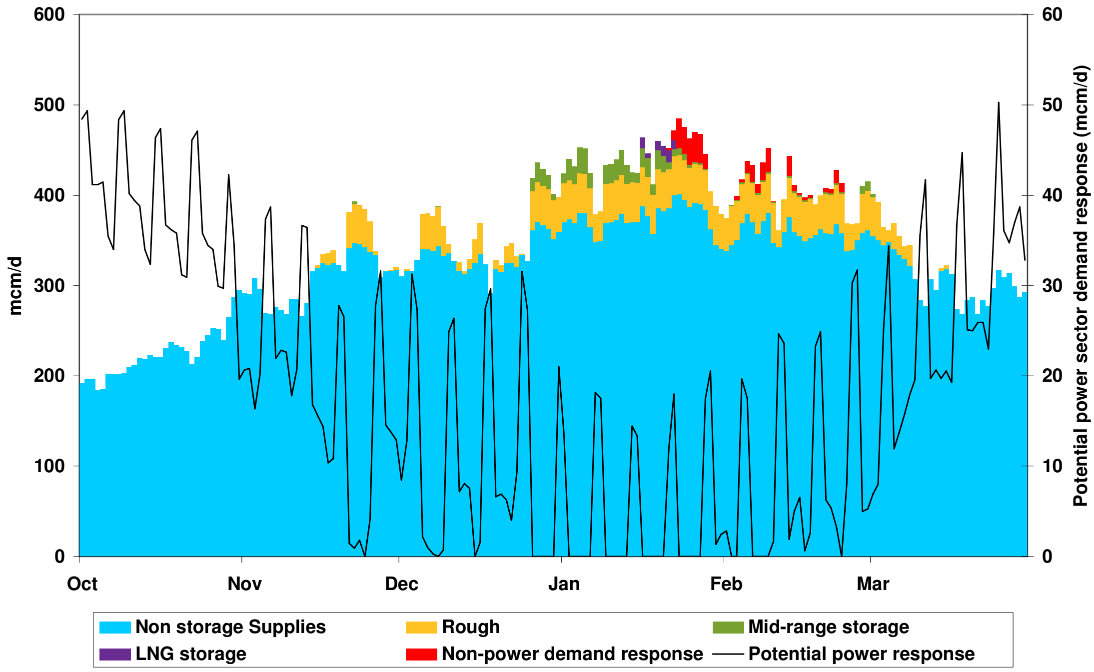


200. In terms of a potential DSR, the simulation clearly shows a weekly pattern of relatively low weekdays and much higher weekends. The DSR for weekdays during the December to February period averages 5 mcm/d compared to 27 mcm/d during weekends. The difference of 22 mcm/d is consistent with the approximate 5 GW difference in weekday / weekend electricity demand where every GW of electricity equates to approximately 4.5 mcm/d of CCGT gas demand.

201. The simulation also suggests that the supply availability covers the demand with no need for any non power DSR.

202. **Figure GE3** shows the make-up of gas supplies for the coldest winter (1962/63) on record and the potential DSR that the power generation sector could provide if **all** gas power stations operate as the marginal source of power generation.

