Review of the National Grid LNG Storage Business

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List of Revisions

Version	Date	Pages Affected	Revision History
Draft 1	3/05/06	All	First Draft Report Issued to Ofgem – Initial Analysis
Draft 2	3/05/06	Pg. 9 &10	Amended draft issued. Section 2.2.3 only
Draft 3	12/05/06	All	Re-drafted following Ofgem comments
Draft 4	08/06/06	All	Internal working draft
Draft 5	09/06/06	All	Revised draft submitted to Ofgem incorporating information received from National Grid LNG
Draft 6	04/08/06	All	Revised draft submitted to Ofgem following the OM workshop with National Grid
Final Draft Report	22/08/06	All	Following OM info from National Grid and Ofgem comments
Final Report	17/10/06	All	Final report incorporating NG LNG responses to final questions

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1. Introduction

Investment of around £15M has been made at Glenmavis in the period 2004 – 2006 to replace the liquefaction plants and NGG believe that Ofgem gave "approval" to this investment.

National Grid LNG has now advised Ofgem that significant capex (around £25M) is required at Partington in the next 2 years to replace the liquefaction plant and at Avonmouth in 2009-10. National Grid LNG argues that without such investment, there could be a breach of the National Transmission System Safety Case in the event of a major failure of the Partington plant.

National Grid LNG has said that it is unable/unwilling to fund this investment without an assurance from Ofgem that they could get a return. As a result of the new importation projects, forecasts of services sold to shippers are falling from 2008 and it may be that the only income will be from services to support the National Transmission System (primarily Operating Margins) and to provide road tanker LNG supplies to the Scottish Independent Undertakings (SIUs).

Falling requirements forecast for shipper supply/demand services and Operating Margins, mean that there could be limited income to Partington after 2008 and no requirement for Dynevor Arms.

The combination of ageing plant needing investment (Partington and Avonmouth) with low medium term utilisation means that National Grid has asked that the £25M Partington capex be, in effect, treated as part of the NTS RAV. Another £14M of capex is also planned in the next 5 years at Partington. Investment of £15M has been made at Glenmavis in 2004-6 in order to build a new liquefaction plant and National Grid have also requested that this be added to the NTS RAV.

In addition, National Grid LNG argues that the price cap on Operating Margins LNG and gas for the SIUs acts to restrict profitability of its LNG business and also to make it harder for competitors to enter this market. There are a number of onshore gas storage projects that are being developed in the 2009 timeframe (same timetable as the Partington work) that could reasonably be expected to offer National Grid SO an alternative service.

NG LNG gave a presentation to TPA/Ofgem on 17th May 2006 setting out its case for the 4 LNG sites to be brought back into the RAV. This is attached as Appendix 6.

TPA Solutions has been requested by Ofgem to carry out a review of National Grid Gas's four embedded LNG facilities in order to help Ofgem decide on the appropriate regulatory treatment for these assets and respond to National Grid Gas in respect to the Partington capex issue. As part of the analysis, TPA has also been asked to review Operating Margin requirements, to produce capex plans based on 4 year and 10 year life for each of the facilities in turn and to identify alternative providers for storage services necessary for the National Grid Gas System Operator.

2. Executive Summary

TPA has reviewed the business plans for the 4 LNG facilities, including forecasts for income, capex and opex from 2003/4 to 20011/12

Draft conclusions are as follows:

Business Profitability

- The LNG business had a small operating profit of around £5M in each of 2003/4 and 2004/5, with profits of £34.9M in 2005/6 and forecast profits of around £40M in 2006/7. From 2007/8 however, and subject in particular to Milford Haven gas, profits are forecast to fall back to around £5M per annum.
- TPA believes that profits of around £22M are likely in 2007/8 (compared to the original forecast of £1.5M by National Grid LNG after accounting for forecast increases in electricity costs). This is because shippers will not be able to assume gas from Ormen Lange and Milford Haven will arrive in April 2007 when the LNG auctions take place.
- Compared to the long term trend, NG LNG forecast there to be an additional profit of around £70M arising in the 2 years 05/06 and 06/07 as a result of the short term UK supply/demand position. TPA believes this could be as high as around £90M additional profit over three years commencing 05/06.
- The Cap on prices paid for Operating Margins and SIU gas reduces profits in the 2 years 05/06 and 06/07 by around £20m compared to paying shipper (market) prices on the assumption that current C3 prices are typically less than half the market price.

Capacity Sales

- The following table shows actual capacity income over the first 3 years of the period and forecast for the remainder (all figs in £M):

Actual and Forecast Capacity Income

Sales	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
OM	16.6	16.3	10.3	11.3	6.7	6.7	6.7	6.7	6.7
SIU	1.9	2.5	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Shipper	9.4	15.7	54.5	62.4	22.1	15.0	23.2	22.6	23.9
Total	**27.89**	**34.6**	**66.7**	**75.5**	**30.6**	**23.6**	**31.7**	**31.1**	**32.4**

Source: National Grid

Note – commodity income related to throughput is separate. This income covers the variable costs associated with making and re-gasifying LNG.

- TPA believes that the actual level of Shipper and OM sales for 07/08 will depend on the performance of new import projects such as BBL and IUK expansion this coming winter and the market perception in relation to Ormen Lange, IOG and Milford Haven for winter 07/08.
- TPA believes that if all these gas importation projects (and associated onshore pipelines) have been successfully delivered by early 2008 then there will be significant downwards pressure on both Shipper Sales and OM, however, sales are likely to be higher than forecast by National Grid LNG due to timing mismatch (bookings will be made in April 2007 before it is clear whether the new supplies are on schedule)

Operating Margin Sales

- National Grid Gas believes there is a locational requirement for OM. In the following table, 06/07 figures are from National Grid Gas. TPA has calculated 07/08 and 08/09 based on the same split and National Grid Gas forecast of OM requirement for these years.

Locational Requirement for OM in GWh

	06/07 Figs from National Grid			07/08 Estimate (by TPA)			08/09 Estimate (by TPA)		
	Non Loc	Loc	Loc As % Of 1 tank	Non Loc	Loc	Loc As % Of 1 tank	Non Loc	Loc	Loc As % Of 1 tank
Avonmouth	199	151	54%	**150**	114	41%	150	115	41%
Dynevor	82	78	28%	**58**	55	20%	58	55	20%
Grain	74	112	40%	**74**	112	40%	56	84	30%
Glenmavis	51	83	30%	**58**	95	34%	58	95	34%
Partington	107	159	57%	**129**	**191**	68%	122	**181**	65%
Rough	455	0							
MRS	98	0							
Total	**1066**	**583**							

Source: As Shown by Column

Note: – NGG's latest figs in TP4201 show a long term RISING need for OM at Partington. These are NOT consistent with National Grid LNG's forecasts which show a fall to 166 GWh in 2007/8 remaining flat until 2011/12.

- TPA believes that the total OM requirement is overstated by around 356 Gwh as a result of overlap between OM categories
  - Supply losses and orderly rundown
- TPA believes that additional bookings at Hornsea and/or Rough are more economic than bookings at National Grid LNG (even with the price cap) for the discretionary 217 GWh of non-locational LNG.
- TPA believes there is a case that the level of OM associated with Orderly Rundown could be reduced significantly to remove a large proportion of the UK DM component. However, we have not adopted this in our analysis.
- TPA also believes the gross OM requirement will fall as a result of certain factors:
  - Installation of additional electrically driven compressors
  - Reduction in reliance on compressors
  - Instantaneous flow-metering at terminals which will alert shippers to failures and allow them to use their own stored gas
  - Reduced reliance on north sea production which is not as reliable as LNG
  - This reduction is estimated as being approximately 96 GWh
- TPA does not believe National Grid SO has made a case for a substantially increased requirement for OM and hence rejects the National Grid high OM case. TPA has therefore adopted the following scenarios with respect to future OM requirements.

- TPA High equals NG Central
- TPA Central equals NG Central minus double counting and Hornsea shift (down to minimum locational requirement)
- TPA low equals TPA Central minus 96 GWh and remove Dynevor locational after 2007/8.

TPA assessed the impact on the OM provision at all sites for 2006/7 of removing the double counting and changing bookings to Hornsea as shown below.

GWh	2006/7	Approx Non-Locational	Approx Locational
Avonmouth	174	113	61
Dynevor	77	46	31
Grain	87	43	44
Glenmavis	62	29	33
Partington	122	61	61
Rough	455	455	0
MRS	315	315	0
Total	**1292**	**1062**	**230**

Proposed Capex

- National Grid Gas believes it is necessary for Safety Case reasons, ie: the provision of OM, to build new liquefaction plants as follows:

National Grid Planned investment

Plant	Project	Capex	Completion
Partington	New liquefaction plants	25M	Spring 2009
Avonmouth	New liquefaction plant	20M	Spring 2011

- TPA has reviewed the forecast capex for all 4 facilities and accepts that significant capex is required at Partington and Avonmouth if these facilities are to have a further operating life of 10 years or more. The following table sets out TPA's view of investment required for 4 and 10 year lives. Under the 4 year case, investment would only be made for safety reasons, with a contingency provided each year for this.

	Additional capex proposed by NGT in 2006/7 – 2010/11 period		TPA capex estimates £M	
	Capex £M	Date majority of capex incurred/forecast	4 Year plant life	10 year plant life
Glenmavis *	12.2	06/07	5.9	12.2
Dynevor	4.3		1.6	4.3
Partington	38.8	Majority on 07/08 and 08/09	5.8	38.8
Avonmouth	27.8	Majority in 09/10 and 10/11	5.3	27.8

* £14.2M in years 04/05 and 05/06

TPA Forecast of Facility Requirement

Dynevor

- TPA does not believe there is any requirement for Dynevor Arms once Milford Haven gas is flowing and the pipeline projects are completed. Dynevor has a back up role for Peterstow but that compressor station is also not required.

Partington

- TPA does not believe there is any requirement for Partington if the Canatxx Fleetwood Project goes ahead and is operational from summer 2010 (broadly same timetable as the new liquefaction plants) and assuming National Grid is able to contract with Canatxx. If the Canatxx project does not go ahead, there may be a small residual requirement at Partington, but it may be more efficient to supply this by road tanker. In addition, TPA believes that the Pannal to Nether Kellet pipeline provides OM that can support this locational need (together with use of capacity reserved for Flow Margins)

Glenmavis and Avonmouth

- From October 2008, TPA believes there is still a requirement for Glenmavis (Operating Margins and to supply the Scottish Independent Undertakings) and for Avonmouth (Operating Margins, back-up to Glenmavis and constrained LNG for NTS transmission support).

Future Competitive Options

SIU

- A new tanker loading facility at Isle of Grain, Milford Haven or Teesside (assuming ConocoPhillips LNG project goes ahead) is likely to be the most efficient means of supplying the SIUs and should be investigated by NGG / Scotia Gas. In addition, LNG road tanker imports from Norway or Spain are also taking place at the current time and it would be appropriate to compare the economics of such imports (note - these imports do not represent a credible source of OM at this time due to logistics)

Constrained LNG-Transmission Support

- TPA believes a decision on investment at Avonmouth should be postponed until 2008, by which time there may be alternative options (such as 3rd party storage or CCGT fuel oil back up) or demand for capacity to supply the SW DN may have reduced.

Operating Margins

- TPA believes a thorough review of the OM methodology should take place in 2007, together with a review of Flow Margins, given the substantial changes in supply patterns, investment in infrastructure, market developments and current overlap of provision
- TPA believes that it is likely that there will be competitive options for OM by 2009/10 and National Grid Gas should engage with these projects now rather than waiting for them to be built.
- TPA believes that some shippers at the new LNG facilities at Milford Haven and Isle of Grain may be interested in providing LNG for the Orderly Rundown scenario.

Price Cap

- TPA believes that the C3 price cap should be removed to allow additional revenues into the LNG business in the period 2007/8 – 2009/10 which will encourage competition and provide funding for the necessary restructuring of the LNG business, including sale/closure of Dynevor and Partington.
- NG identifies 217 GWh of OM that could be provided from MRS, but is placed in LNG to guarantee its availability. TPA assumes that removal of the price cap could alter this approach as the lowest price service will prevail, likely to be MRS

General Operating Efficiency

- TPA believes that the operation of the facilities is generally efficient with no significant opportunity to reduce costs apart from investment in new liquefaction plants to reduce liquefaction costs.
- TPA believes that the general asset health of the facilities has shown some improvement as a result of recent investment that has been made in the knowledge of high levels of shipper sales in the 05/06 and 06/07 period.

Income from Electricity Generation

- National Grid LNG is prevented by National Grid's Licence from generating electricity at its LNG facilities (using standby plant). This used to be done prior to merger between National Grid and Lattice Group and would be a useful additional source of income in 06/07 and 07/08. National Grid LNG should consider asking Ofgem for permission to generate electricity at these facilities

3. Methodology

TPA's detailed methodology for the report is set out below:

- Review the LNG business to understand the general state of its assets and services it provides to shippers and to the NTS.
- Review, by site, the central case of volumes of Operating Margins required by the NTS System Operator and sensitivities around this case
- Review alternative ways of providing these OM's (both from 3rd party sources and by utilising one LNG facility to make LNG but another to store it, with road tankers used)
- Review, by site, the economics of each facility with sensitivities related to income.
- Produce 2 capex cases based on:
  - 10 year life from 1 April 2007
  - 4 year life from 1 April 2007

Initial questions were submitted to National Grid Gas LNG on 3rd May 2006 with an initial workshop held on the 17th May 2006.

Questions were submitted to National Grid Gas in relation to OM bookings on 8th June 2006, with a workshop held on 7th July 2006. Further OM related questions were then submitted to National Grid Gas on 11th July 2006 and 18th August 2006.

Ofgem require a final report by 31 August 2006.

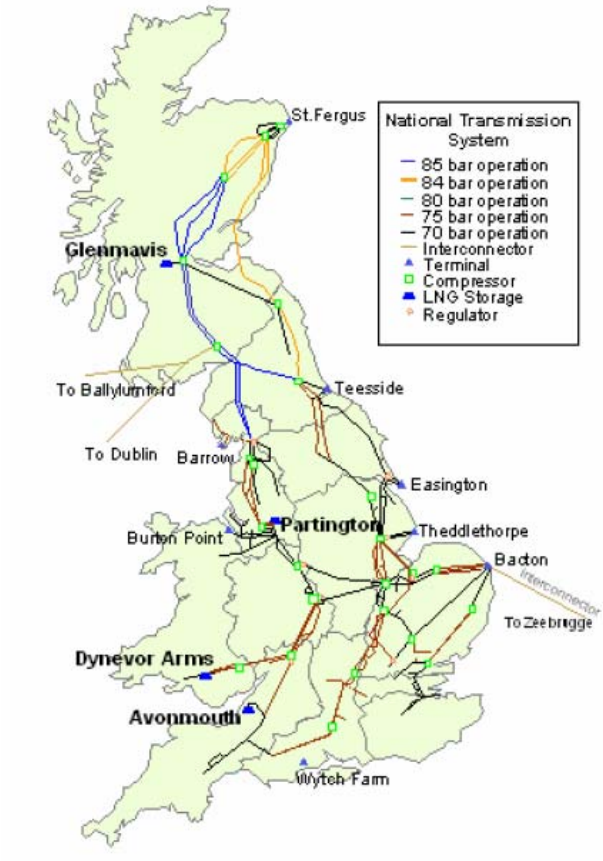
The questions submitted to National Grid Gas SO and to National Grid LNG are set out in Appendix 2

4. Background

4.1 Purpose of LNG Storage Facilities

When the LNG facilities were built in the 1970's they were located towards network extremities, designed to deliver gas during a few days of high demand and had a peak shaving role in the supply/demand curve. Their use developed such that they were required when all interruptibles were switched off, beach, Rough and Hornsea were at maximum but there remained firm demand that had to be supplied. TPA Solutions believe that they were not built with the primary role of providing gas transmission capacity as, in a growing network, it was not normally economic to build LNG facilities specifically for this purpose, but they were utilised as an alternative to pipeline capacity as a bi-product of their primary role, by locating the facilities at system extremities.

Where benefit to the network could be obtained, the capitalised marginal cost of operating the facility would have been lower than a new pipeline providing the same capacity benefit. Over the years, however, the network support role did become more prominent, though now only Avonmouth has a transmission support role (Constrained LNG service). Dynevor and Partington no longer have any transmission support role and Glenmavis has not had any such role since gas at St Fergus commenced flowing. During periods of high demand, the facilities enable National Grid Gas to ensure that sufficient quantities of gas can be delivered in specific localities to meet firm demand in line with its network planning requirements. The map below shows the location of the four facilities.



National Transmission System

Source: http://www.nationalgrid.com/uk/Gas/lngstorage/What/#

Existing Plant Data Summary

	Injectability *(GWh/d)*	Space *(GWh)*	Deliverability *(GWh/d)*	Duration *(days)*	No of 20,000 tonne tanks	Liquefaction Tonne/day
Avonmouth	2.3	876.1	156.2	5.6	3	1 x 200
Dynevor Arms	2.6	304.1	49.2	6.2	1	1 x 200
Glenmavis	4.6	505.5	101.1	5	2	1 x 100 + 1 x 200 originally, New 230 plant in 2006
Partington	2.4	1,121.90	219.8	5.1	4	2 x 200
Total	**7.3**	**2,807.60**	**526.3**		**10**	

Source : National Grid

4.2 LNG Services

4.2.1 Shipper peak shaving and balancing services

The facilities primary use is to provide a contestable 'peak gas storage' service to shippers

4.2.2 Services provided to National Grid Gas:

i) Provision of Operating Margins:

There are 3 groups of Operating Margin services, defined by National Grid as follows:

- **Group 1 (**formerly Major Events) 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.
- **Group 2 (**formerly Minor Events), though better described as multiple events, include 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.
- **Group 3 Orderly rundown** 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. This is the major use for OM gas.

