Safety Monitor and Firm Gas Monitor Requirements

September 2010

Introduction

This document sets out 'Safety Monitors' and 'Firm Gas Monitors' for the 2010/11 winter, pursuant to National Grid's obligations under the Uniform Network Code (UNC), Section Q.

Safety Monitors were introduced in 2004 to replace the so-called 'Top-up' monitors, which had existed (through the Network Code) since 1996. Safety Monitors define levels of storage that must be maintained through the winter period. The focus of the Safety Monitors is public safety rather than security of supply. They provide a trigger mechanism for taking direct action to avoid a potential gas supply emergency (as defined in the Gas Safety (Management) Regulations).

The Firm Gas Monitors represent the storage levels required to support firm demand in a severe winter. They are published for information only.

Safety Monitor overview

For winter 2009/10 we made a number of changes to the Safety Monitor methodology, to improve security of supply whilst at the same time facilitating improved transparency and enhanced information provision to the market. It is important to note that these changes have not affected the overall Safety Monitor space requirement. The revisions to the Safety Monitor methodology sought to;

- Treat 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, rather than apportioning over the historically determined three storage types, Long, Medium and Short range storage.
- Retain the prevailing determination of storage space requirements but make the deliverability requirement more visible. Hence there is one Safety Monitor for space and one for deliverability.

For winter 2010/11 we have made some additional modifications to the Safety Monitor methodology:

Variable Non Storage Supply (NSS) assumption

The Safety Monitor space requirement is highly dependant on the NSS level. Previously, the Safety Monitor methodology has assumed a single figure for NSS which applies for all days within the winter, i.e. the value of NSS is independent of demand. In reality NSS levels increase with increasing demand. The Safety Monitor is now calculated by using a variable NSS assumption based on a relationship with demand.

This approach, whilst not having a material impact on the overall level of the Safety Monitor does have a number of benefits:

- It represents a more realistic approach to the relationship between supply and demand

- Within winter monitoring of actual NSS levels will enable us to determine whether the NSS v demand relationship used within the Safety Monitor calculation methodology is fit for purpose: if it is found not to be, it can be revised based on the latest information

Impact of a lower level of NSS or a sustained supply shock

As the Safety Monitor requirement is so heavily dependent on NSS levels, any significant sustained supply shock will result in a significant increase in the Safety Monitor requirement. This year in an effort to provide the marketplace with some additional information regarding the potential impact of a lower level of NSS or supply shock, we have calculated, for information only, an indicative Safety Monitor requirement with a reduced level of NSS. It must be stressed that this "low level Safety Monitor" is published for information only, just as the firm monitor is. However this additional monitor does reflect the consequences of increased storage requirements should a NSS be lower or a sustained supply loss materialise.

Safety Monitor Methodology

It is our 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 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. It is therefore appropriate that we adopt a prudent approach to setting the Safety Monitor levels.

The concept behind the Safety Monitors is to ensure that sufficient gas is held in storage to support those gas consumers whose premises cannot be physically and verifiably isolated from the gas network within a reasonable time period. To achieve this all gas consumers are categorised into one of two groups:

- Protected by Monitor - Gas is held in storage to facilitate continuity of supply to these consumers even in a 1 in 50 winter
- Protected by Isolation – Network safety would be maintained if necessary by physically isolating these customers from the network

The storage deliverability Safety Monitor indicates the minimum level of deliverability required to both safely isolate loads that are "protected by isolation" and also support loads that are "protected by monitor". The deliverability Safety Monitor is therefore providing operational cover should an emergency be called on any particular day, whilst the space Safety Monitor ensures that there is sufficient gas in store to support "protected by monitor" loads for the remainder of the winter.

We believe that by having just one Safety Monitor for space and one for deliverability, there is greater clarity for market participants in terms of their operational decision making.

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Operation of Safety Monitors

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 (space) do not fall below the defined level. The level of storage established by the Safety Monitor is that required to underpin the safe operation of the gas transportation system. It ensures the preservation of supplies to domestic customers, other non-daily metered (NDM) customers and certain other customers who could not safely be isolated from the gas system if necessary in order to achieve a supply-demand balance and thereby maintain sufficient pressures in the network.