Figure GE3 – Demand side response & gas supplies, 1962/63 winter



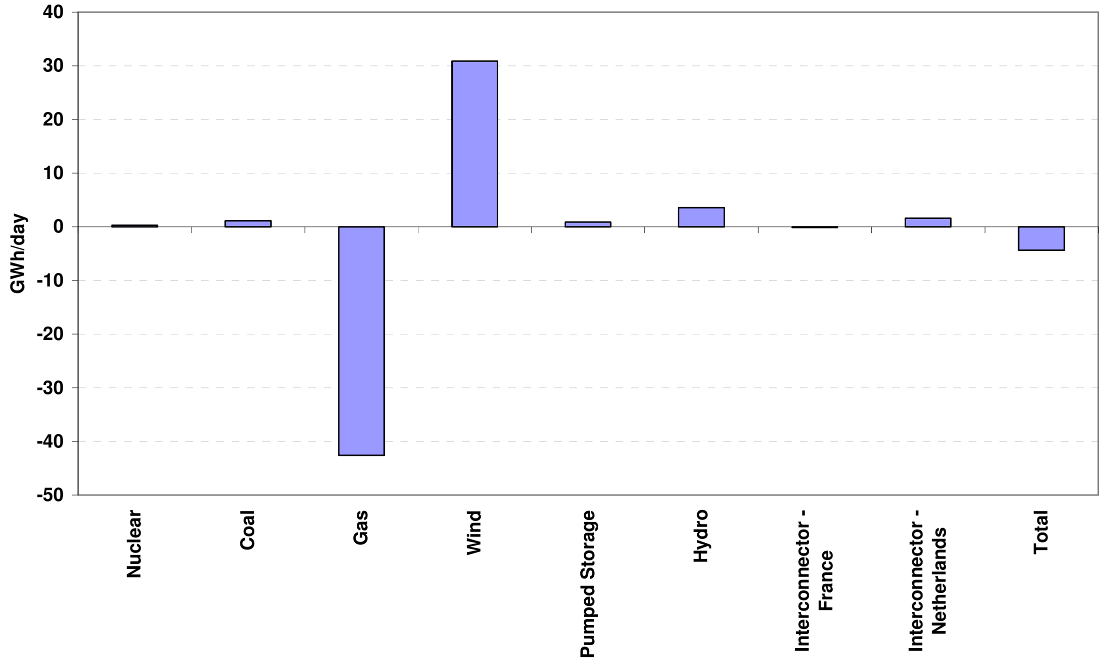
203. In terms of a potential DSR, the simulation again shows a weekly pattern of relatively low weekdays and much higher weekends. The DSR for weekdays during the December to February period averages just 2 mcm/d compared to 23 mcm/d during weekends. The difference of 21 mcm/d is again consistent with the approximate 5 GW difference in weekday / weekend electricity demand where every GW of electricity equates to approximately 4.5 mcm/d of CCGT gas demand.

204. In terms of supplies, the simulation highlights the need for a non power DSR or an increase in supplies or a combination of both.

205. This is an extreme example. 1962/3 was the coldest winter in 250 years. A slight relaxing of the electricity assumptions could also make more gas available. For example, if wind generation was 30% instead of 8% and electricity interconnectors were at float instead of exporting at peak times an extra 8 mcm of gas could be available.

206. The sensitivity of gas operating as the marginal source of generation and therefore directly affected by changes to other types of generation is illustrated in Figure GE3 by comparing the generation mix on Saturday 3rd September with Saturday 10th.

Figure GE3 – Change in generation from September 3rd to September 10th[26]



207. The chart shows that a large increase in wind generation, along with smaller increases in hydro, coal and interconnector imports, directly translates into a corresponding reduction in gas demand for power generation in excess of 40 mcm/d. Again this highlights the dynamic changing nature of gas supplies and demand and the operational issues to manage such conditions.

208. **Table GE1** summarises some of the impacts on gas demand for next winter. With gas as the assumed marginal source for power generation, the ability for the power market to provide extra relief for the gas market is limited, particularly during the darkest, coldest months of the winter because the gas demand forecasts already assume low levels of gas powered generation.

209. Though not detailed the use of distillate for power generation could also reduce gas demand. However both the distillate generation capacity and number of hours of stocks continue to decline. Switching to distillate could displace up to a total of 100 mcm of gas albeit spread over a period of many days.

[26] Gas day generation 6am to 6am. Figures calculated from BM reports half hour generation http://www.bmreports.com/bsp/bsp_home.htm

Table GE1 – Possible variation in daily gas demand from model assumptions

Cause	Impact on daily gas demand
Variation in LDZ gas demand from demand model estimate	+/- 25 mcm LDZ demand was significantly higher than model estimates during the cold weather in the 2010/11 winter
Variation in NTS industrial demand from demand model estimate	+/-2 mcm. Demand response in 2005/6 was up to 4 mcm
Variation in Moffat exports from demand model estimate	+/- 4 mcm. Demand tends to increase above model estimate in very cold weather.
Wind generation 30% instead of 8%	3 mcm reduction
Electricity interconnectors at float all day	4.5 mcm reduction
24 hour 3GW electricity imports	13.5 mcm reduction (from float)
1 GW increase in non-gas generation	4.5 mcm reduction