For a description of Operating Margins please see Appendix 2

ii) Provision of Constrained LNG

This is a geographic service supporting the transmission network, with the Transmission System Operator providing a discount to gas shippers prepared to book such LNG. The TSO uses this service instead of building additional pipeline capacity.

At present, only Avonmouth is used for this purpose.

For a description of Constrained LNG please see Appendix 3.

There is no longer any mechanism for ensuring minimum stocks at constrained sites since the removal of Constrained Top-Up from the Network Code.

iii) Scottish Independent Undertakings

The Glenmavis facility supplies LNG for use in the **Scottish Independent Undertakings,** which is transported by road tanker before being re-gasified.

Dynevor also has a back-up role in having the capability to fill LNG road tankers with similar facilities being installed at Partington and Avonmouth in 2006

4.2.3 Safety Monitor

There is currently a role for short term storage, and in particular LNG, in maintaining security of supply to the customers that are protected by the safety reserve that is managed by NG as part of their obligations under the GS(M)R.

This relates to a minimum volume of gas to be held in store in order to sustain demand for a designated group of customers in a 1 in 50 winter[1]. These customers are:-

- Priority Firm DM
- Ireland Firm
- All NDM loads

For a full description of the Safety Reserve please see Appendix 4.

In addition, a certain amount of capacity in these facilities is required to be maintained at a certain level under the 'Safety Monitor regime'. This is described in more detail in Appendix 4.

[1] In the event that there is an excess of supply over this level of 1 in 50 demand then there is no requirement for storage stocks to be monitored.

4.3 Provision of Services by Site

The table below outlines the different uses for each facility.

Facility	Shipper Peak shaving and balancing	Constrained LNG	Operating Margins	SIU
Glenmavis	Yes	No	Yes	Yes
Dynevor	Yes	No	Yes	No (reserve)
Avonmouth	Yes	Yes	Yes	No (reserve)
Partington	Yes	No	Yes	No (reserve)

Source: TPA Analysis

(Note –The Isle of Grain LNG facility (including the former Transco LNG storage facility) is not part of National Grid Gas. It is however still available for supply of Operating Margins as National Grid Gas has contracted through the Transco Services Agreement with BP/Sonatrach to retain the option of using gas in storage for this purpose)

4.4 Shipper Peak Shaving and Balancing Services

Capacity has been fully booked for this winter for supply/demand reasons. This is the key reason for the sites in the short term and is a result of the well publicised issues relating to the supply availability/import uncertainties next winter (See Sonia Brown presentation – 22nd March 2006 – Winter 2005/6 experience and issues for 2006/7).

The first auction results have been published and only Avonmouth is designated as a constrained site at 34%. These auction results are reproduced below:

Auction Results – 1st Stage April 2006

	Avonmouth (34% Constrained)	Dynevor	Glenmavis	Partington
Space sold (kWh)	231,482,500	49,242,500	115,750,000	395,010,000
Total Space Available (kWh)	876,100,000	304,100,000	505,500,000	1,121,900,00
Deliverability sold (kWh/d)	72,471,508	20,909,724	50,550,000	103,447,048
Total Deliverability Available (kWh)	156,200,000	49,200,000	101,100,000	219,800,000
Average bid price (net of constrained rebate) - p/kWh	4.2884 (3.6370)	4.8722	4.836	4.008
Min Accepted Price (net of transmission benefit) – p/kWh	3.3848 (2.7334)	4.6473	4.0297	3.5688
Reserve price (net of transmission benefit) – p/kWh	0.4094 (0.0)	0.4094	0.3334	0.3494

Prices shown in brackets for Avonmouth are net of the constrained rebate
Source: National Grid LNG

Auction Results –2nd Stage April 2006

	Avonmouth (34% Constrained)	Dynevor	Glenmavis	Partington
Space sold (kWh)	231,482,500	49,242,500	115,750,000	395,010,000
Deliverability sold (kWh/d)	72,471,508	20,909,724	50,550,000	103,447,048
Average bid price (net of constrained rebate) - p/kWh	4.3391 (3.6877)	3.9028	3.7959	2.9731
Min Accepted Price (net of transmission benefit) – p/kWh	4.3382 (3.6868)	3.1165	2.7181	2.4217
Reserve price (net of transmission benefit) – p/kWh	0.4094 (0.0)	0.4094	0.3334	0.3494

Prices shown in brackets for Avonmouth are net of the constrained rebate
Source: National Grid LNG

4.5 Operating Margins

National Grid went out to tender for these services for the first time this year but did not receive any bids that met its requirement. Only two offers were submitted following the OM formal tender. They were both rejected on the following grounds.

- Did not match the lowest physical response requirement of 25 GWh
- Bidder could not guarantee delivery when requested
- Too expensive compared to C3 prices – the current C3 prices (based on NG actual bookings) are 1.36 p/kWh Avonmouth, 2.51 p/kWh Dynevor, 1.56 p/kWh Glenmavis and 1.02 p/kWh Partington. These prices include deliverability, which was no longer booked post May 2005. The respective figures for space only are 1.17 p/kWh Avonmouth, 2.272 p/kWh Dynevor, 1.365 p/kWh Glenmavis and 0.869 p/kWh Partington These figures are mostly higher than Grain was prior to conversion to an importation facility, but lower after (see below) – by removing the cap on C3 prices it is hard to envisage that there could be much movement in the charges above the current high levels of Hornsea. The price for Hornsea taken from a presentation given by Peter Ritson of Energy Markets at the British Energy Association last November shows a figure of 1.08 p/kWh for Hornsea and 0.56 p/kWh for Rough. The price actually paid by NG for the period 1st April 2005 to 31st March 2006 from the UK Transmission Procurement Guidelines was for a space only service of 0.19 p/kWh for each service. This would suggest that non-locational OM services could be procured from Hornsea or Rough at a lower price than uncapped LNG for all the sites except Partington.

4.5.1 Isle of Grain Operating Margins

[This paragraph removed on grounds of commercial confidentiality

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For financial year 2006/7 the maximum monthly space booking is 186 GWh, [removed on the grounds of commercial confidentiality

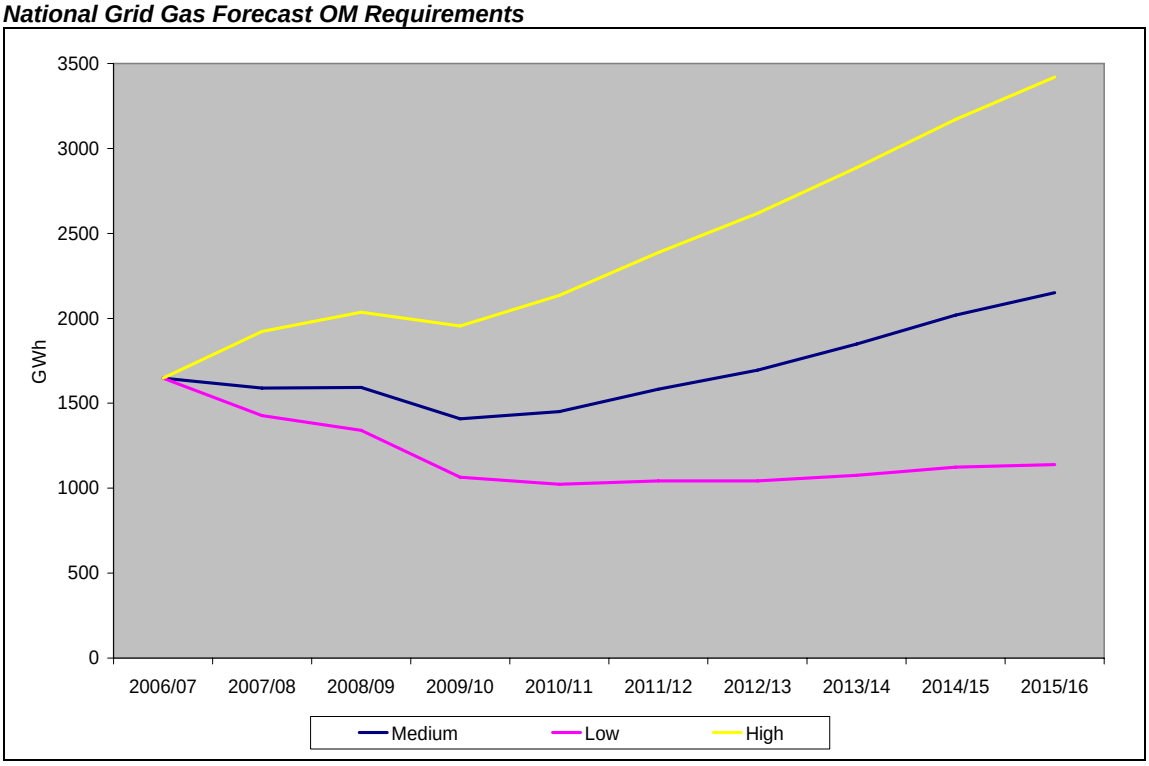
)] and during the summer months the space booking reduces down to 38 GWh. [This sentence removed on the grounds of commercial confidentiality

]. The previous years booking for Grain from the period 1st April 2005 to 31st March 2006 as shown in the National Grid UK Transmission Procurement Guidelines was for 220 GWh (plus 45 GWh for stock protection) and a deliverability of 72.7 GWh/d). The unit cost was 1.16 p/kWh prior to the contract with Grain LNG when it became 4.762 p/kWh/a.

4.5.2 National Grid SO Requirements

National Grid SO has provided the following forecast ranges for OM requirements.

National Grid Gas Forecast OM Requirements



Source: National Grid

The chart shows a High / Low range of possible OM. This range is determined by a cumulative range of supply / demand uncertainty (+/- 10 mcm/d per year) and a longer term view of the need for specific OM components at LNG sites as a consequence of proposed network reinforcements.

National Grid says that the 'Low' range is based upon 15 mcm/d demand response, together with a cumulative increase in supplies of 10 mcm/d a year. The 'High' range is based upon no demand response, a supply loss of 30 mcm/d and a cumulative loss of 10 mcm/d per year. The range of OM shown should be considered as indicative rather than explicit.

The tables below show the data behind the chart and for the 2006 Medium Case, broken down by site in GWh. National Grid have stated that these values are indicative and subject to change due to operational performance, network investment and the availability of new storage facilities or alternative OM service providers.

Future OM Assessment range to 2015/16 (GWh)

	Medium	Low	High
2006/07	1648	1648	1648
2007/08	1589	1427	1922
2008/09	1528	1340	2037
2009/10	1347	1064	1954
2010/11	1451	1023	2135
2011/12	1583	1042	2388
2012/13	1696	1042	2618
2013/14	1849	1076	2887
2014/15	2018	1124	3172
2015/16	2151	1139	3420

Source: National Grid

Future OM Assessment to 2015/16 – 2006 Medium Case by site*

Booking	Avonmouth	Dynevor	Grain	Glenmavis	Partington	Rough	MRS	Total
2006/07	350	160	186	135	266	455	98	1648
2007/08	264	113	186	153	320	455	98	1589
2008/09	265	113	140	153	303	455	98	1528
2009/10	210	97	140	116	231	455	98	1347
2010/11	242	106	140	137	273	455	98	1451
2011/12	282	119	140	165	325	455	98	1583
2012/13	316	129	140	189	369	455	98	1696
2013/14	361	143	140	220	433	455	98	1849
2014/15	411	158	140	254	502	455	98	2018
2015/16	450	170	140	281	557	455	98	2151

Source: National Grid

A detailed review of Operating Margins gas (from SO point of view) is provided in Appendix 3.

In summary TPA does not believe that National Grid Gas has provided justification for its High Case. TPA believes that there is no case for increasing OM given the supply/demand and other factors and hence does not believe that the National Grid SO High Case is well founded.

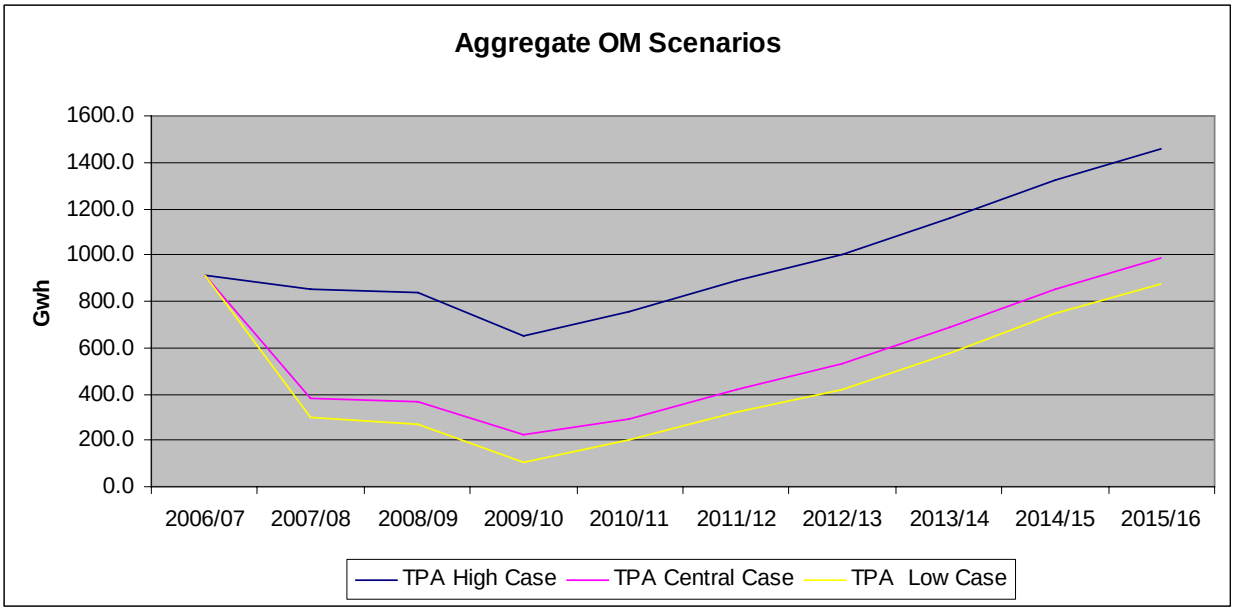
TPA has therefore developed cases around the National Grid Gas Central Case as follows:

- TPA High equals NG Central
- TPA Central equals NG Central minus double counting and Hornsea shift (down to minimum locational requirement)
- TPA low equals TPA Central minus 96 GWh and remove Dynevor locational requirement after 2007/8.

We have considered the possibility of reducing the amount of OM provision for Orderly Rundown on the basis that there is essentially an increased proportion of gas supply from non-

storage facilities if you take demand as being 1 in 50 severe, excluding DM loads (except priority and Ireland) instead of total firm demand. However this is something that should be considered by National Grid as part of the overall review of OM methodology suggested in Appendix 3.

The three scenarios are presented below for the aggregate OM booking requirements that relate to NG LNG facilities only.



5. Overall Review of Historic and Forecast Opex and Capex and Income

TPA have analysed the data received from National Grid LNG and an overview of the information received is provided in the following section. The subsequent sections of this document contain more focused assessment of the four sites on an individual basis with distinct conclusions for each site.

5.1 Aggregate Opex

National Grid LNG have presented the following information about their opex costs, in response to TPA questions.