The space Safety Monitor defines the minimum level of stored gas required in aggregate in all UK storage, on each day of the winter. We monitor the level of gas in all storage facility types throughout the winter to ensure that the actual aggregate stock level does not fall below the space Safety Monitor level. If this were to occur, there would be insufficient gas left in storage to underpin the safe operation of the system in a 1 in 50 cold winter or for 1 in 50 conditions for the remainder of the winter. Under these conditions, we would therefore be obliged by our Safety Case to take action to remedy this situation. In the lead-up to such a situation, we would advise the market with the objective of encouraging mitigating action. If necessary, however, the Network Emergency Co-ordinator (NEC) may require the relevant storage operators to reduce or curtail flows of gas out of storage. In this situation, we would expect the market to rebalance in order to achieve a match between supply and demand.

We would continue to provide information to the market as the situation developed. For this winter we will continue to provide through our website a five day ahead view of the supply/demand balance, historic and forward projections of storage use and how these levels relate to the Safety Monitor requirements and the setting of the Gas Balancing Alert (GBA) trigger.

The combination of increased information, clarity of the remaining storage position together with the alignment between the GBA and Safety Monitor will assist market participants and enhance security of supply. While National Grid would seek to minimise the extent of any intervention in the market, the balance between allowing the market to resolve the situation and taking action via the NEC will clearly depend on the severity of the situation and the associated timescales.

Approach to the Safety Monitor Levels

This note is published in conjunction with the Winter 2010/11 Outlook Report, which contains our Base Case supply forecast for the coming winter. This Base Case was composed of our 2010 Transporting Britain's Energy (TBE) forecasts being updated with new information regarding supply developments and feedback and intelligence received via the winter consultation process.

For winter 2010/11 a significant level of uncertainty remains with regard to NSS levels, in particular with import supplies. As the purpose of the Safety Monitors is to ensure that an adequate pressure can be maintained in the network at all times and thereby protect public safety, a prudent approach is therefore required.

The following sections explain the approach that we have taken to the Safety Monitor calculation in relation to supply and demand respectively. It should be noted that we will continue to review the Safety Monitor and Firm Gas Monitor levels throughout the

winter and, if necessary, we will revise them to reflect material changes to the supply-demand balance.

National Grid will continue to provide winter feedback to industry regarding supply assumptions and resulting changes to Safety Monitors by means of monthly updates via Operational forums and our reporting on our website.

Supply Assumptions

There is still considerable uncertainty associated with the supply background for winter 2010/11. For the calculation of the Safety Monitors we have used the Base Case supply assumptions from the 2010/11 Winter Outlook Report as a starting point.

Table 1 details our ranges for NSS for winter 2010/11, as stated within the 2010/11 Winter Outlook Report. The Base Case assumes a NSS level of 367 mcm/d. This level of supply will be used for the initial setting of the Safety Monitors.

Table 1 – NSS Assumptions by Supply Source

(mcm/d)	Range	Base Case
UKCS	166	166
Norway	86 – 116	101
BBL	30	30
IUK	30 – 0	10
LNG	30 – 100	60
Total	**342 – 412**	**367**

Note, IUK is assumed to increase as a consequence of tighter supply conditions (i.e. reacting to an increase in UK gas price). Hence the low case has higher IUK imports than the high case. For our Base Case we only assume IUK imports when demand approaches 400 mcm/d, for conditions where the level of NSS supply is lower we assume higher IUK imports commencing at lower levels of demand on the basis that IUK flows are price dependent and for tighter supply conditions prices should be higher.

In reality NSS levels increase with increasing demand. Hence the Safety Monitor is now calculated by using a variable NSS assumption as detailed below.

Figure 1 shows trend lines for NSS versus demand for winters 2005/6 to 2009/10. An aggregated trend line for all five winters worth of data is also shown.

