National Grid

OPERATING MARGINS

2006/07

Contents

1 About this Document

This document is published pursuant to National Grid's obligations under the Uniform Network Code Section K Part 2.2.3, which places a requirement on National Grid to publish the following information:

- The assumptions used in the determination of Operating Margins (OM)
- The aggregate amount of OM
- The maximum rate of deliverability required for OM
- The amounts of deliverability and space in each storage location
- The OM profile

The terms and conditions of the Uniform Network Code apply to the contents of the document.

The resultant OM booking also meets National Grid's requirements to conform to its current Safety Case.

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2 Background Information

2.1 Use of Operating Margins

The criteria for the use of Operating Margins are set out in the System Management Principles Statement.

2.1.1 The triggers for use of OM are: -

1. Typically OM gas will be used to maintain system pressures in the period before other balancing measures become effective.

   Primarily OM will be used in the immediate period following a supply failure or the identification of a demand forecast change.

   However the use of OM in the context of the above will be the minimum associated with operational requirements.

2. A quantity of OM will be kept in reserve to manage the orderly run-down of the System following the exhaustion of all other storage gas and during periods of high demand. The National Grid Network Gas Supply Emergency Procedure E/1 covers this.

3. OM will also be used to support system pressures on the gas day in the event of a compressor trip, pipe break, or other failure or damage to transmission plant. Following the day of the event, any reduction in capacity resulting from the event becomes equivalent to a planned maintenance activity, and therefore is unlikely to be supported by the use of OM.

2.1.2 Refilling of OM

If the volume of OM, at any point in the winter, falls below the monitor level calculated by National Grid at individual sites, National Grid will seek to refill OM to the extent of the published monitor where it is practical to do so.

2.2 Safety Case OM Requirements

Besides meeting our Network Code requirements for OM, the OM booking must also satisfy our current Safety Case requirements for OM. These are broadly similar and we now use terminology that is consistent with our Safety Case definitions for OM.

3 Overview of the OM methodology

This year National Grid has determined its OM requirement to identify a maximum and minimum requirement for services provided from its LNG Storage facilities ("LNG Storage"). This has been determined by consideration of all available storage facilities in the OM analysis.

National Grid Gas proposes, at this stage, to book its LNG requirement based on the maximum required levels to ensure that in any event it can comply with its Safety Case, but seeks to procure storage services above the minimum levels and less than the maximum levels of LNG Storage, from any other storage provider.

Where bookings for OM between the required minimum LNG Storage quantity and the maximum LNG Storage quantity are made at other storage facilities, any resultant surplus bookings in LNG Storage of OM will be released back to LNG Storage and made available to the market prior to any allocation of LNG Storage services for the Storage Year 2006/7.

The philosophy behind this year's methodology is consistent with that used last year, with the total booking being split between Major Events (Group 1), Multiple Events (Group 2) and Orderly Rundown as broadly defined in our Safety Case.

Major Events - GROUP 1: includes those events that, although unlikely to occur co-incident with a 1 in 50 winter, would have a major impact on the safe operation of the NTS. This group includes a loss of supply or loss of infrastructure as required in our Safety Case.

Multiple Events - GROUP 2: includes those events that could reasonably be expected to happen during any winter, but potentially more so in a severe winter as alternative supplies are expected to be less available and occurrences of such events could escalate due to higher demands. Inclusion of this OM is required in order that OM is kept available for a series of such events. This events group includes analysis for compressor failure; routine forecast errors and significant supply losses as required in our Safety Case.

Orderly Rundown - GROUP 3: is OM stock to ensure safe rundown of the system in the event of a Network Gas Supply Emergency while firm load shedding takes place as required in our Safety Case.

A more detailed explanation of the calculation of the individual elements is provided in section 4 of this document.

4 Assumptions used in the determination of Operating Margins (OM)

4.1 Assumptions used in the OM calculations

1. Supply is utilised in the following order: UKCS beach supplies and imports, Long duration storage (Rough), Medium duration storage (MRS) and Short duration storage (LNG).

2. UKCS beach gas and imports have been set at a combined level of 3900 GWh/d (360 mcm/d). This level reflects the operational experience we have encountered this winter and some of the uncertainty associated with the delivery of new and existing import infrastructure

3. Other storage, NTS compressors and pipelines have 100% availability (apart from the specific failure condition being considered).

4. Relevant LNG facilities are on short standby at high demands.

5. If operating conditions require OM stocks to be depleted they may be refilled[1] to the stock profile shown in Section 7.

4.1.1 OM requirements for Major Events - Group 1

The determination of the requirements for Group 1, include assessment of the following scenarios:

- Loss of key infrastructure, notably loss of Forties liquids pipeline and an electrical supply failure at St Fergus
- Loss of the largest sub-terminal at each terminal

As with last year this results in 12 hours[2] worth of space at each of the LNG sites. This approach caters as far as is reasonably possible for **ANY** unforeseen event and is not limited to the range of scenarios modelled, or the supply/demand assumptions under which they are modelled.

4.1.2 OM requirements for Multiple Events - Group 2

The requirements for Group 2 include compressor failures and other operational factors such as forecast changes and significant supply losses. These requirements are added together reflecting that all of these events could reasonably be expected to occur, in some cases more than once during a severe winter.