Aggregate Opex Costs

	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Controllable Costs									
Net staff costs	7.9	6.7	5.9	5.2	5.4	5.5	5.6	5.7	5.8
Pension Contributions	1.5	1.3	1.1	1.3	1.3	1.3	1.4	1.4	1.4
Materials - Process	0.8	0.8	0.7	0.2	0.2	0.2	0.2	0.2	0.2
Non salary staff costs *	0.7	0.8	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Insurance	0.9	1.0	0.6	0.4	0.5	0.5	0.5	0.5	0.6
Rents and Buildings	0.6	0.8	0.5	0.6	0.6	0.6	0.6	0.6	0.6
Profit/loss on sale fixed assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Internal sales/purchases	0.1	0.9	0.9	1.7	1.7	1.7	1.7	1.7	1.7
Utility Costs & Process Materials	3.4	3.9	3.2	3.6	3.4	3.2	3.1	3.1	3.1
Commodity Costs	2.9	2.3	3.6	4.3	3.8	3.4	5.4	5.4	5.8
Revenue Projects	2.0	2.1	4.5	5.7	3.3	3.1	2.1	2.2	2.0
Other	2.5	2.0	2.9	6.5	3.0	2.9	2.8	2.7	2.7
Total Controllable	**23.3**	**22.6**	**24.3**	**30.0**	**23.6**	**22.9**	**23.9**	**23.9**	**24.3**
Non controllable									
Depreciation	0.8	7.0	8.9	7.2	7.3	8.5	7.8	8.6	8.0
Rates	2.6	2.2	1.8	1.9	1.9	1.9	1.9	1.9	1.9
Total Non controllable	**3.4**	**9.1**	**10.7**	**9.1**	**9.2**	**10.4**	**9.7**	**10.5**	**9.9**
Total costs	**26.6**	**31.7**	**35.1**	**39.1**	**32.7**	**33.2**	**33.6**	**34.4**	**34.2**

Source: National Grid

****including T&S***

Opex is forecast to be fairly flat for most categories of cost, with the overall profile being driven by:-

- An increase in revenue projects in 05/06 and 06/07 reflects various factors, including
  a) Increased levels of maintenance painting reflecting condition assessment work carried out in 2004/05.
  b) Increased levels of operational breakdowns, particularly at Partington in 2005/6
  c) Implementation of HSE directed projects including IEC61508 (SIS/SIL) and Human Factors.
  d) Feasibility study for replacement of Partington liquefaction plant
  e) Assessment of and remedial works to Partington earth bunds to maintain integrity of safety systems

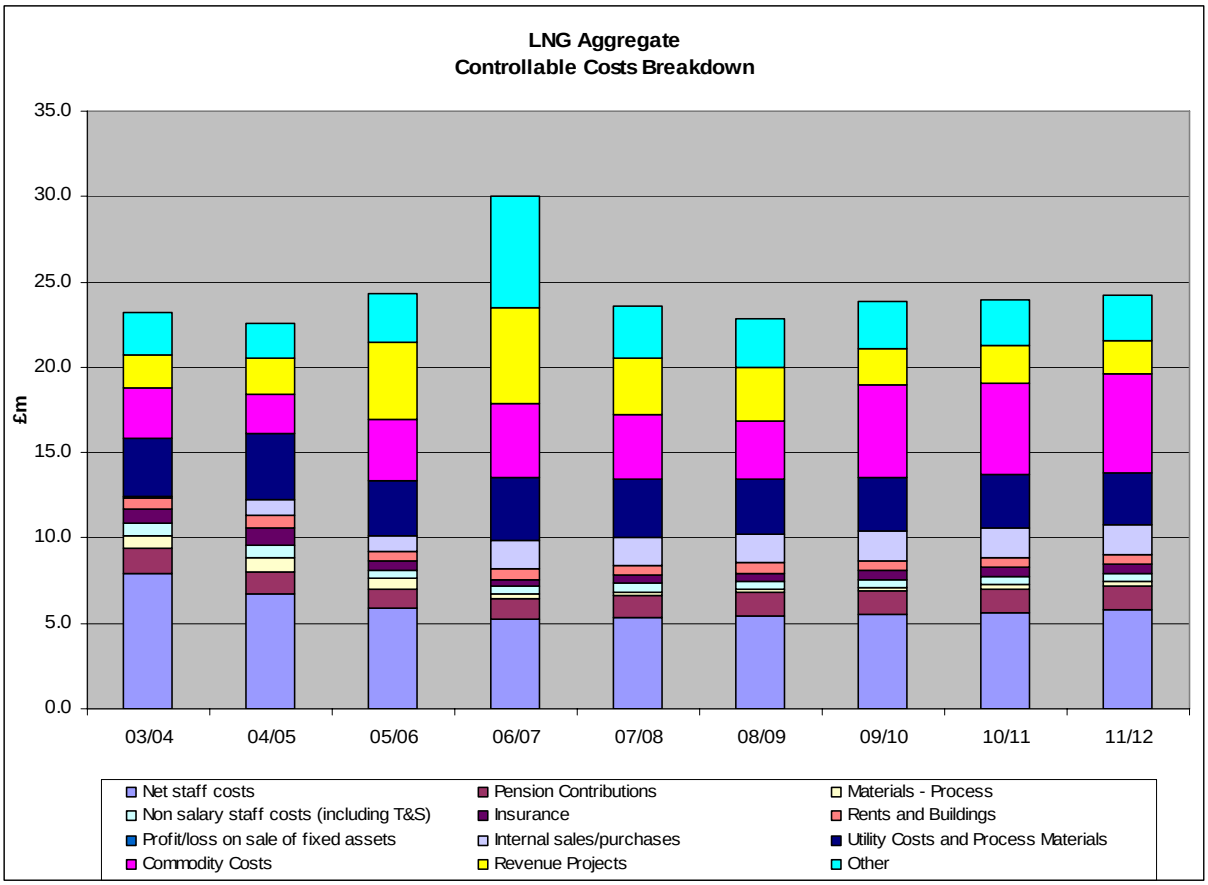
f) Implementation of new corrosion management policy

- An increase in commodity costs in the last three years of the forecast is explained by National Grid LNG by the following statement. Commodity costs are both fuel gas for vaporisation and electricity costs for liquefaction. These both vary with the level of withdrawals and subsequent re-injection and customers are charged for these elements separately from their capacity holding. It is assumed that current injection performance would slowly decline until the injection plants have been replaced at Avonmouth and Partington. Once these plants are replaced the injection capability increases and hence it is possible to carry out more injection. The weather assumptions used in the models resulted in high withdrawals and hence a requirement to use the increased injection performance to facilitate sale of all capacity.
- The profile of costs given by National Grid LNG reflects above inflation rises in electricity prices.

Points highlighted by NG LNG are:-

- Commodity costs are recovered through the commodity income line
- Substantial increases in electricity prices are anticipated. They vary from year to year depending on expected plant availability.

The opex data is presented below in chart form:



Source: National Grid Data

5.1.1 Analysis of Historical Opex Savings

During the period 03/04 to 05/06, the figures show:-

- £2m reduction in direct staff costs, and corresponding £0.7m reduction in associated overheads. The movements in the staff costs line reflect a series of changes in the structure of the organisation and some changes in what is reported against this heading. The staff costs at sites increase slightly over the period. There is limited scope for headcount reductions at sites as a minimum level has to be maintained to meet operational safety requirements. The level of agency costs varies from year to year according to operational requirements, mainly project work.
- Staff levels in managerial and support functions have been reduced, with the merging of the senior operational management team with the Engineering Services Gas Transportation team. Similarly, the commercial team has been combined with NGET Interconnector business commercial group under a single manager. The finance team has also reduced by two, following its integration with the main Transmission Finance function.
- Reduction in Insurance costs. The largest part of the reduction is to due the removal of costs for the Isle of Grain site from the total. The remainder of the saving reflects a reduction in public liability and property insurance costs.

- These reductions are offset by increasing variable costs (Utility, process and commodity costs) and a £2m increase in revenue projects costs.

5.1.2 Health and Safety Opex Impact

National Grid has not indicated any specific adverse cost impact as a result of new legislation or the Buncefield incident. They did provide the following statement of their understanding of current issues that may impact upon their business.

> *"Top tier COMAH facilities such as the four LNG Storage sites are subject to a requirement to comply with the direction of the 'statutory authorities' (the HSE, EA and SEPA) and to adopt international best practice as it becomes the operational norm. Recent examples of HSE intervention that has affected the LNG Storage sites include implementation of IEC 61508 (the international standard for electrical, electronic and programmable electronic safety related systems) and HSG 48 (HSE Guidance document on "Reducing error and influencing behaviour").*
>
> *The most significant recent incident that is likely to affect LNG Storage in the short to medium term is the explosion and resulting fire at the Buncefield fuel depot. The initial findings were published on 9th May but the scope of recommendations likely to arise from the current investigation has yet to be determined but could be expected to include improvements to tank level systems, safety instrumented systems, deluge systems, improvements to hazardous gases/vapours detection, reinforcement of on-site control facilities and establishment of 'permanent' off-site incident control facilities.*
>
> *It is known that the LNG Storage sites attract significant HSE attention due to the quantity of hazard material stored, the magnitude of any gas cloud likely to be formed following a breach of containment, and in the case of Partington, the proximity of the site to sizeable centres of population. HSE have indicated that the site presents potentially the highest Societal Risk factor of any COMAH facilities in the country.*
>
> *Due to the indeterminate nature of changes to legislation and regulations, no specific provision is included within the LNG Storage Business Plan to cover such uncertainty."*

5.1.3 Potential Ongoing Efficiency Improvements

Significant staff reductions in the LNG business took place in 1998 – 2001 and TPA does not believe there is any significant scope for reductions in fixed opex going forward. Variable opex can be reduced but only if more efficient new liquefaction plants are built.

5.1.4 Review of Forecast Opex Plans

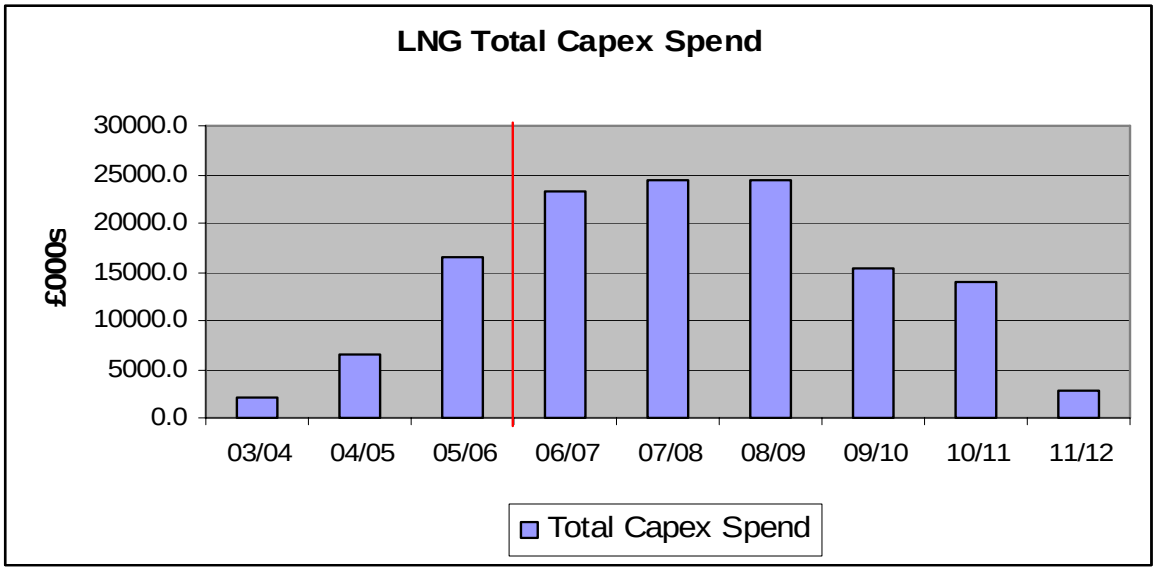
TPA believes that the operation of the facilities is generally efficient with no significant opportunity to reduce costs apart from investment in new liquefaction plants to reduce liquefaction costs.

TPA also believes that the general asset health of the facilities has shown some improvement as a result of recent investment that has been made in the knowledge of high levels of shipper sales in the 05/06 and 06/07 period.

5.2 Aggregate Capex

National Grid have provided the following information about their historic and future capex costs

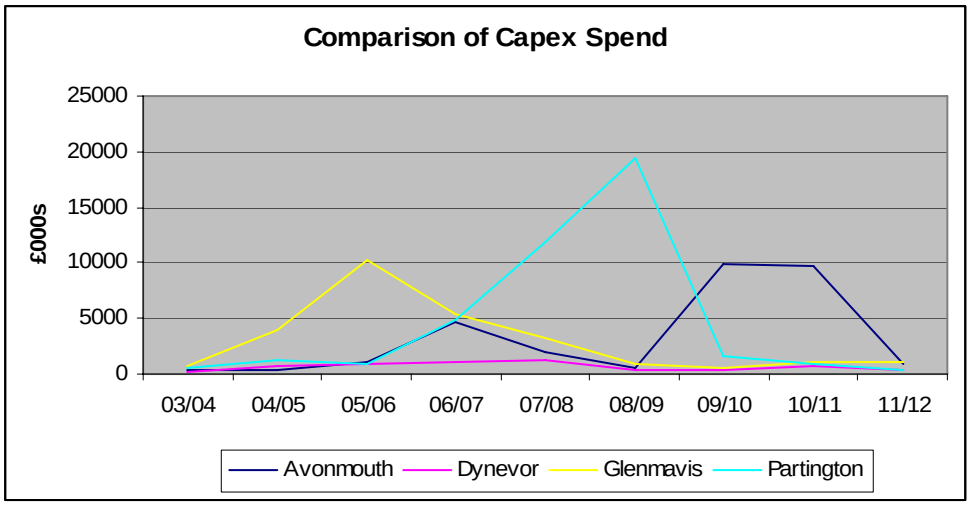
Total LNG Capex Spend (£k)



03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
2001.5	6596.7	16596.0	23167.8	24419.0	24485.4	15314.5	13875.0	2725.4

Source: National Grid

The following chart shows capex for each site:-



Source: National Grid

- Increase 04/05 and 05/06 relates to Glenmavis liquefaction plant replacement
- 05/06 – 08/09 relates to Partington liquefaction plant replacement.
- 09/10 – 10/11 relates to Avonmouth liquefaction plant replacement

5.2.1 Capex Drivers Analysis

Capex drivers relate to the age of the LNG facilities and the significant deterioration there has been in the efficiency and capacity of the liquefaction plants at Partington and Avonmouth. These have plants designed to make 200 tonnes/day of LNG but they have been producing significantly below this on some occasions (in 2002 Partington was only 165 tonnes/day, Avonmouth has been as low as 133 tonnes/day in 2004) although Partington is currently producing at an average rate of 214 tonnes/day. The variability is due to a number of factors including downtime from plant failure and gas quality issues. The sites are also more prone to significant failures. TPA accepts that the liquefaction plants are nearing the end of their useful lives and are significantly less efficient than they used to be.

5.2.2 Analysis of Forecast Changes to Capex Drivers

Some expenditure has taken place in 2005/6 - £846k at 2004/05 prices, £868k at outturn. This included £241k (£247k) for vaporiser conversion, £209k ((£214k) for cooling water pipework and £111k (£114k) for pre purification unit control system and valve replacement. There were other individual projects of less than £100k totalling £285k (£293k).

Given the poor performance of Avonmouth liquefaction plant National Grid LNG were asked to explain why they have chosen to modify Partington ahead of Avonmouth. Their response was that they plan to replace the Partington liquefaction plant ahead of the Avonmouth plant because they have seen an earlier onset of failure at Partington. During the 2005/6 liquefaction regime, the Phase 1 cold box at Partington suffered a seam failure in one of the internal heat exchangers which resulted in refrigerant spraying through the internal 'rockwool' lagging and reaching the outer mild steel casing. The failure was evidenced by a build up of ice on the casing which, if left unattended, would lead to materials failure in the outer casing and potential release of refrigerant/natural gas into the environment with consequent safety risks to personnel and plant and environmental implications.

The type of leak encountered at Partington is similar in nature to the initial leaks on the Glenmavis Phase 2 plant in the period 2000 – 2003. These leaks became increasingly frequent and ultimately led to a decision to shut down the plant and initiate the asset replacement of the liquefaction facilities at the site. There is a reasonable assumption that recurrence will also occur at Partington leading to a need to shut down the plant to ensure safety.

The inclusion of Avonmouth in the forward capex plan reflects anticipation that similar failure is expected to occur at some time in the next 5 to 10 years, based upon historic plant operations. It is not possible to determine the exact timing of onset of failure, however, as a responsible operator of Top Tier COMAH facilities, it would be National Grid's intent to initiate replacement at Avonmouth prior to the onset of failure.

TPA Capex Assessment

TPA has reviewed the forecast capex for all 4 facilities and accepts that significant capex is required at Partington and Avonmouth if these facilities are to have a further operating life of 10 years or more. The following table sets out TPA's view of investment required for 4 and 10 year lives. Under the 4 year case, investment would only be made for safety reasons, with a contingency provided each year for this.

	Additional capex proposed by NGT in 2006/7 – 2010/11 period		TPA capex estimates £M	
	Capex £M	Date majority of capex incurred/forecast	4 Year plant life	10 year plant life
Glenmavis *	12.2	06/07	5.9	12.2
Dynevor	4.3		1.6	4.3
Partington	38.8	Majority on 07/08 and 08/09	5.8	38.8
Avonmouth	27.8	Majority in 09/10 and 10/11	5.3	27.8

* £14.2M in years 04/05 and 05/06

5.2.3 Health and Safety Impact on Capex

National Grid have not indicated any adverse cost impact as a result of new legislation or the Buncefield incident.

5.3 Aggregate Income and Profitability

5.3.1 Review of Income Assumptions

There are two key areas of income assumption that relate to all sites - the future requirement for the service and the price at which the service can be sold. The future requirement is sub-divided into two main categories – OM services and Shipper services.

OM Services

As described in Section 4 above, the overall service requirement will be heavily dependant on the forecasts provided by NGG of future OM requirements. It has been clearly demonstrated by NGG that they are very uncertain regarding the forecast requirements beyond the current year as the methodology relies heavily on reliable current data on supply availability, demand forecasts, reliability data etc. Therefore they were only able to provide forecasts that were heavily caveated and we considered were quite conservative because of the nature of the modelling methodology. The main area of impact on the individual sites is the future locational requirement.

Shipper Services

The total demand from shippers for LNG services will be dependant on the forecasts made by shippers of the likely supply availability to meet their demand portfolio and also the availability of future competing services. The impending supply surplus will have a substantial impact on the demand for LNG peak shaving services. The worst case scenario would be for no service requirement, but there would still be some shippers that could take a very conservative view and buy some capacity by bidding at the reserve price, if only to get some comfort from the insurance value of this gas in store.

Other Services

The requirement for other services is currently limited to the tanker loading at Glenmavis and/or Dynevor. NG LNG have stated that they are not pursuing any other commercial services for the LNG facilities and are concentrating on developing the current business through regulatory discussion and development of the Operating Margins market.

Service Prices

National Grid LNG are concerned that they have been constrained in their ability to make a reasonable level of income from OM services because of the fact that prices for this service are regulated at C3 prices. There is clearly a tension between the industry need to control the cost of what is deemed to be an essential service requirement with no other significant competing options at present (OM services, particularly the locational requirement) and the desire of NG LNG to achieve a market price for all services provided.

The issue that TPA believes is crucial to this debate is that in the medium term there is very likely to be very limited demand by shippers for LNG services. This will create a significant surplus of LNG capacity which will be exacerbated by the new LNG importation facilities coming on stream. So even if the C3 price regulation was removed the price that could be realised from selling all LNG services in the open market will be affected by the limited demand.