Figure 1 – NSS v demand relationship for winters 2005/6 to 2009/10

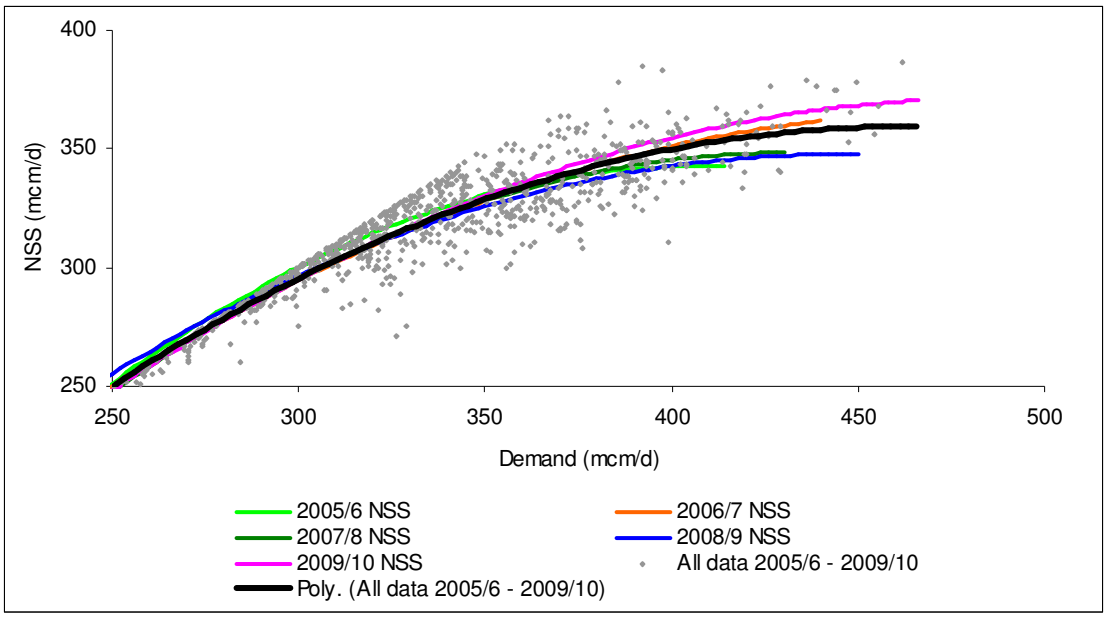
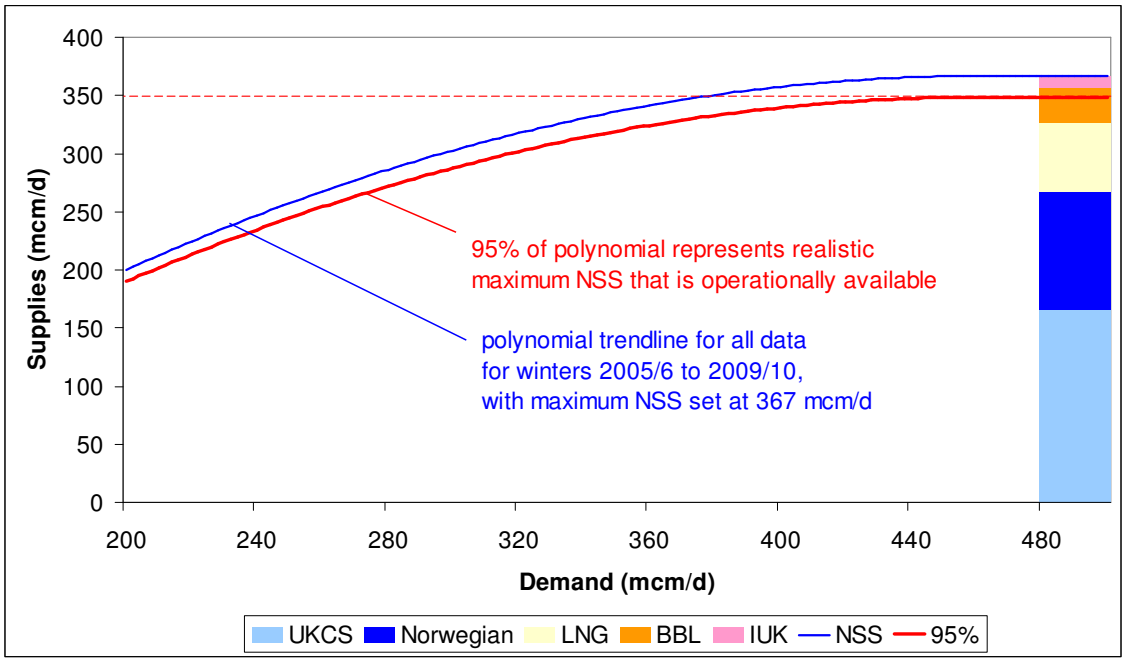


Figure 1 shows the relationship of NSS vs demand where NSS tends to equal demand for demands below 300 mcm/d thereafter NSS increases at a lower rate (due to use of storage) towards an asymptotic value. The shape (not the values) of the aggregated trend line forms the basis for the NSS versus demand relationship for calculating the 2010/11 Safety Monitor (and the winter security assessment within the 2010/11 Winter Outlook Report).