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[1] This may need to be effected by transfer of gas in store for LNG stock because of limited injection capacity.

[2] 12 hours to allow the market to respond, National Grid to reconfigure the system and/or declare a Network Gas Supply Emergency

4.1.2.1 NTS Compressor failure assumptions

1. Our compressor model takes into account our most recent compressor performance data, including:
   - Planned running hours (for a severe winter)
   - Mean time between failure (MTBF)
   - Start probabilities
   - Average repair times
   - Complete station trip data (reliability)
   - Planned and unplanned unit availability

2. The compressor model determines 3 key components namely:
   - Station trips
   - Station emergency shut downs (SESDs)
   - Unavailability

   From these a compressor power loss is determined

3. These power losses are first converted into volume losses (GWh) and then assigned to the appropriate downstream LNG sites

4.1.2.2 Supply losses

1. This component is included to provide OM cover for occasional significant supply losses, which could occur during a typical winter period.

2. A Monte Carlo analysis has been used to produce a probability distribution of the supply losses that can be expected to occur on any day.

3. This distribution has been applied to the 1 in 50 diversified Load Duration Curve to calculate the additional supplies required to achieve a supply demand balance.

4. Where any supply shortfall cannot be met by increased beach and imports, Rough or MRS then any additional LNG requirement is assumed to be provided by OM.

4.1.2.3 Forecast Changes

1. This component has been included to reflect the operational fact that during any winter a level of under forecasts can be expected, and in the extreme this may require OM support.

2. The OM requirement has been calculated based upon historic trends in 1600 hours forecasting performance, assuming 10 mcm of linepack is

available.

3. Although recent winters have been mild it is assumed that in a cold winter the requirement would not increase as demand would be higher but less volatile.

4.1.3 OM requirement for Orderly Rundown – Group 3

4.1.3.1 Orderly rundown assumptions

1. Severe winter has been experienced, no shipper storage available from 06:00 hrs and no shipper firm load reduction.

2. A Network Gas Supply Emergency is declared effective from 06.00hrs and firm load shedding of VLDMCs and LDZ DM loads is required to balance supply and demand.

3. NTS linepack is used to smooth out the mis-match between supply and demand within day, but is limited to +/- 10mcm.

4. With no shipper storage available the within day supply shortfall is assumed met by a combination of OM booked storage in Rough, MRS and LNG.

5 Isle of Grain OM Requirements

Due to the global market dynamics of LNG, National Grid continues to book some OM at Grain.

6 Aggregate Operating Margins requirement 2006/07

Table 1 below summarises the 2006/07 requirements in terms of maximum and minimum LNG.

Based on maximum LNG, the OM requirements for 2006/07 are 1648 GWh of which 1096 GWh is LNG, 455 GWh is Rough and 98 GWh is MRS.

Based on minimum LNG, the OM requirements for 2006/07 are 1648 GWh of which 879 GWh is LNG, 455 GWh is Rough and 315 GWh is MRS.

National Grid Gas proposes, at this stage, to book its LNG requirement based on the maximum required levels to ensure that in any event it can comply with its Safety Case, but seeks to procure storage services above the minimum levels and less than the maximum levels of LNG Storage, from any other storage provider. This equates up to 217 GWh and will be sought by means of a tender issued by National Grid.

Where bookings for OM between the required minimum LNG Storage quantity and the maximum LNG Storage quantity are made at other storage facilities, any resultant surplus bookings in LNG Storage of OM will be released back to LNG Storage and made available to the market prior to any allocation of LNG Storage services for Storage Year 2006/7.

This booking explicitly meets our Safety Case obligations.

Table 1: 2006/07 Operating Margins Booking

	2005/06 Space Booking. (GWh)	**2006/07 Max LNG Booking (GWh)**	2006/07 Min LNG Levels (GWh)	2006/07 Max Deliverability (GWh/d)
Avonmouth	269	**350**	247	156
Dynevor	135	**160**	122	49
Grain	186	**186**	186	186
Glenmavis	140	**135**	103	101
Partington	257	**266**	220	220
Rough	455	**455**	455	455
MRS	98	**98**	315	315
Total[3]	1540	**1648**	1648	

6.1 The maximum rate of deliverability required for Operating Margins

The requirement for the maximum deliverability at each storage location under each operating condition is shown in Table 1 above. To reduce costs and to reflect at high demand that many of these sites are expected to be flowing gas we will not be booking any site deliverability. Hence where deliverability up to that shown in Table 1 is required, we will use interruptible deliverability or over-run deliverability on the day of use.

7 The Operating Margins profile

The table below shows the Operating Margins profile, the quantity of gas required in store for each month of the year. Though not shown the LNG profiles can be site specific reflecting their individual OM needs.

Table 2: 2006/07 Operating Margin Profile

	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Monitor (GWh)	911	911	911	911	911	1648	1648	1648	1638	1424	1286	911	911
Monitor (%)	55	55	55	55	55	100	100	100	99	86	78	55	55

[3] Totals may be slightly out due to rounding errors