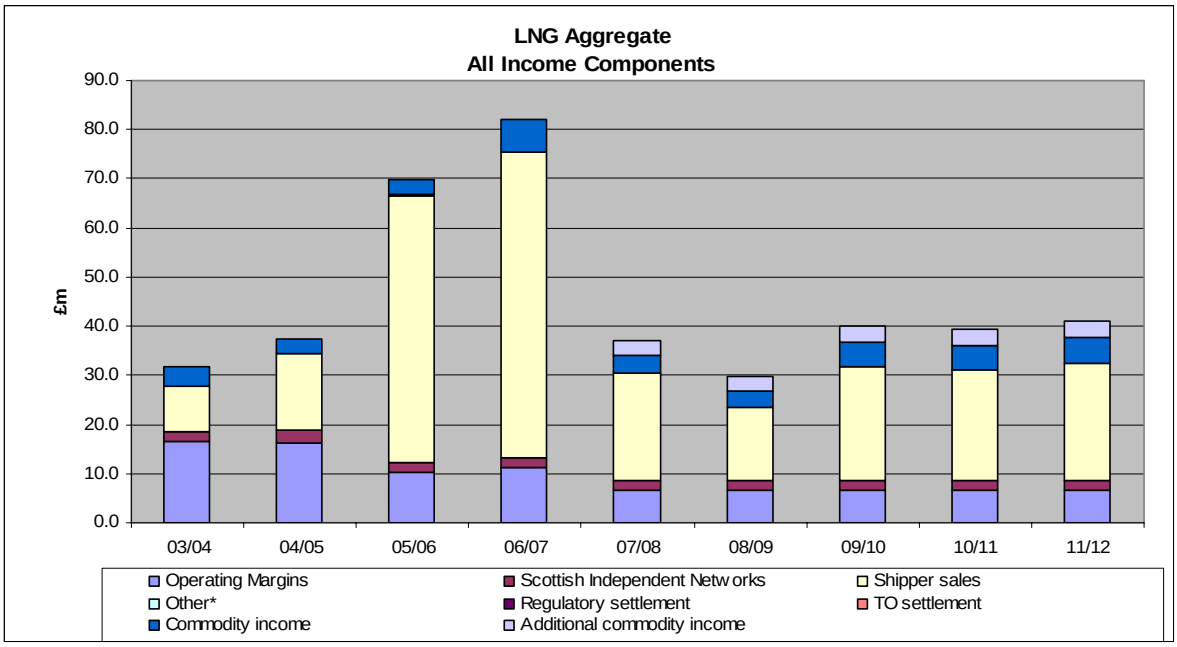
5.3.2 Sales Forecasts and Income Drivers

National Grid have provided the following information about their income, historic and forecast. These illustrate dependence on capacity income, commodity income being a relatively small proportion

Forecast Sales/Income

	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Operating Margins	16.6	16.3	10.3	11.3	6.7	6.7	6.7	6.7	6.7
SIU's	1.9	2.5	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Shipper sales	9.4	15.7	54.5	62.4	22.1	15.0	23.2	22.6	23.9
Other*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regulatory settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity income	**27.9**	**34.6**	**66.7**	**75.5**	**30.6**	**23.6**	**31.7**	**31.1**	**32.4**
Commodity income	**4.0**	**2.8**	**3.3**	**6.7**	**3.4**	**3.2**	**5.1**	**5.1**	**5.4**
Total income	**31.8**	**37.3**	**70.0**	**82.1**	**34.0**	**26.8**	**36.8**	**36.2**	**37.8**
Additional commodity income	0.0	0.0	0.0	0.0	3.1	3.1	3.1	3.1	3.1

Source: National Grid LNG ** This line relates to income from road tanker slots, but because of rounding the £50k income does not show*



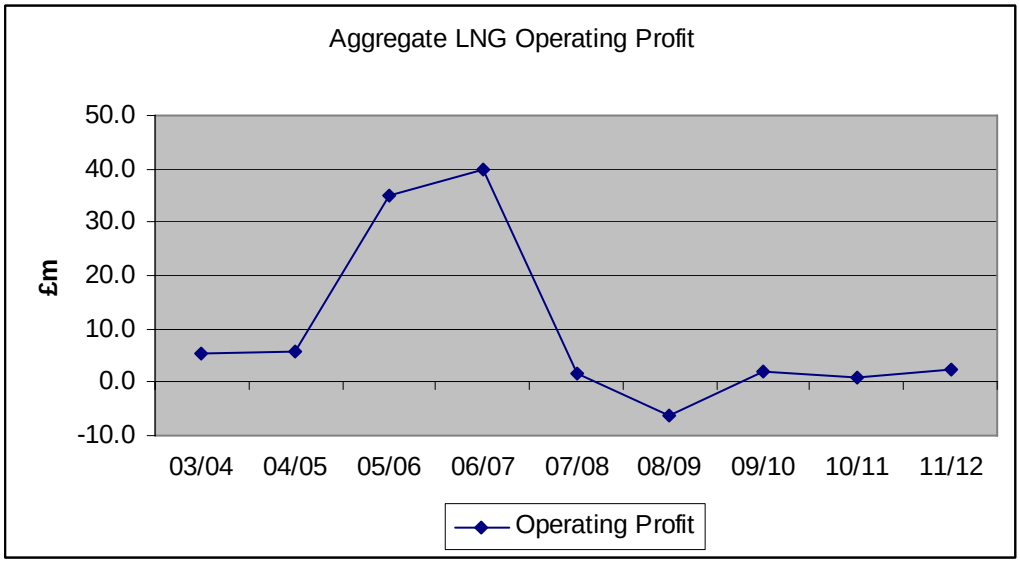
Source: National Grid LNG

The basis for the OM income is a relatively conservative forecast of OM requirements, shown below, which could possibly understate income from some of the facilities for OM services.

	Avonmouth	Dynevor	Glenmavis	Partington	Notes
2006/07	350	160	135	266	Actual Booking
2007/08	180	90	94	166	October 20005 Forecast
2008/09	180	90	94	166	October 20005 Forecast
2009/10	180	90	94	166	October 20005 Forecast
2010/11	180	90	94	166	October 20005 Forecast
2011/12	180	90	94	166	October 20005 Forecast

5.3.2 Aggregate Profitability of the LNG Business

The following chart illustrates the actual/forecast profile of operating profit for National Grid LNG.



Source: National Grid LNG

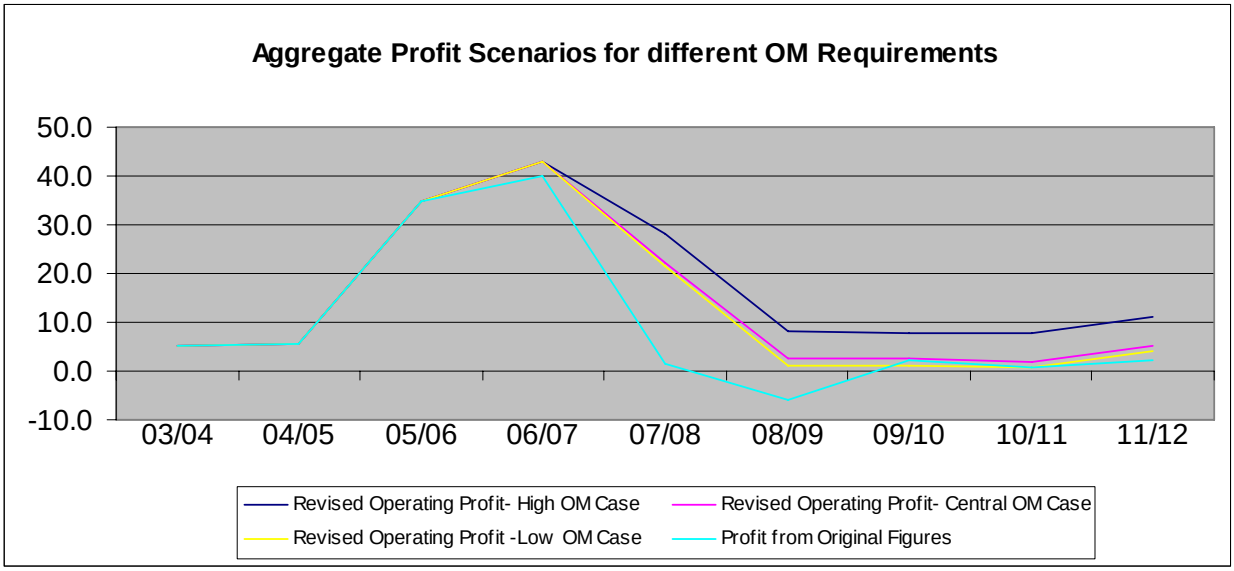
Commentary

Current Peak in Shipper sales, tight demand supply situation

The last three years of the period (2009-2012) still show LNG making a profit, although lower than currently being experienced In the years 2004/5 – 2007/8.

TPA believes that Shipper Sales in 07/08 (orange cell above) will be significantly higher given the timing for Ormen Lange and Milford Haven (Oct 07) compared to when shippers need to make bookings for LNG (April 07). TPA estimates that shipper sales will be around £42M in 07/08 based on a mid point between the bookings for 2006/7 and the long term trend assumed by NG LNG. We also do not agree that 08/09 should be less than 09/10 and future years and have therefore made the estimate of shipper sales equal to £23m on 08/09.

The impact of this change under the three TPA scenarios compared to the original profit forecast by NG LNG can be seen in the graph below.



Profits at the end of the period still rely on increased shipper sales relative to the previous two years. This may not be possible in practice due to other developments such as the new storage facilities being developed.

National Grid LNG is prevented by National Grid's Licence from generating electricity at its LNG facilities (using standby plant). This used to be done prior to merger between National Grid and Lattice Group and would be a useful additional source of income in 06/07 and 07/08. National Grid LNG should consider asking Ofgem for permission to generate electricity at these facilities

5.4 Decommissioning Costs

These are forecast to be very high for Partington as it was a former gas reforming site and is within and urban area. National Grid has estimated the following costs would be incurred to dispose of each site (excluding any costs related to the sale of the land other than making it fit for sale). These figures are from a study carried out in 2002 and are based on returning the sites to either a brownfield site for light industrial use or parkland.

£m	Avonmouth	Dynevor	Glenmavis	Partington	Total
Closure, decommissioning & remediation costs	25 - 40	15 – 25	20 – 30	50	110 - 145

Source: National Grid

TPA has not been given any details of these figures which appear to be high for a return to brownfield site. The cost of decommissioning Bathgate compressor station back to Greenfield is £2M. TPA would have expected figures around £5 – 10 M per site based on Bathgate, though the key factor is whether a brownfield/industrial use is available for the sites.

5.5 Introduction to Site-by-Site analysis

The following sections provide a site-by-site analysis, presenting the cost and income data which National Grid have provided in response to TPA's questions, along with TPA estimates of the fixed/variable split and hence the running costs of each site.

Ofgem also asked TPA to examine two capex scenarios for each site, a four and a ten year scenario.

In the four year scenario in which the intention would be to close the sites after a four year period. In this scenario, effectively no capex would be spent, other than a limited minimum amount to ensure safety was maintained.

In the alternative 10 year scenario, the intention would be to keep the sites functional for 10 years (or more) TPA's view is that the capex plans provided by National Grid effectively form the basis for this scenario, being an appropriate level of investment to keep them open for a longer period.

6. Glenmavis

6.1 Physical Characteristics

	Injectability *(GWh/d)*	Space *(GWh)*	Deliverability *(GWh/d)*	Duration *(days)*	Million Therms	No of tanks	Liquefaction plants
Glenmavis	4.6	505.5	101.1	5	17.2477	2	1
Total (4 LNG facilities)	**11.9**	**2,807.60**	**526.3**		**95.7953**	10	

The injectability shown above relates to the new liquefaction plant installed in 2005-6 at a cost of £15M

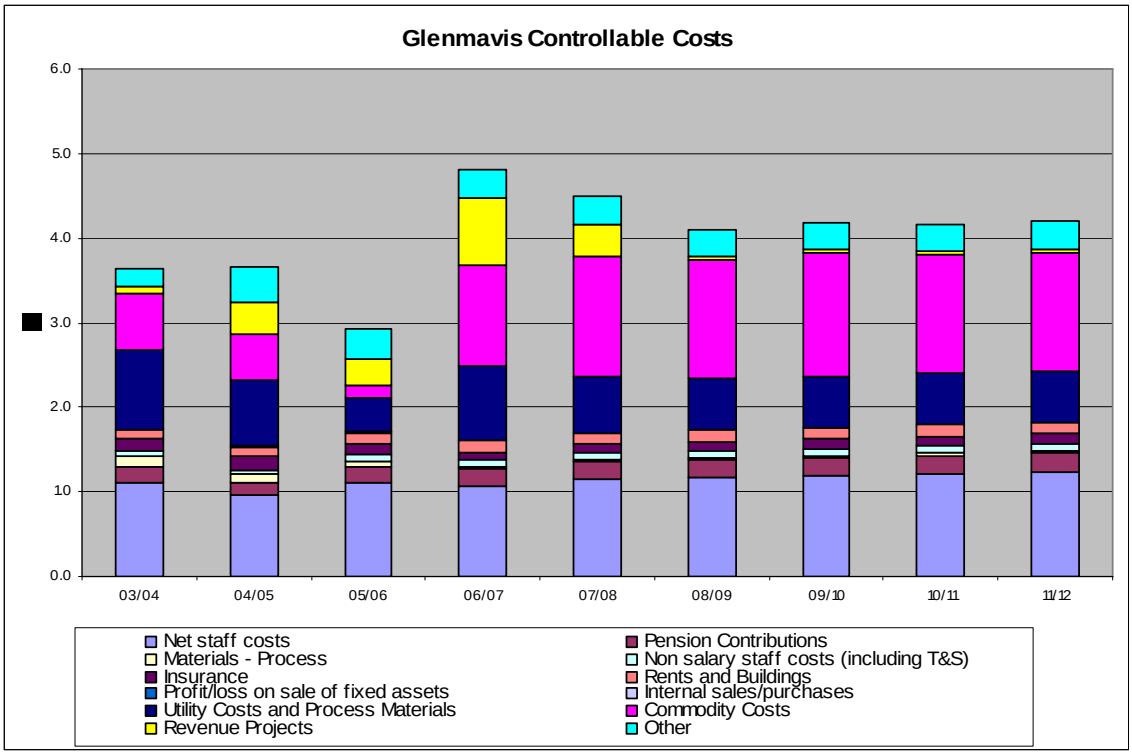
6.2 Opex

Glenmavis Historic and Forecast Opex

	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Controllable Costs									
Net staff costs	1.1	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.2
Pension Contributions	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Materials - Process	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non salary staff costs (including T&S)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Insurance	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rents and Buildings	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Profit/loss on sale of fixed assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Internal sales/purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Utility Costs and Process Materials	0.9	0.8	0.4	0.9	0.7	0.6	0.6	0.6	0.6
Commodity Costs	0.7	0.6	0.2	1.2	1.4	1.4	1.5	1.4	1.4
Revenue Projects	0.1	0.4	0.3	0.8	0.4	0.0	0.0	0.0	0.0
Other	0.2	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3
	3.6	**3.7**	**2.9**	**4.8**	**4.5**	**4.1**	**4.2**	**4.2**	**4.2**
Non controllable									
Depreciation	0.4	1.1	0.8	1.7	1.9	1.9	1.7	1.5	1.5
Rates	0.0	0.1	0.4	0.4	0.4	0.4	0.4	0.4	0.4
	0.4	**1.2**	**1.2**	**2.1**	**2.2**	**2.2**	**2.1**	**1.9**	**1.9**
Total costs	**4.1**	**4.9**	**4.1**	**6.9**	**6.7**	**6.3**	**6.3**	**6.1**	**6.1**

Source: National Grid

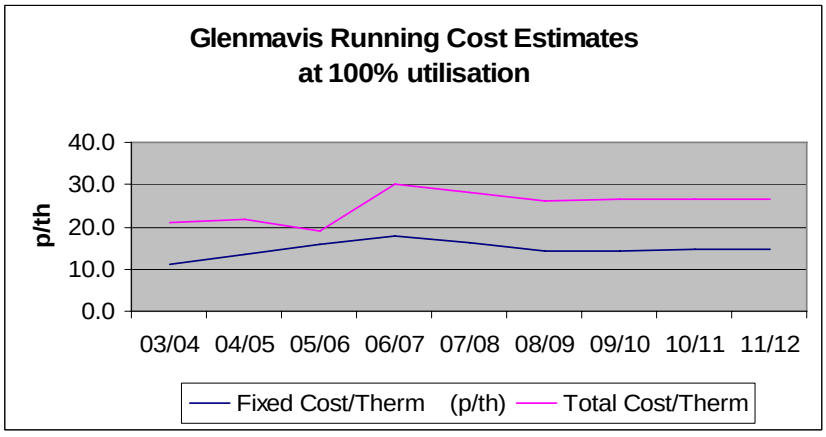
The only significant change in forecast opex is the increase in commodity costs and the cessation of revenue projects. The cost profile is effectively steady at just slightly higher than current levels, as illustrated below.