To capture most data points the trend line needs to be reduced. On analysis of previous winters lowering the trend line to 95% captures typically 95% of all data points, with those that are still below often reflected by short term supply losses as experienced on occasion last winter. This represents a prudent basis for calculating the Safety Monitor requirement, as NSS levels are unlikely to be below this level in most normal circumstances.

By applying a value of 95% to the aggregated total of NSS, the maximum value of NSS used in determining the 2010/11 Safety Monitors is reduced from 367 to 349 mcm/d. The resulting relationship of NSS against demand is shown in Figure 2.

Figure 2 – 2010/11 NSS assumptions v demand relationship



The total NSS assumption used in setting the 2009/10 Safety Monitors was 343 mcm/d. Hence the maximum NSS assumption of 349 mcm/d used for calculating the 2010/11 Safety Monitors is 6 mcm/d higher. However care should be taken when making year on year comparisons as the NSS assumption used in calculating the 2009/10 Safety Monitors was not demand dependent, whereas the 2010/11 Safety Monitors uses a variable NSS assumption.

Table 2 shows the anticipated availability of storage in winter 2010/11.

Table 2 – Storage Space and Deliverability Assumptions

Storage type	Space[1] (GWh)	Deliverability[2] (GWh/d)
Short (LNG)[3]	601	253
Medium (MRS)[4]	9095	440
Long (Rough)	38485[5]	495
Total	**48181**	**1188**

Demand Assumptions

The basis for the calculation of the Safety Monitor levels is our 2010 demand forecasts for 2010/11, using a severe (1 in 50 cold) load duration curve. Our base case for

[1] Commercial stocks only: excludes Operating Margins space booking for 2010/11 and Scottish Independent Undertakings
[2] Deliverability values are now based on a site by site review of the operational performance of all storage facilities. This will enable improved security analyses to be undertaken
[3] Includes Glenmavis, Partington and Avonmouth
[4] Includes Hornsea, Holehouse Farm, Hatfield Moor, Humbley Grove and Aldbrough
[5] Reflects latest information from Centrica Storage Limited on anticipated space for winter 2010/11

demands assumes significant use of CCGTs with little upside: lower demands are possible with increased use of coal for power generation.

Safety Monitor Levels

Table 3 shows the initial Safety Monitor requirements for space and deliverability.

Table 3 – Stored Safety Gas and Storage Safety Deliverability Requirement

Assumed total storage space (GWh)	Space Safety Monitor (GWh)	Space requirement (%)	Deliverability Safety Monitor (GWh/d)
48181	**1164**	**2.4%**	**702**

Stored Firm Gas Requirement

The Firm Gas Monitors represent the storage levels required to support all firm demand in a severe (1 in 50 cold) winter. They are published for information only. Note that they are calculated using the same supply demand assumptions as used for calculating the Safety Monitor.

Table 4 – Firm Monitor Space Analysis

Assumed total storage space (GWh)	Firm Space (GWh)	Firm Space (%)
48181	**18069**	**37.5%**

Storage Firm Deliverability Requirement

Table 5 – Peak Firm Demand[6] and Peak Day Supply

Firm Demand	GWh/d
Diversified 1 in 20 Cold Peak Day (A)	4782
Peak Supplies	
Non-storage supplies	3839
Storage	1188
Total Supplies (B)	5027
Supply Surplus (B) – (A)	**245**

