National Grid

OPERATING MARGINS

2007/08

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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Date of issue: 1 March 2007

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 by identify a range (maximum and minimum) 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.

In additional to procuring OM services from LNG, National Grid Gas also procures OM services from MRS, Rough and capacity holders at the Grain importation facility. To that end, National Grid Gas has recently completed a tender to procure storage capacity offers. These bids are currently being assessed ahead of National Grid Gas' bookings in LNG.

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. With the separation of the Distribution Networks and the development of their own Safety Cases; National Grid Gas seeks engagement with the Distribution Networks to ensure their participation in the assessment of orderly rundown. This may result in changes to the requirements for OM for orderly rundown and may also increase the locational needs for OM.

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 approximately 3800 GWh/d (351 mcm/d). This level reflects a combination of the operational experience we have encountered this winter, some of the uncertainty associated with the delivery of new and existing import infrastructure and Baseline capacity at Easington.

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

[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 reconfiguration the system and/or declare a network gas supply emergency

could reasonably be expected to occur, in some cases more than once during a severe winter.

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. As detailed in Section 3, this assessment may change or be expanded following engagement with the Distribution Networks re their participation in their assessment for orderly rundown

5 Isle of Grain OM Requirements

Due to the strategic location of Grain, National Grid continues to book some OM at Grain for safety purposes.

6 Aggregate Operating Margins requirement 2007/08

Table 1 below summarises the 2007/08 requirements in terms of maximum LNG and minimum LNG based on locational needs.

The aggregated OM requirements for 2007/08 are 1494 GWh of which 744 GWh is identified as the minimum LNG requirement based on locational needs. The maximum LNG requirement is 1039 GWh.

The OM requirement for Rough is 455 GWh, this is primarily booked for orderly rundown purposes but could be used for other requirements.

For MRS the OM requirement is between 0 and 295 GWh. National Grid Gas has completed a tender process for up to 210 GWh to secure storage services in addition from those from LNG. These bids are currently being assessed ahead of National Grid Gas' bookings in LNG.

Table 1: 2007/08 Operating Margins Booking

	2006/07 Max LNG Booking (GWh)	**2007/08 Max Booking (GWh)**	**2007/08 Min Booking (GWh)**	2007/08 Max Deliverability (GWh/d)
Avonmouth	350	**259**	**156**	156
Dynevor	160	**137**	**99**	49
Grain	186	**186**	**186**	186
Glenmavis	135	**134**	**83**	101
Partington	266	**323**	**220**	220
Rough	455	**455**	**455**	455
MRS	98	**295**	**0**	
Total[3]	1648	**1494**		

This booking explicitly meets our Safety Case obligations.

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

As the OM booking is not yet finalised, the table below shows a provisional 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: 2007/08 Operating Margin Profile

	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Monitor (GWh)	50%	50%	50%	50%	50%	100%	100%	100%	99%	85%	75%	50%	50%
Monitor (%)	752	752	752	752	752	1494	1494	1494	1483	1267	1128	752	752

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

8 Operating Margins WACOG Calculation Principles

Per K4.2.6(b) of the UNC, National Grid Gas must publish the principles by which the Net Margins WACOG will be calculated in relation to facilities where National Grid Gas has entered into OM Gas Delivery Arrangements. National Grid Gas currently enjoys OM Gas Delivery Arrangements at the Isle of Grain LNG Importation Terminal, as provided by the Contracting Shipper. The Net Margins WACOG in respect of these OM Gas Delivery Arrangements at the Isle of Grain LNG Importation Terminal shall be calculated as follows as follows:

DC = DQ * DGP

Where:

DC is the Net Margins WACOG

DQ is the quantity delivered (in GWh) to National Grid Gas pursuant to the OM Gas Delivery Arrangements on the day in question:

DGP is the greater of:

a price (in GBP/GWh) calculated as the average of the three highest System Average Prices (in GBP/GWh) in the five Days immediately after the date on which the delivery occurred, minus the average of System Entry Capacity Charges applicable in respect of the Gas Delivery point in the same period;

and

the weighted average of the System Average Price (in GBP/GWh) in the three hundred and sixty-five Days immediately before the date on which the delivery occurred, minus the average of System Entry Capacity Charges (in GBP/GWh) applicable in respect of the Gas Delivery Point in the same period.

This methodology applies to the first 1000GWh OM gas delivered to National Grid Gas in each calendar year. In the event that further gas is required for OM purposes, National Grid Gas must enter into supplementary arrangements with the Contracting Shipper regarding Delivery Charges to be negotiated at such a time. The Net Margins WACOG in such circumstances with be determined as the quantity delivered to NGG (in GWh) multiplied by the price (in GBP/GWh) payable by National Grid Gas to the Contracting Shipper pursuant to any such supplementary arrangement.

Please note that this clarification does not affect the prevailing methodology for the recovery of gas costs where OM services are provided from facilities at which NGG benefits from Operating Margins Capacity Arrangements.