Source: National Grid Data

Fixed/Variable Split	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Fixed Costs	1.9	2.3	2.7	3.1	2.8	2.5	2.5	2.5	2.6
Variable Costs	1.7	1.4	0.6	2.1	2.1	2.0	2.1	2.0	2.0
Depreciation	0.4	1.1	0.8	1.7	1.9	1.9	1.7	1.5	1.5
Total Costs	3.7	3.7	3.3	5.2	4.9	4.5	4.6	4.6	4.6

Source: TPA Analysis of National Grid Data



Source: TPA Analysis of National Grid Data

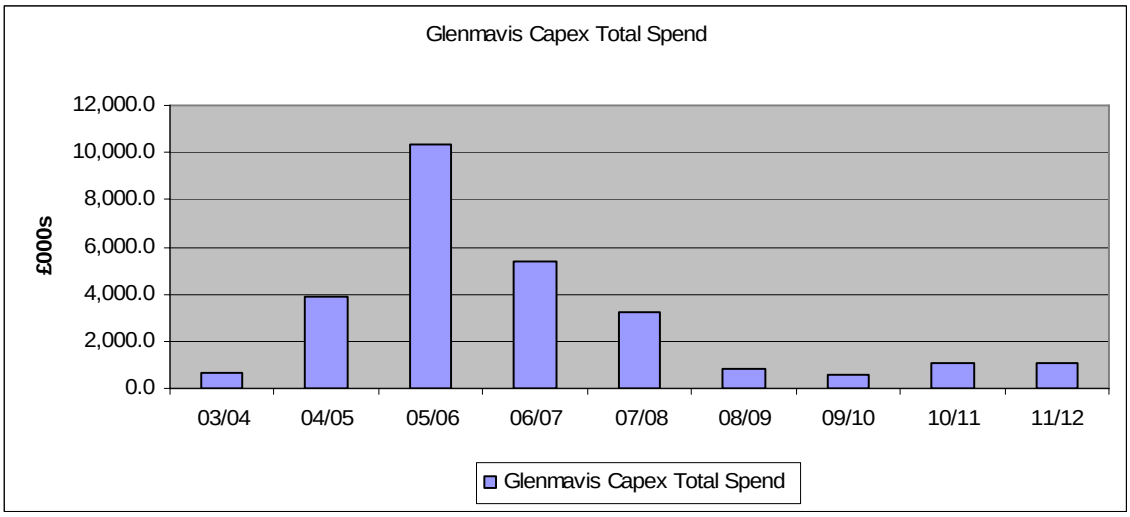
Similarly, running cost forecasts are steady.

6.3 Capex

6.3.1 Capex 10 Year Case

Glenmavis Capex 10 year case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	695.9	3,898.0	10,318.1	5,399.4	3,206.5	867.4	599.4	1,062.3	1,038.0

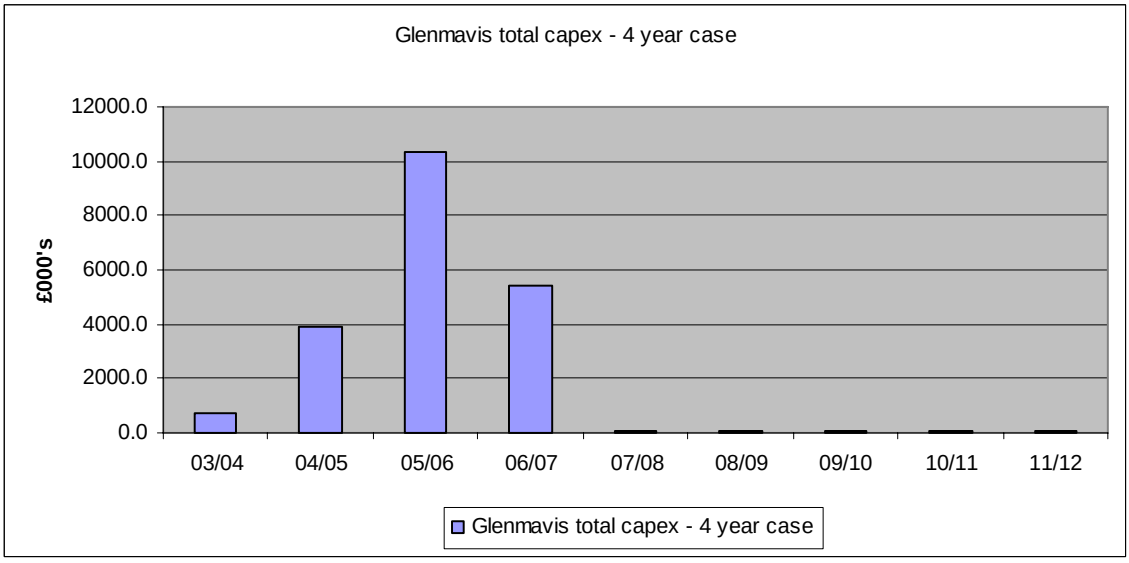


Source: TPA Assessment of National Grid Plans

6.3.2 Capex 4 Year Case

Glenmavis Capex 4 year case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	695.9	3898.0	10318.1	5399.4	100.0	100.0	100.0	100.0	100.0



Source: TPA Assessment of National Grid Plans

6.4 Income

6.4.1 Shipper peak shaving and balancing services

	Glenmavis	
Space sold (kWh)	231,500,000	46% of space
Total Space Available (kWh)	505,500,000	
Deliverability sold (kWh/d)	101,100,000	100% of deliverability
Total Deliverability Available (kWh)	101,100,000	

Source: National Grid LNG

6.4.2 Operating margins

	Glenmavis	
Space sold (kWh)	135,000,000	27% of space
Total Space Available (kWh)	505,500,000	
Deliverability sold (kWh/d)	0	0% of deliverability
Total Deliverability Available (kWh)	101,100,000	

6.4.3 Constrained LNG

Glenmavis has no role in providing transmission support as there is no transmission credit applied to this facility in the latest National Grid Transmission Charging Statement (effective from the 1st April 2006). This site has never been designated a constrained LNG facility and therefore can never be considered as being a provider of transmission capacity. Therefore the current cost to National Grid of replacing the facility (in capacity terms) would be related to the provision of an alternative source of LNG for the SIUs from either other sites or other potential suppliers outside the UK.

6.4.4 Scottish Independent Undertakings

National Grid uses the tanker facility at the Glenmavis site to transport gas to four remote towns in Scotland known as the Scottish Independent Undertakings (SIU). They total around 91 km of pipes, which are owned and operated by Scotia Gas Networks Ltd and supply around 6,500 consumers with regasified Liquefied Natural Gas (LNG), transported by road tankers from National Grid's LNG Storage facility at Glenmavis to entry points at Campbeltown, Thurso, Oban, and Wick.

Scotia Gas (National Grid's former Scottish Distribution Network) is the transporter - they pay for the tankering of the gas. Scotia Gas receive income from all consumers to pay for the cross subsidy.

An LNG road tanker loading installation was built in 2005 to allow LNG to be made at Dynevor Arms and shipped by road to Glenmavis. This was justified on the basis of being able to allow higher shipper sales of LNG which would not have been possible due to the building of the new Glenmavis liquefaction plant in 2005 and 2006.

Tanker loading facilities are being built in 2006 at Partington and Avonmouth which means that LNG can be made at any of the sites and transported to the others, providing flexibility in the event of major liquefaction plant failure. The primary justification for tanker loading facilities at Avonmouth and Partington is believed to be to provide back-up in the event of major cold box failure rather than to supply the SIUs.

In the medium term, LNG tanker loading could be installed at Milford Haven or Isle of Grain, but National Grid have stated that they believe that the transport costs would be higher and raised a number of other issues that would require addressing before these sites could be considered. These include:-

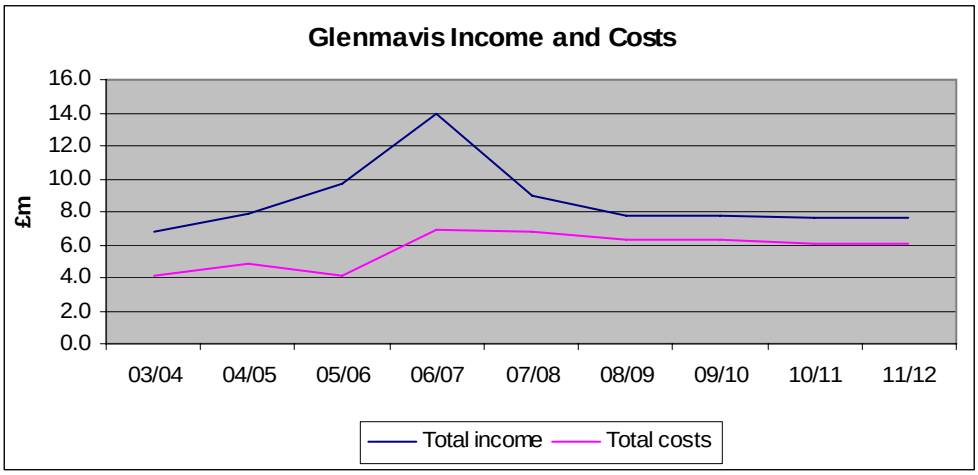
- Willingness of operators to provide the service and the cost
- Gas quality – some cargoes may be outside the GS(M)R and require nitrogen ballasting at the SIU's
- Gas purchase costs currently treated as part of linepack but would have to paid for directly by Scotia Networks

6.4.5 Overall Income Position for Glenmavis

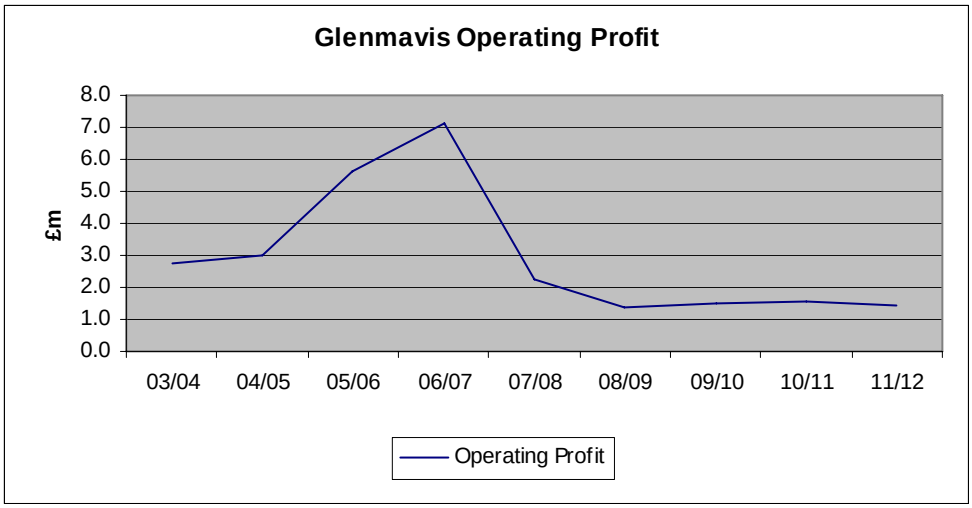
National Grid's Historic and Forecast Income

Income	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Operating Margins	3.3	3.2	2.0	1.8	1.3	1.3	1.3	1.3	1.3
Scottish Independent Networks	1.9	2.5	1.9	1.8	1.8	1.8	1.8	1.8	1.8
Shipper sales	0.7	1.1	5.1	9.5	4.2	3.0	3.0	2.9	2.9
Other*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regulatory settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity income	**5.9**	**6.9**	**9.0**	**13.1**	**7.3**	**6.0**	**6.0**	**6.0**	**5.9**
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Commodity income	**0.9**	**1.0**	**0.8**	**0.9**	**1.7**	**1.7**	**1.7**	**1.7**	**1.7**
	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total income	**6.8**	**7.9**	**9.7**	**14.0**	**9.0**	**7.7**	**7.7**	**7.7**	**7.6**
Additional commodity income	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: National Grid



Source: National Grid Data



Source: National Grid Data

6.5 TPA View

6.5.1 Future Requirements

The Glenmavis facility has already had recent investment (£15m) with future plans to spend up to £10m most of which will be in the next two years. The site also has a continuing need to provide LNG for transportation by road tanker to the SIUs
TPA accepts that prior to installation of LNG tanker loading at an LNG importation terminal, Glenmavis is the most efficient option. However, National Grid Gas/Scotia Gas should investigate the economics of installing road tanker loading at Isle of Grain, South Hook or Milford Haven. TPA believes this could be feasible by October 2008 at one of these sites if an approach was made in 2006.

There is still only limited forecast future operating profit (approx. £1.5 m per annum) income. There may be some potential to improve this situation as a result of higher efficiency from the new liquefaction plant. There are, however, three factors which TPA believe will provide significant uncertainty with regard to future income:

- The level of income from future shipper sales. National Grid LNG are currently anticipating an income of £3m per annum for this element which constitutes 50% of capacity income. It is difficult to anticipate that this level of income will be attainable, particularly given the substantial peak surplus being forecast by National Grid. In addition, although market prices for peak gas in this situation are very difficult to predict, it is almost certain that the bid prices would be expected to be much lower with there being a large peak surplus.
- Shipper sales include sales into road tankers for LNG vehicles. These sales may be lost to Avonmouth due to the fact that LNG vehicle demand in Midlands/South of UK is rising. In addition, if an LNG tanker loading facility was installed at an LNG importation terminal, then sales could be lost due to the fundamentally lower cost option of buying LNG prior to regasification. Given the fact that the current treatment of SIU's doesn't require Scotia Networks to purchase LNG any option that involves purchase will be disadvantaged.
- The OM income is subject to significant uncertainty as described in section 4.

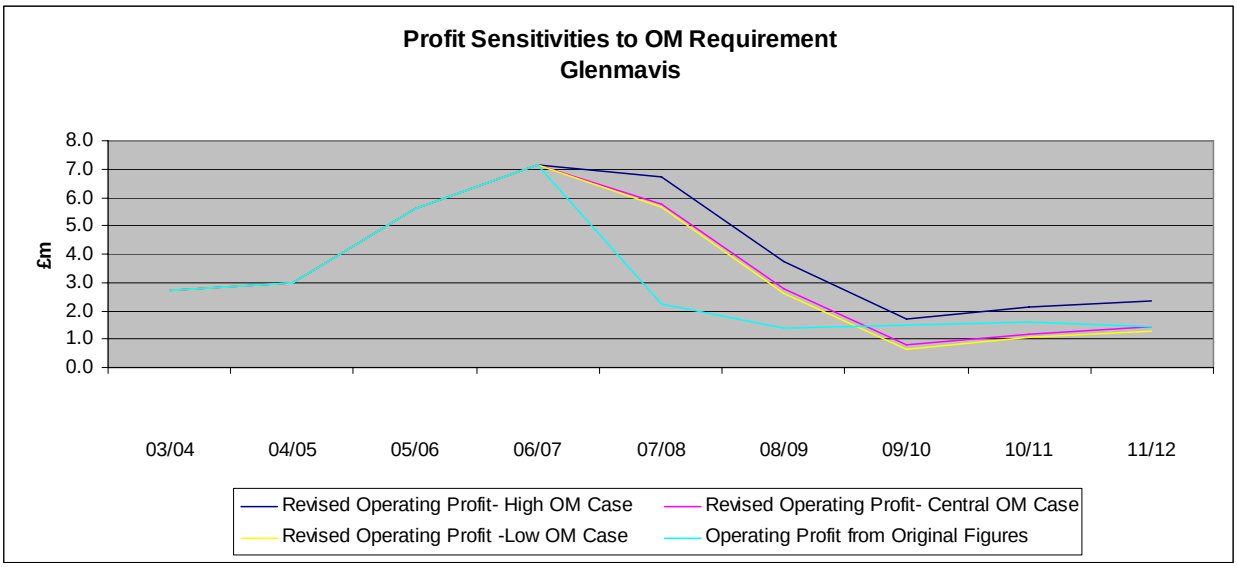
6.5.2 Range Analysis

The extremes of the income range will be driven by two separate factors. With regard to the lower figure the assumption is that minimal income will be achieved from shipper sales. With regard to the upper limit, it may be assumed that OM sales will be at market prices.

An alternative is to close the site completely and transfer all the remaining requirements to another site, say Avonmouth, which currently has an essential capacity requirement and could be easily converted to provide tanker filling for the SIUs. Closure will incur clean up costs dependant on the planned future usage of the site.

Assessment of the OM requirements indicates that there does remain a small locational requirement. TPA however believe that it will be possible to reduce and even eliminate this requirement over time as there is substantial pipeline infrastructure in Scotland that will become under-utilised as St.Fergus supplies decline and the level of compressor running will be significantly reduced also as a consequence of this decline.

The TPA assessment of income from this site is as shown below under the three different scenarios and compared to the previous estimate by NG LNG. These graphs include an assessment of additional income from shipper services that TPA believes will occur. This has been allocated on a pro-rata basis according to the current split shown by NG LNG for the particular year. If based on the split for 2006/7 the results would be very different. However profits are overstated as aggregate site costs are less than total costs for LNG business.