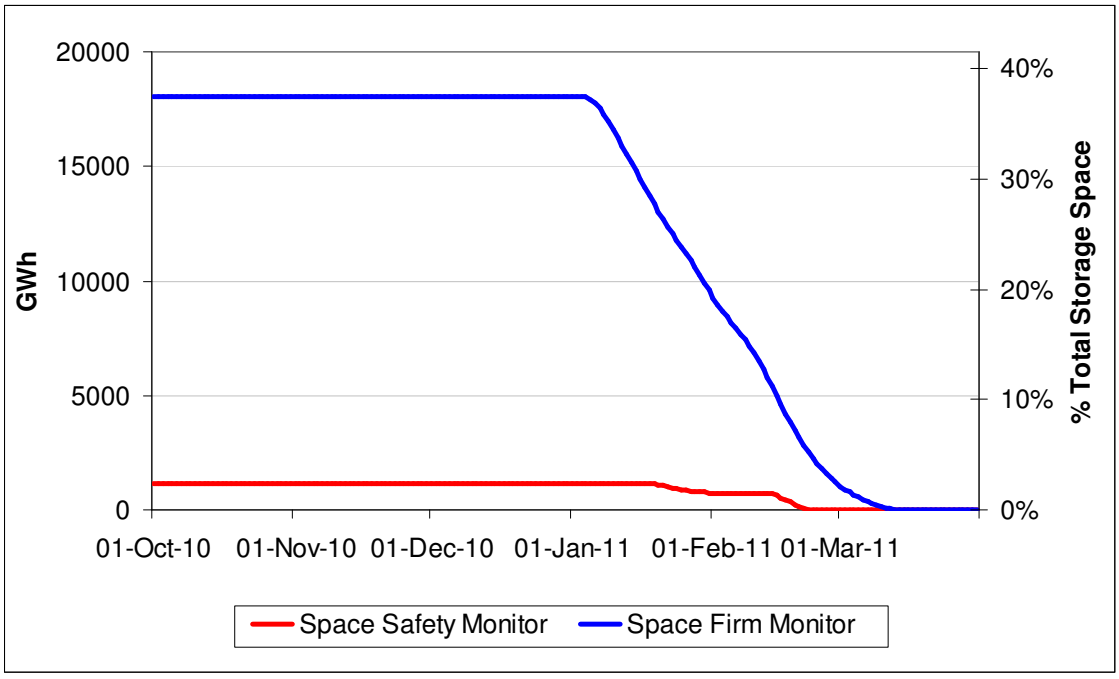
[6] Diversified firm demand for a 1 in 20 cold peak day

Monitor Profiles

Figure 3 show the space profiles for the Safety Monitor and Firm Gas Monitor whilst Figure 4 shows the deliverability profile for the Safety Monitor.

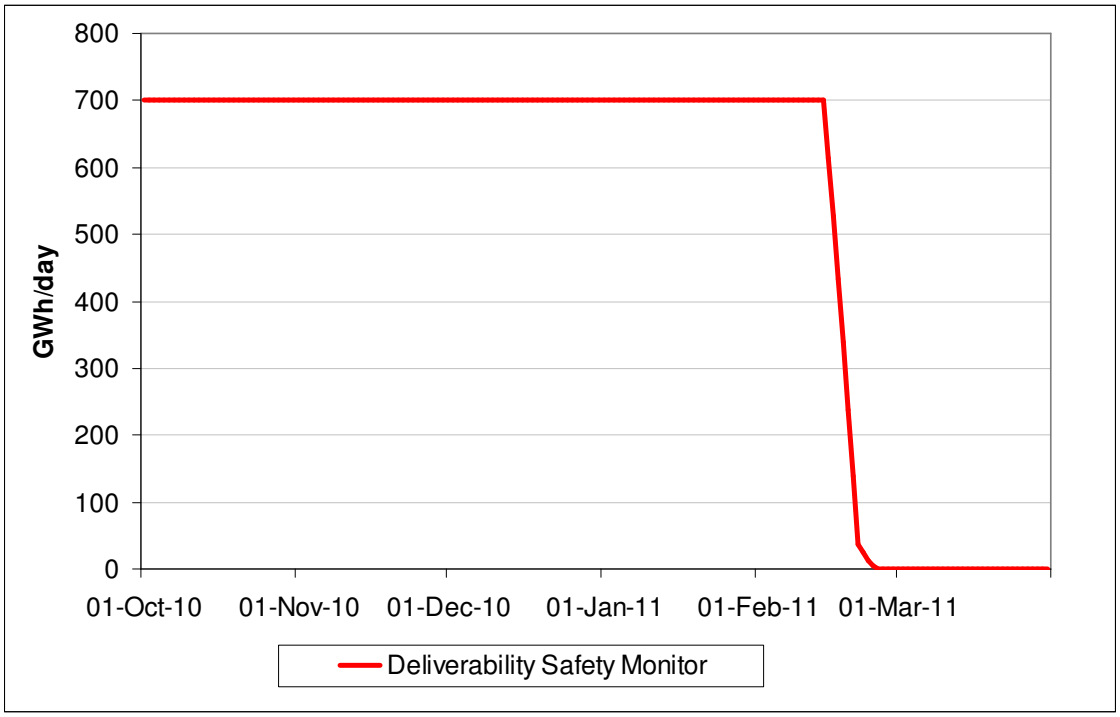
The objective of the Safety Monitor profiles is to ensure that at any point in time sufficient gas will remain in store to underpin the safe operation of the gas transportation system for what remains of the winter period. They allow for the possibility of late winter cold weather patterns based on analysis of historical temperatures. However, in the event of cold weather earlier in the winter, the profiles may be reduced to reflect the occurrence of cold weather. This methodology is explained in more detail in our Safety & Firm Gas Monitor Methodology document[7].

Figure 3: Space Safety Monitor and Space Firm Monitor Profiles



[7] http://www.nationalgrid.com/NR/rdonlyres/B4ACC5F8-A8AF-48B4-A8AA-04BE3743E1C9/13676/20067SafetyFirmGasMonitorMethodology.pdf

Figure 4: Deliverability Safety Monitor profile



Impact of lower level of NSS or a sustained supply shock

Please note that this analysis is for information only.

As stated previously the Safety Monitor requirement is very dependent on NSS levels. Any significant variation in NSS from the Base Case NSS assumption of 367 mcm/d, (as used in calculating the Safety Monitors), will result in a substantially different Safety Monitor requirement. This year in an effort to provide the marketplace with some additional information regarding the potential impact of variations in NSS on the Safety Monitor, we have calculated the Safety Monitor requirements using the high and low NSS assumptions as shown in Table 1. Hence the low NSS value of 342 mcm/d is equivalent to a 25 mcm/d supply loss when compared to the Base Case NSS of 367 mcm/d. Similarly, the high NNS value of 412 mcm/d is equivalent to a 45 mcm/d increase in NSS.

Figure 5: Space Safety Monitor profile using High - Low NSS range (and Base Case NSS for reference)

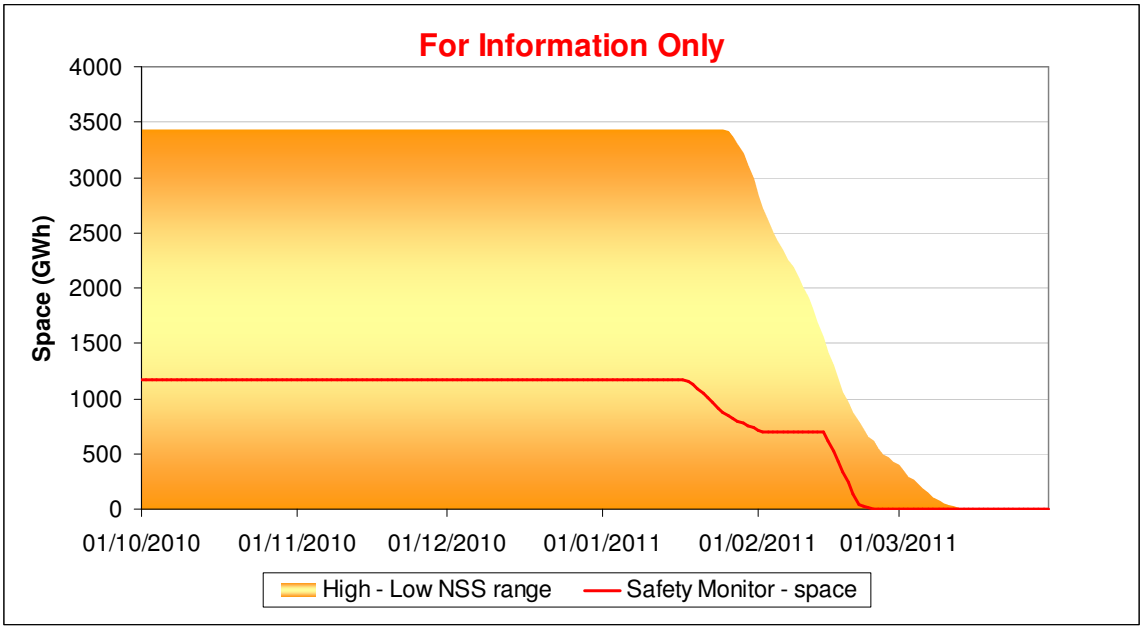


Figure 5 shows that a 25 mcm/d reduction in supply (that is reducing the NSS assumption from the Base Case of 367 mcm/d to the low NSS forecast range of 342 mcm/d) results in an increase in the initial Space Safety Monitor requirement from 1064 GWh (96.7 mcm) to 3441 GWh (312.8 mcm). A 45 mcm/d supply increase (that is increasing the NSS assumption from the Base Case of 367 mcm/d to the high NSS forecast range of 412 mcm/d) results in the initial Space Safety Monitor requirement of only 3 GWh, too small to see on the chart.