7. Avonmouth

7.1 Physical Characteristics

	Injectability *(GWh/d)*	Space *(GWh)*	Deliverability *(GWh/d)*	Duration *(days)*	Million Therms	No of tanks	Liquefaction plants
Avonmouth	2.3	876.1	156.2	5.6	29.8925	3	1
Total (4 LNG facilities)	**11.9**	**2,807.60**	**526.3**		**95.7953**	10	

National Grid has proposed that the liquefaction plant should be replaced in 2009/10 and 2010/11

7.2 Opex

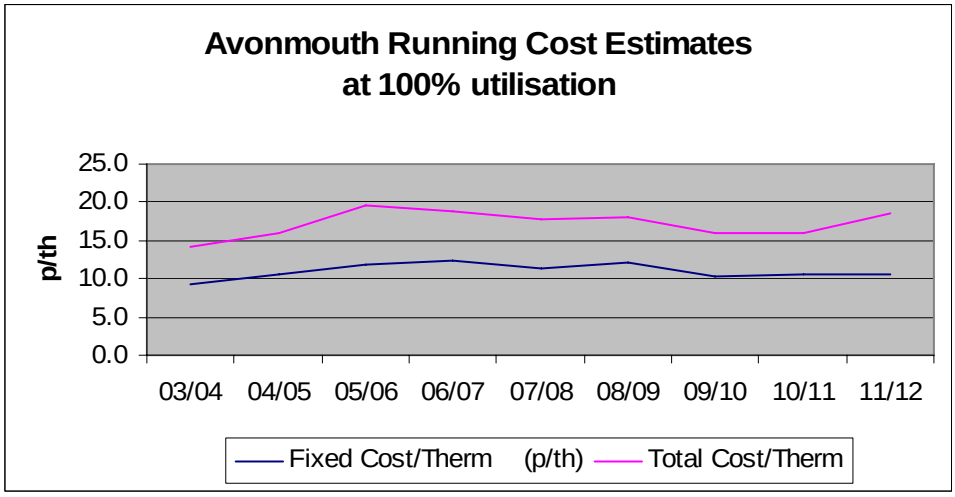
Avonmouth Opex

Controllable Costs	**03/04**	**04/05**	**05/06**	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**
Net staff costs	1.0	0.9	1.1	1.2	1.2	1.2	1.2	1.2	1.3
Pension Contributions	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Materials - Process	0.2	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Non salary staff costs *	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Insurance	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2
Rents and Buildings	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Profit/loss on sale of fixed assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Internal sales/purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Utility Costs and Process Materials	0.9	0.7	1.0	0.9	0.9	0.9	0.9	0.9	0.8
Commodity Costs	0.4	0.7	1.1	1.0	0.9	0.8	0.7	0.7	1.5
Revenue Projects	0.1	0.3	0.8	0.7	0.4	0.6	0.0	0.0	0.0
Other	0.3	0.6	0.4	0.5	0.5	0.5	0.5	0.5	0.5
	3.5	**4.0**	**5.2**	**5.0**	**4.6**	**4.7**	**4.1**	**4.1**	**4.9**
Non controllable									
Depreciation	0.9	1.0	2.2	1.5	1.7	1.7	1.6	1.9	2.3
Rates	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6
	1.6	**1.7**	**2.8**	**2.1**	**2.3**	**2.3**	**2.2**	**2.5**	**2.9**
Total costs	**5.2**	**5.7**	**8.0**	**7.1**	**7.0**	**7.0**	**6.4**	**6.6**	**7.8**

Source: National Grid ****including T&S costs***

Fixed/Variable Split	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Fixed Costs	2.7	3.2	3.5	3.7	3.4	3.6	3.1	3.2	3.2
Variable Costs	1.5	1.6	2.3	2.0	1.9	1.7	1.6	1.6	2.3
Depreciation	0.9	1.0	2.2	1.5	1.7	1.7	1.6	1.9	2.3
Total Costs	4.3	4.8	5.9	5.7	5.3	5.4	4.8	4.7	5.5

Source: TPA Analysis of National Grid Data



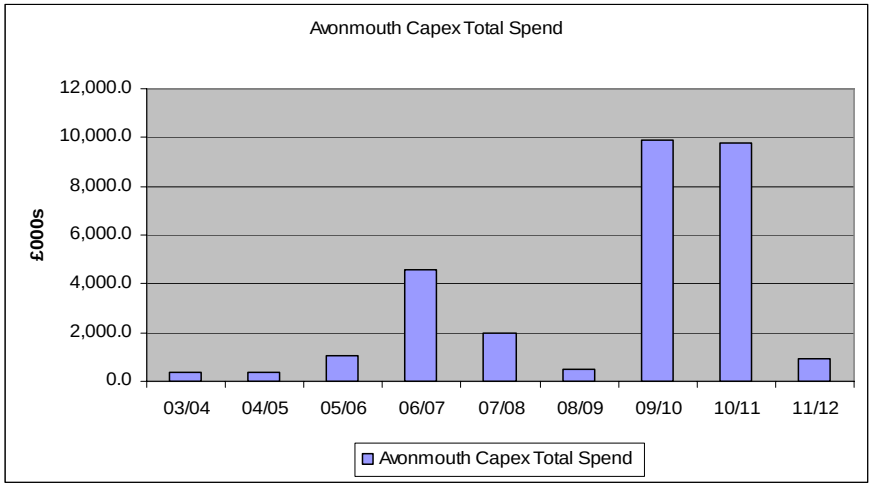
Source: TPA Analysis of National Grid Data

7.3 Capex

7.3.1 Capex – 10 Year case

Avonmouth Capex 10 year Case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	376.3	365.6	1,021.7	4,604.4	2,003.1	492.4	9,917.0	9,794.5	951.6

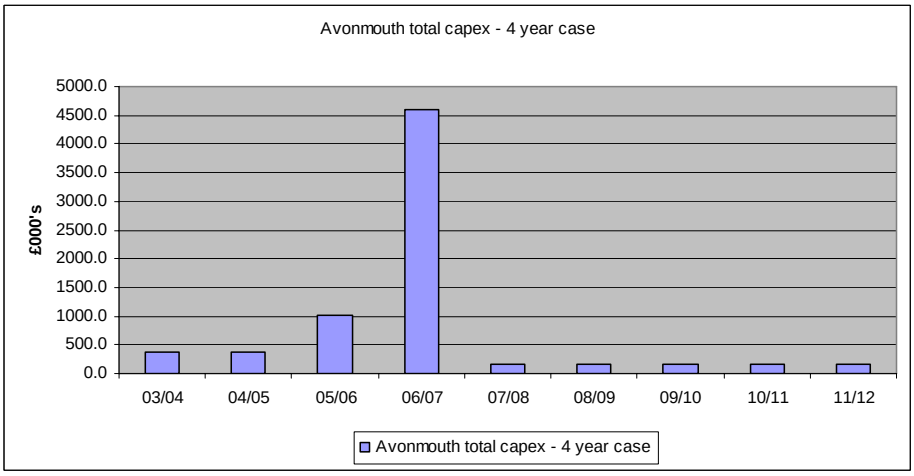


Source: TPA Assessment of National Grid Plans

7.3.2 Capex – 4 Year Case

Avonmouth Capex 10 year Case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	376.3	365.6	1021.7	4604.4	150.0	150.0	150.0	150.0	150.0



Source: TPA Assessment of National Grid Plans

7.4 Income

7.4.1 Shipper peak shaving and balancing services

	Avonmouth	
Space sold (kWh)	462,965,000	52% of space
Total Space Available (kWh)	876,100,000	
Deliverability sold (kWh/d)	144,943,016	92.8% of deliverability
Total Deliverability Available (kWh)	156,200,000	

Source: National Grid LNG

7.4.2 Operating margins

	Avonmouth	
Space sold (kWh)	350,000,000	40% of space
Total Space Available (kWh)	876,100,000	
Deliverability sold (kWh/d)	0	0% of deliverability
Total Deliverability Available (kWh)	156,200,000	

Source: National Grid LNG

7.4.3 Constrained LNG

This site is currently designated as a constrained facility attracting a Constrained LNG credit of 0.0057p per registered kWh per day from 1st May 2006. In our Forecast Capex report we have identified that a combination of a successful exit reform, delayed growth (due to higher than planned gas prices) and removal of the flow margin should lead to deferral of the FBPQ investment needed in the South West to a point where energy efficiency measures by the government take hold and/or Portland gas storage is developed.

Avonmouth would be needed in the short to medium term to support the network to a greater extent than it currently does to allow the deferment (perhaps indefinitely) of current plans until the exit reform and efficiency measures have their impact on demand for capacity in the South West. There would then remain the need to evaluate the cost of retaining Avonmouth

against the cost of reinforcement. National Grid in their response to questions on the role of Avonmouth in deferring investment stated that it does appear attractive financially, but had reservations that sufficient combined volume and deliverability requirements could be provided through the constrained service. TPA believes that the deliverability/volume profile can be achieved; otherwise the current constrained LNG service would not be workable, if the deliverability/volume profile cannot be adjusted to achieve the desired result. A 50% deliverability requirement currently could mean the site being constrained to greater than 50% by volume because of the need to sustain deliverability at the site for anything up to 15 days or more to avoid any reinforcement lower down the load curve. However it has been considered less commercially viable to constrain sites at levels above 50% as it restricts the flexibility to utilise the service because the constrained LNG monitor has a greater impact the higher the constrained level is. This makes the service less attractive to users as it reduces the value to them.

The cost of providing capacity in this area as a substitute for Avonmouth can be inferred from the information that has been provided by National Grid in their FBPQ submission for SW reinforcement and from the presentation on the 7th March 2006. The FBPQ contains £142m of exit capacity investment in the SW area of the NTS. The table below was provided at the presentation.

	CLNG Deliverability (mscmd)
Planned Scenario	2
Without Exit Reinforcement	7
Without Exit Reinforcement or Demand Growth	4

Source: National Grid Presentation of FBPQ

To completely replace Avonmouth deliverability of 5mcmd (the difference between planned scenario and without exit reinforcement) would involve an investment of £142m which approximates to £28m per mcmd. This is a very simplistic approach based on the fact that 5 mcmd of Avonmouth deliverability is equivalent to not building the SW reinforcement at a cost of £142m. But the demand growth associated with the planned scenario is approximately 3mcmd from 2006 to 2014. The maximum deliverability at Avonmouth is 14mcmd. A high level study of the options for reinforcement to replace Avonmouth suggest that it could be possible to develop a 900 mm pipeline project north of Pucklechurch and uprate the line to 75 barg to give sufficient capacity at a cost of around £40m.

TPA do not envisage there being any significant difference to the cost of replacing this site with pipeline capacity under the different supply scenarios. In the situation whereby Shippers are booking constrained LNG the costs provided by NG (from their response TP4087) show an average cost under their current incentive regime over the last five years of £2.6m per annum. NG did not provide forecast figures, but it could be assumed that this figure would be an acceptable value to use for a simple NPC calculation. Net present cost of this over a 20 year life would be approximately £26m which is cheaper than the pipeline option.

Other potential commercial solutions that could be utilised to support this level of capacity substitution are:-

- Service from other storage facilities – nothing at present but Portland storage may be developed and could be a possible option – better information believed to be available later in 2006 (see extract from 2006 Jess Report below)

Portland Gas storage	Edon Resources/ Portland Gas Ltd	990 Mcm dependent on test results	Proposed operational by 2010	Being processed by local planning. Test wells due to be completed Q1 2006	..

Source: JESS report 2006

- Demand Side Response

  Langage power station may offer this service – if they had a standby fuel they would be potentially attractive option, especially given that the mild winters since the last 1 in 20 day mean that it is unlikely, in a normal winter, that any interruption by Langage would be required (see extract from 2006 Jess Report)

Langage, South Devon	Wainstones (Carlton Power) Option acquired by Centrica	1,010	CCGT	Black start and back up fuel issues are still under discussion	Approved November 2000;	Preliminary work begun

Source: JESS report 2006

- Similarly with Seabank Phase 1 and Phase 2 power stations.

- Pipeline link to South Wales - unlikely to be a viable option

- Special operating arrangements – there may be circumstances whereby NG could operate the grid below the normal minimum pressure on the NTS and still maintain LDZ minimum pressures – joint NTS/DN solution which removes or reduces the need for Avonmouth – may be feasible, would need to be discussed with the DN
- Reduction/removal of flow margins

7.4.4 Scottish Independent Undertakings

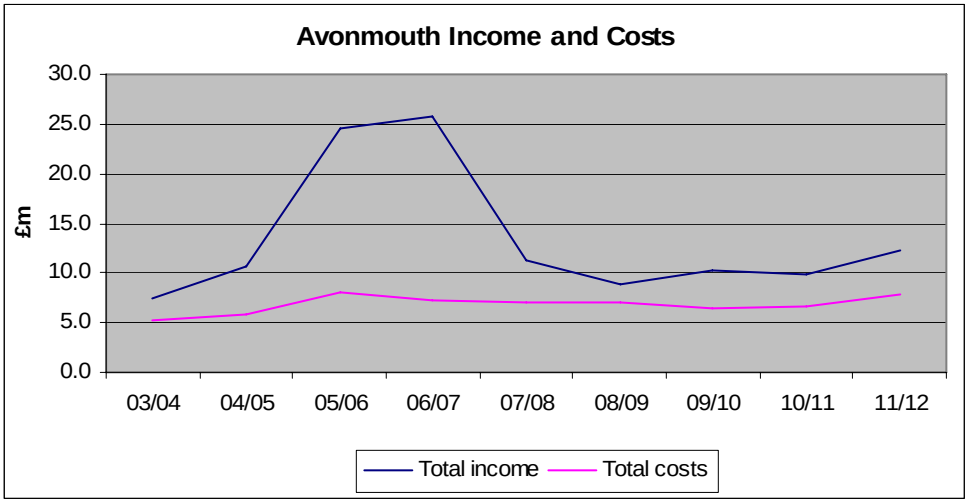
Avonmouth can provide a back-up role to Glenmavis with some investment but has not been used for this purpose.

7.4.5 Overall Income Position for Avonmouth

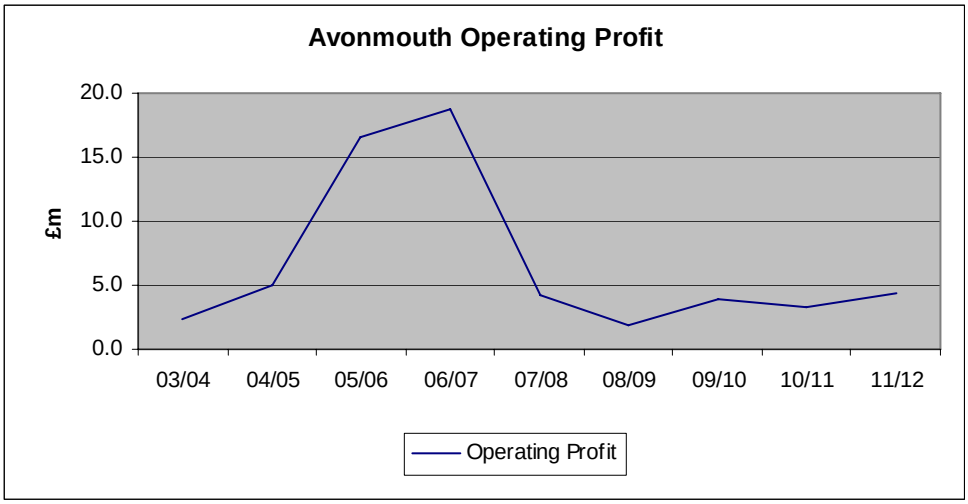
National Grid Historic and Forecast Income

Income	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Operating Margins	3.3	3.3	3.1	3.9	2.1	2.1	2.1	2.1	2.1
Scottish Independent Networks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shipper sales	3.6	6.7	20.6	20.2	8.4	6.2	7.6	7.2	9.0
Other*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regulatory settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity income	**6.9**	**10.0**	**23.6**	**24.1**	**10.5**	**8.2**	**9.6**	**9.3**	**11.0**
Commodity income	**0.6**	**0.7**	**0.9**	**1.8**	**0.7**	**0.7**	**0.6**	**0.6**	**1.2**
Total income	**7.4**	**10.7**	**24.6**	**25.9**	**11.2**	**8.9**	**10.2**	**9.8**	**12.2**

Source: National Grid



Source: National Grid Data



Source: National Grid Data

7.5 TPA View

7.5.1 Future Requirements

As indicated in section 2 Avonmouth does have a current role for providing transmission support. NG LNG are proposing to spend around £25m over the next five years to keep the facility operational.

TPA believes that its transmission support role is valuable in the period 2006 – 2009 and may allow deferment of SW LDZ related growth projects. In time these may not be required at all and other options may develop which reduces the need for Avonmouth (eg Portland gas storage/Langage demand side response)

Unlike Glenmavis there is reasonably healthy forecast future operating profit (averaging £3.5m per annum). Controllable opex is £4.5m per annum.

As with Glenmavis National Grid LNG are anticipating a certain amount of shipper sales and OM requirement going forward and TPA would again state that the level of income will be affected by the justification for an ongoing requirement for OM and the peak supply surplus affecting shipper sales. Shipper sales may be supported as LNG vehicles are supplied from Avonmouth once it has its own loading bay in 2007.

There is an issue in that Avonmouth only has a single liquefaction plant, rated at 200 tonnes/day but has been delivering much less recently (133 t/d in 2004), but NG LNG have stated that Partington is the priority for investment.

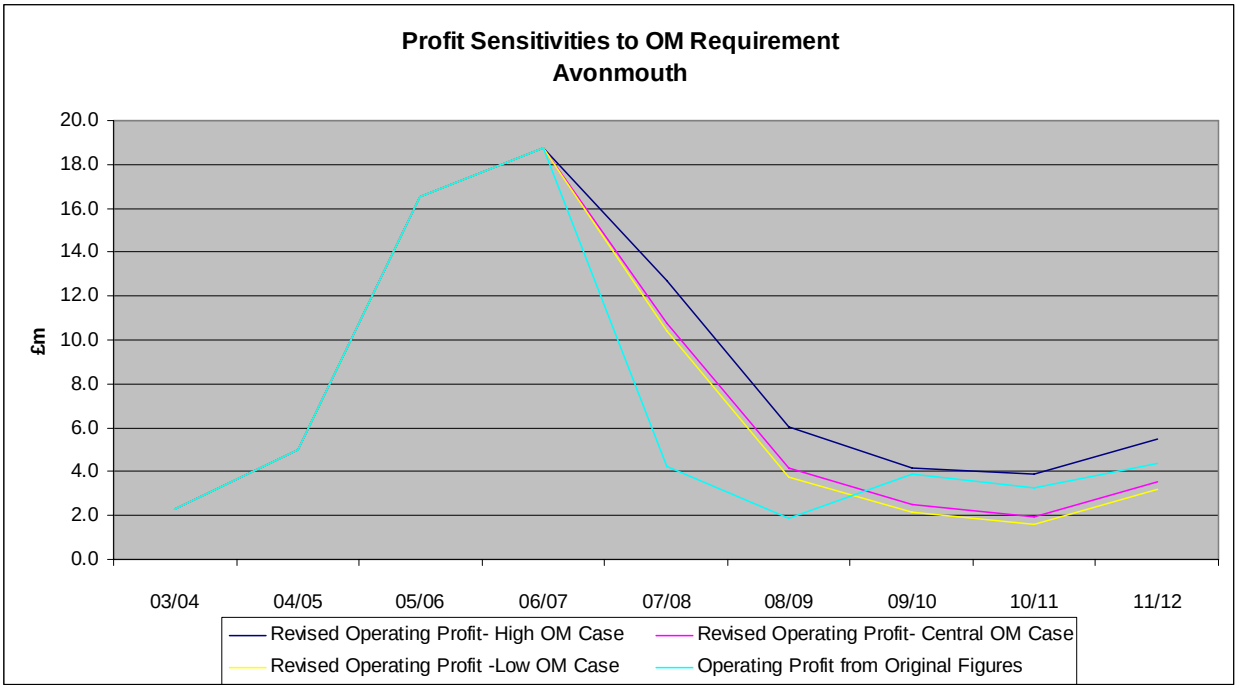
7.5.2 Range Analysis

The extremes of the income range will be driven by two separate factors. With regard to the lower figure the assumption is that minimal income will be achieved from shipper sales. With regard to the upper limit, it may be assumed that OM sales will be at market prices.

An assessment of the OM requirements to see if there remains any locational requirements indicates that this is the case.

If the site was retained as a constrained facility (assuming the economic signals that currently apply are retained) the risk of lower shipper income could be less.

The TPA assessment of income from this site is as shown below under the three different scenarios and compared to the previous estimate by NG LNG. These graphs include an assessment of additional income from shipper services that TPA believes will occur. This has been allocated on a pro-rata basis according to the current split shown by NG LNG for the particular year. If based on the split for 2006/7 the results would be very different. However profits are overstated as aggregate site costs are less than total costs for LNG business.



8. Dynevor Arms

8.1 Physical Characteristics

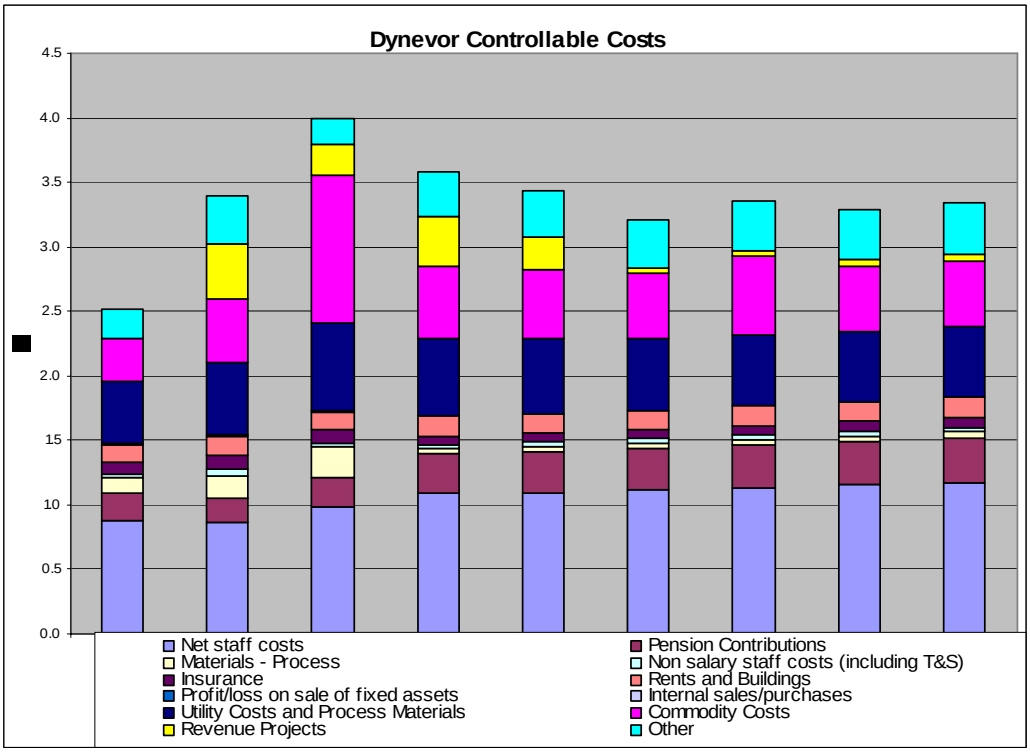
	Injectability *(GWh/d)*	Space *(GWh)*	Deliverability *(GWh/d)*	Duration *(days)*	Million Therms	No of tanks	Liquefaction plants
Dynevor Arms	2.6	304.1	49.2	6.2	10.3759	1	1
Total (4 LNG facilities)	**11.9**	**2,807.60**	**526.3**		**95.7953**	10	

8.2 Opex

Dynevor Arms Opex

Controllable Costs	**03/04**	**04/05**	**05/06**	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**
Net staff costs	0.9	0.9	1.0	1.1	1.1	1.1	1.1	1.2	1.2
Pension Contributions	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Materials - Process	0.1	0.2	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Non salary staff costs (including T&S)	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Insurance	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Rents and Buildings	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Profit/loss on sale of fixed assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Internal sales/purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Utility Costs and Process Materials	0.5	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.5
Commodity Costs	0.3	0.5	1.1	0.6	0.5	0.5	0.6	0.5	0.5
Revenue Projects	0.0	0.4	0.2	0.4	0.3	0.0	0.0	0.0	0.1
Other	0.2	0.4	0.2	0.3	0.4	0.4	0.4	0.4	0.4
	2.5	**3.4**	**4.0**	**3.6**	**3.4**	**3.2**	**3.3**	**3.3**	**3.3**
Non controllable									
Depreciation	0.8	1.0	2.4	1.5	1.5	1.5	1.4	1.3	1.3
Rates	0.2	0.2	0.1	0.2	0.2	0.2	0.2	0.2	0.2
	1.0	**1.2**	**2.5**	**1.7**	**1.7**	**1.7**	**1.6**	**1.5**	**1.5**
Total costs	**3.6**	**4.6**	**6.5**	**5.3**	**5.1**	**4.9**	**4.9**	**4.8**	**4.9**

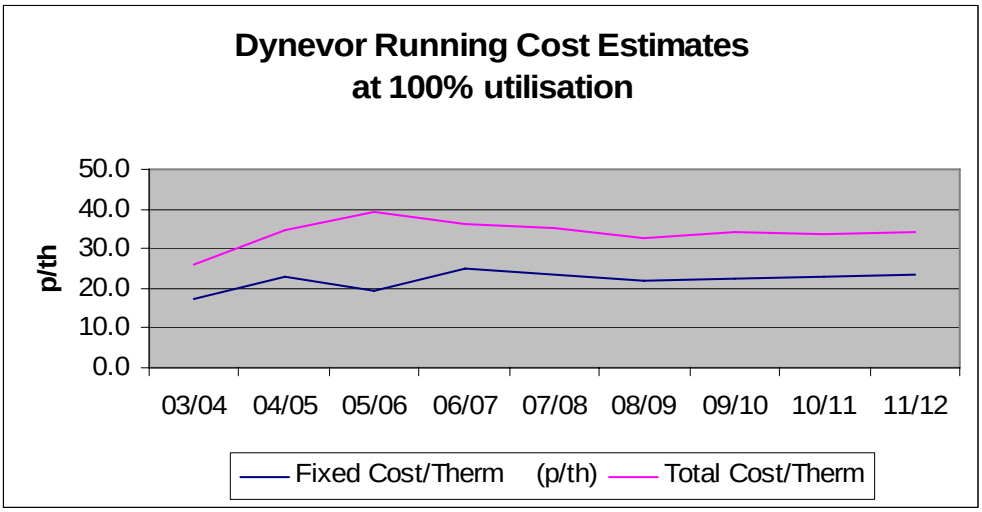
Source: National Grid



Source: National Grid Data

Fixed/Variable Split	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Fixed Costs	1.8	2.4	2.0	2.6	2.5	2.3	2.3	2.4	2.4
Variable Costs	0.9	1.2	2.1	1.2	1.2	1.1	1.2	1.1	1.1
Depreciation	0.8	1.0	2.4	1.5	1.5	1.5	1.4	1.3	1.3
Total Costs	2.7	3.6	4.1	3.8	3.6	3.4	3.5	3.5	3.5

Source: TPA Analysis of National Grid Data



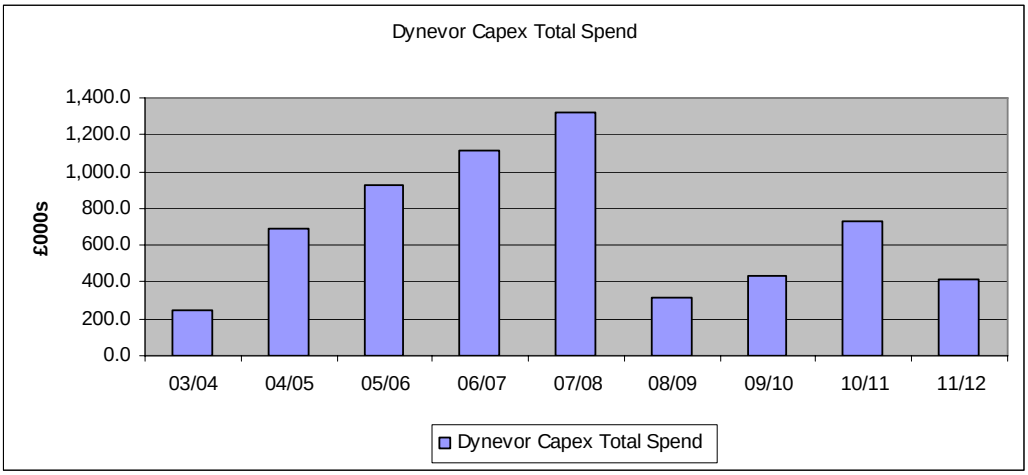
Source: TPA Analysis of National Grid Data
Note: Dynevor has higher running costs than the other sites as it has only one tank. At 50% utilisation, this is highly uneconomic.

8.3 Capex

8.3.1 Capex – 10 Year Case

Dynevor Arms Capex 10 year Case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	248.3	688.1	925.3	1,111.1	1,325.5	316.8	438.6	731.0	414.2

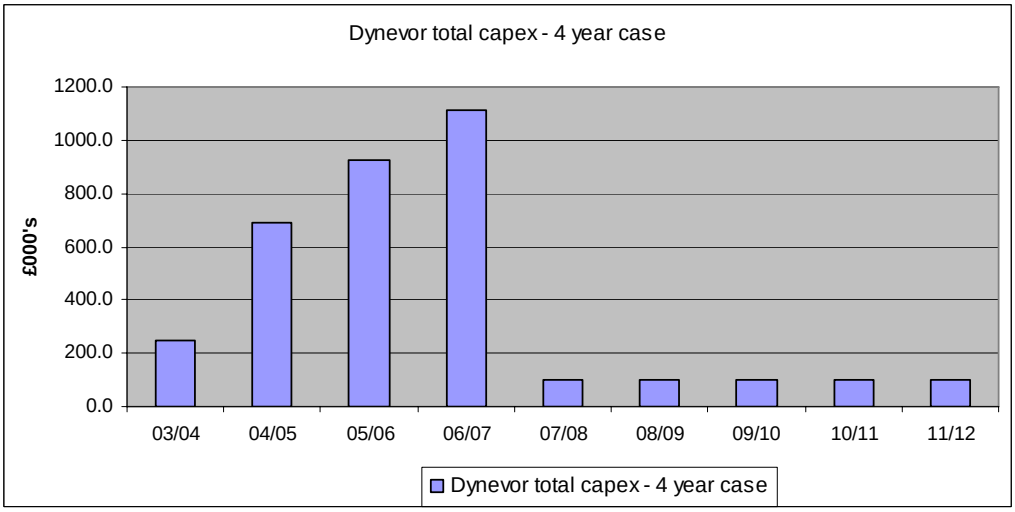


Source: TPA Assessment of National Grid's Plans

8.3.2 Capex – 4 Year Case

Dynevor Arms Capex 4 year Case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	248.3	688.1	925.3	1111.1	100.0	100.0	100.0	100.0	100.0



Source: TPA Assessment of National Grid's Plans

8.4 Income

8.4.1 Shipper peak shaving and balancing services

	Dynevor	
Space sold (kWh)	98,485,000	32% of space
Total Space Available (kWh)	304,100,000	
Deliverability sold (kWh/d)	41,819,448	85% of deliverability
Total Deliverability Available (kWh)	49,200,000	

8.4.2 Operating margins

	Dynevor	
Space sold (kWh)	160,000,000	53% of space
Total Space Available (kWh)	304,100,000	
Deliverability sold (kWh/d)	0	0% of deliverability
Total Deliverability Available (kWh)	49,200,000	

8.4.3 Constrained LNG

This site has no transmission support role.

8.4.4 Scottish Independent Undertakings

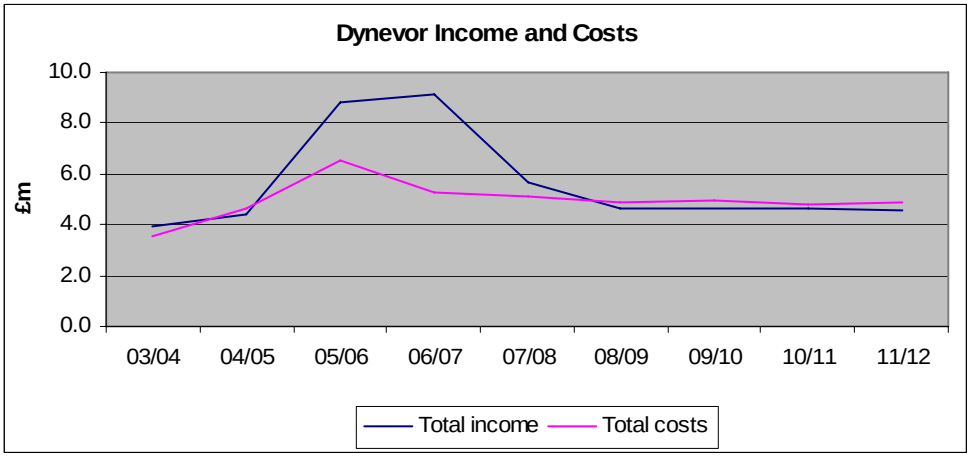
A new LNG tanker loading facility was built in 2005 in order to allow LNG sales to shippers from Glenmavis when the Glenmavis liquefaction plants were rebuilt at a cost of £24M (FBPQ). As a result, Dynevor could provide a back up service to Glenmavis.

8.4.5 Overall Income Position for Dynevor

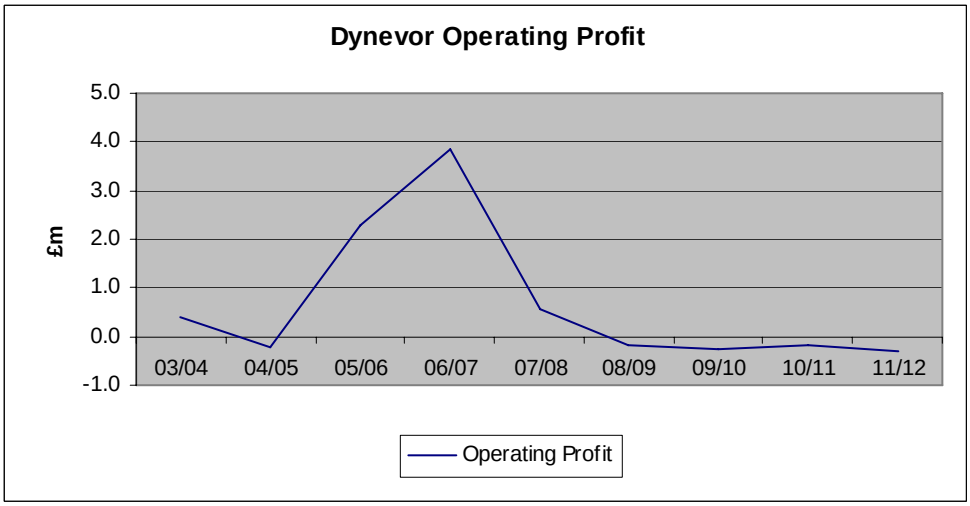
National Grid's Historic and Forecast Income

Income	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Operating Margins	2.8	2.7	3.0	3.5	2.0	2.0	2.0	2.0	2.0
Scottish Independent Networks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shipper sales	0.7	1.4	5.6	5.0	3.3	2.3	2.3	2.3	2.2
Other*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regulatory settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity income	**3.6**	**4.0**	**8.5**	**8.5**	**5.3**	**4.3**	**4.3**	**4.3**	**4.2**
Commodity income	**0.4**	**0.3**	**0.3**	**0.6**	**0.4**	**0.4**	**0.4**	**0.4**	**0.4**
Total income	**4.0**	**4.4**	**8.8**	**9.1**	**5.7**	**4.7**	**4.7**	**4.6**	**4.6**

Source: National Grid



Source: National Grid Data



Source: National Grid Data

8.5 TPA View

8.5.1 Future Requirements

Dynevor has effectively become isolated by the new pipeline arrangements resulting from the reinforcements to serve the new Milford Haven LNG importation facilities. This has left Dynevor in what is effectively a null point on the network and by the nature of the configuration it will have no role either to provide network support or to cover pipebreaks. TPA does not believe it has any value in relation to compressor trips. Furthermore any role it may have in supporting the possible shutdown of both Milford Haven LNG sites or for orderly rundown is significantly reduced by the existence of substantial volume of linepack in the new pipeline from Milford Haven to Turley. TPA therefore assumes that after the successful commissioning of Milford Haven LNG terminals there will no longer be any requirement for locational LNG at Dynevor.