Figure 6: Deliverability Safety Monitor profile using High - Low NSS range (and Base Case NSS for reference)

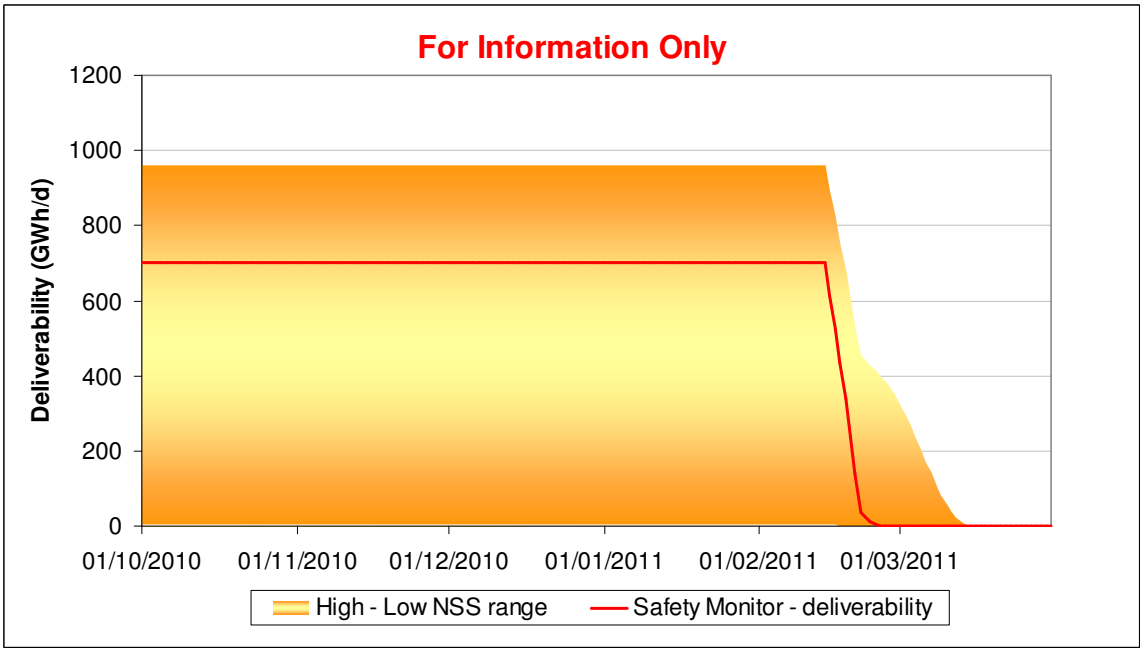


Figure 6 shows that a 25 mcm/d reduction in supply (that is reducing the NSS assumption from the Base Case of 367 mcm/d to the low NSS forecast range of 342 mcm/d) results in an increase in the initial Deliverability Safety Monitor requirement from 702 GWh/d (63.8 mcm/d) to 963 GWh/d (87.5 mcm/d). A 45 mcm/d supply increase (that is increasing the NSS assumption from the Base Case of 367 mcm/d to the high NSS forecast range of 412 mcm/d) results in the initial Deliverability Safety Monitor requirement of only 3 GWh/d, too small to see on the chart.

Notes on Demand Assumptions

National Grid forecasts both diversified demand and undiversified demand. The diversified peak day is the peak day for the whole country, whilst the undiversified peak day is the peak day for each area of the country added together.

For planning and investing in the network, National Grid uses 1 in 20 peak day undiversified demand conditions (in addition to analysing other less severe weather conditions). This allows for the fact that there is no single profile of demand across the country associated with a 1 in 20 cold peak day, and therefore ensures sufficient transportation capacity is available to meet 1 in 20 demand under a range of conditions.

For security planning including Safety Monitors, National Grid uses diversified demand forecasts, which is the appropriate basis for assessing the balance between supply and demand on a national basis.