Dynevor is also forecast to be making a loss beyond 2007/8, and this assumes that there will be income from shipper sales of £2m, which as described above is a risky assumption given the supply surplus position.

With controllable opex of around £3m per annum, this site is the most expensive service with a total cost for LNG (assuming 100% utilisation) of between 33p and 40p/therm, whilst all other sites do not exceed 30p/therm and are generally much lower.

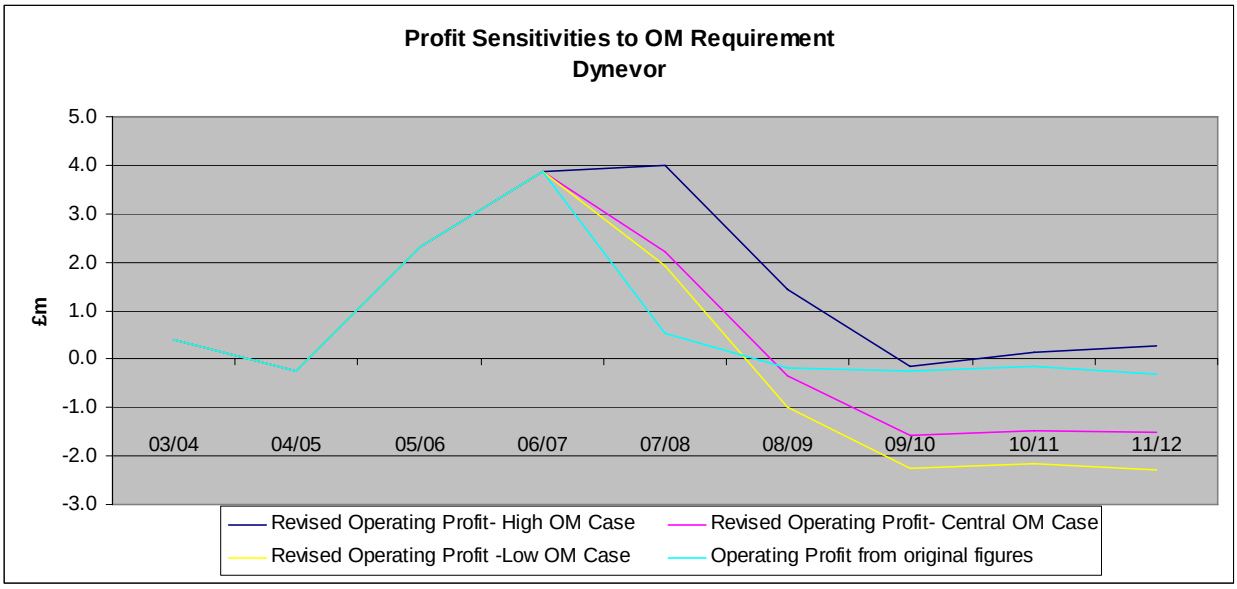
The conclusion has to be that this site has no significant potential for generating any income, let alone any profit. It may be possible to sell it with the land and use for a CCGT.

8.5.2 Range Analysis

There does not appear to be any upside potential for this site, with the low scenario being zero income.

Should the site need to be decommissioned there will be costs associated with site clean up, the extent of which will depend on its proposed usage e.g. industrial/residential. National Grid LNG estimate this to be £15m to £25m based on light industrial use. There is clearly a dilemma here as closing the site down would require a substantial clean up cost, of the order of 10 times the annual losses.

The TPA assessment of income from this site is as shown below under the three different scenarios and compared to the previous estimate by NG LNG. These graphs include an assessment of additional income from shipper services that TPA believes will occur. This has been allocated on a pro-rata basis according to the current split shown by NG LNG for the particular year. If based on the split for 2006/7 the results would be very different. However profits are overstated as aggregate site costs are less than total costs for LNG business.


Profit Sensitivities to OM Requirement
Dynevor
£m
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
-3.0
03/04
04/05
05/06
06/07
07/08
08/09
09/10
10/11
11/12
Revised Operating Profit- High OM Case
Revised Operating Profit- Central OM Case
Revised Operating Profit -Low OM Case
Operating Profit from original figures

9. Partington

9.1 Physical Characteristics

	Injectability *(GWh/d)*	Space *(GWh)*	Deliverability *(GWh/d)*	Duration *(days)*	Million Therms	No of tanks	Liquefaction plants
Partington	2.4	1,121.90	219.8	5.1	38.2792	4	2
Total (4 LNG facilities)	**11.9**	**2,807.60**	**526.3**		**95.7953**	10	

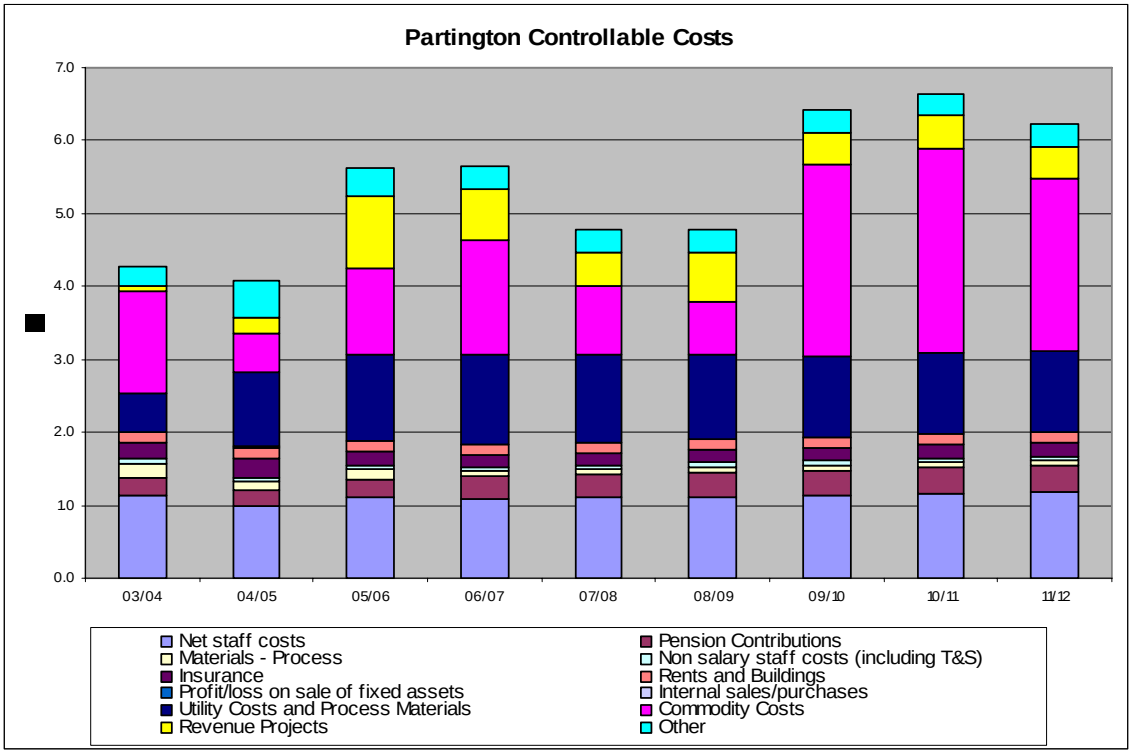
National Grid has proposed that the liquefaction plant should be replaced in 2007/08 and 2008/09

9.2 Opex

Partington Opex

Controllable Costs	**03/04**	**04/05**	**05/06**	**06/07**	**07/08**	**08/09**	**09/10**	**10/11**	**11/12**
Net staff costs	1.1	1.0	1.1	1.1	1.1	1.1	1.1	1.2	1.2
Pension Contributions	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.4
Materials - Process	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Non salary staff costs *	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Insurance	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Rents and Buildings	0.1	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1
Profit/loss on sale of fixed assets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Internal sales/purchases	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Utility Costs and Process Materials	0.5	1.0	1.2	1.2	1.2	1.2	1.1	1.1	1.1
Commodity Costs	1.4	0.5	1.2	1.6	0.9	0.7	2.6	2.8	2.4
Revenue Projects	0.1	0.2	1.0	0.7	0.4	0.7	0.4	0.4	0.4
Other	0.3	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.3
	4.3	**4.1**	**5.6**	**5.7**	**4.8**	**4.8**	**6.4**	**6.6**	**6.2**
Non controllable	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Depreciation	0.8	0.8	3.2	1.4	1.6	2.4	2.9	2.6	2.7
Rates	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7
	1.6	**1.6**	**3.9**	**2.1**	**2.3**	**3.1**	**3.6**	**3.3**	**3.3**
Total costs	**5.8**	**5.7**	**9.5**	**7.7**	**7.0**	**7.9**	**10.0**	**10.0**	**9.6**

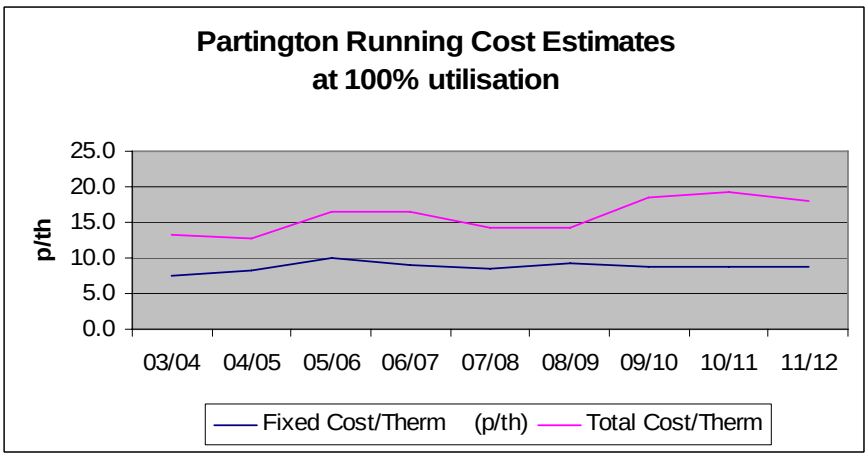
Source: National Grid * including T&S



Source: National Grid Data

Fixed/Variable Split	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Fixed Costs	2.9	3.2	3.8	3.5	3.2	3.5	3.3	3.3	3.4
Variable Costs	2.1	1.7	2.5	2.9	2.2	2.0	3.8	4.0	3.5
Depreciation	0.8	0.8	3.2	1.4	1.6	2.4	2.9	2.6	2.7
Total Costs	5.0	4.8	6.3	6.3	5.5	5.5	7.1	7.3	6.9

Source: TPA Analysis of National Grid Data



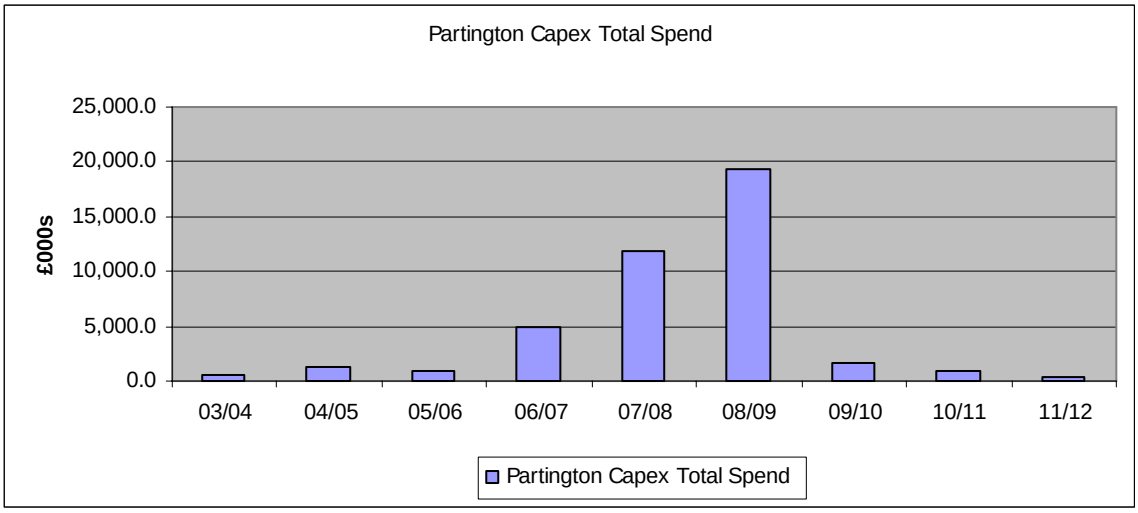
Source: TPA Analysis of National Grid Data

9.3 Capex

9.3.1 Capex – 10 Year Case

Partington Capex 10 year Case

	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	602.1	1281.6	845.9	4844.9	11836.8	19390.2	1671.5	823.6	282.6

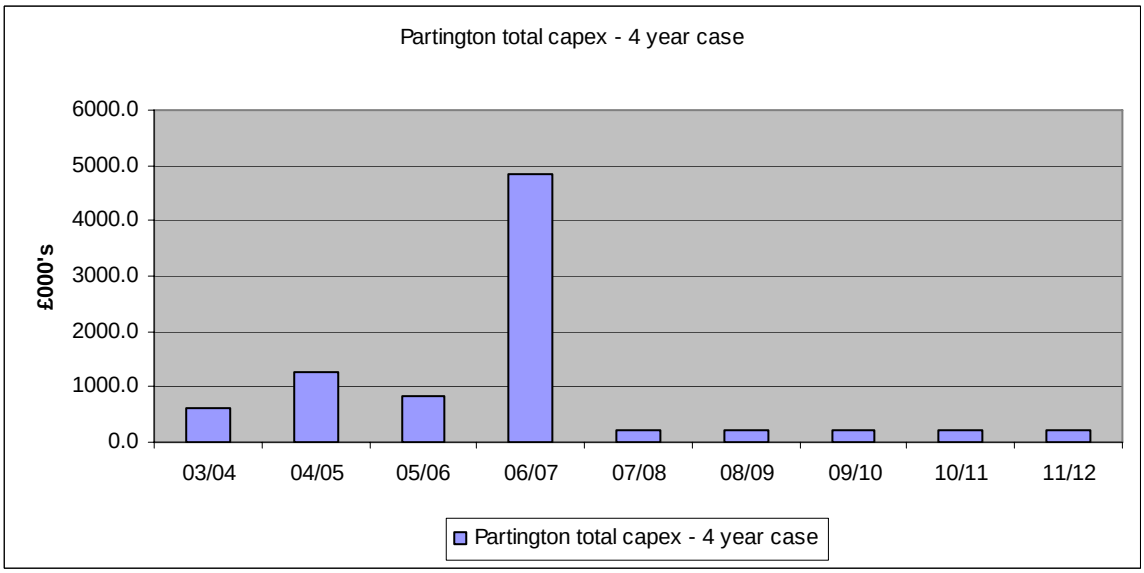


Source: TPA Assessment of National Grid's Plans

9.3.2 Capex – 4 Year Case

Partington Capex 4 year Case

£000's	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Capex Total	602.1	1281.6	845.9	4844.9	200.0	200.0	200.0	200.0	200.0



Source: TPA Assessment of National Grid's Plans

9.4 Income

9.4.1 Shipper peak shaving and balancing services

Partington's main role in the short term is providing shipper peak shaving and balancing services

	Partington	
Space sold (kWh)	790,020,000	70% of space
Total Space Available (kWh)	1,121,900,00	
Deliverability sold (kWh/d)	206,894,096	93.8% of deliverability
Total Deliverability Available (kWh)	219,800,000	

Source: National Grid LNG

9.4.2 Operating margins

It is a major supplier of OM gas to Transmission System Operator.

	Partington	
Space sold (kWh)	266,000,000	23.7% of space
Total Space Available (kWh)	1,121,900,00	
Deliverability sold (kWh/d)	0	0% of deliverability
Total Deliverability Available (kWh)	219,800,000	

9.4.3 Constrained LNG

This facility has no transmission support role as it has not been designated as a constrained facility within the current transportation charges. The removal of this facility would therefore not cause any capacity constraints on the NTS. Historically it is believed that it was designated as a constrained site for a short period to facilitate large scale local load growth (Rocksavage power station), but the site has been unconstrained for many years.

9.4.4 Scottish Independent Undertakings

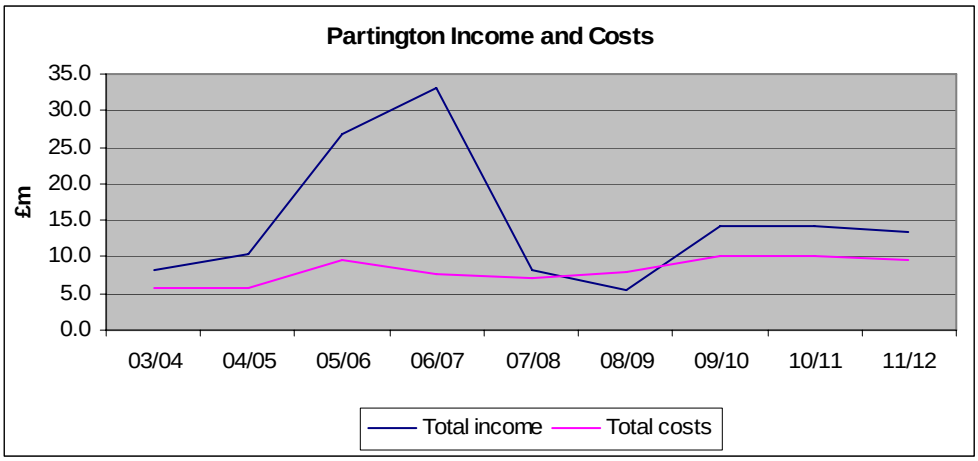
Partington can provide a back-up role to Glenmavis but has not been used for this purpose.

9.4.5 Overall Income Position for Partington

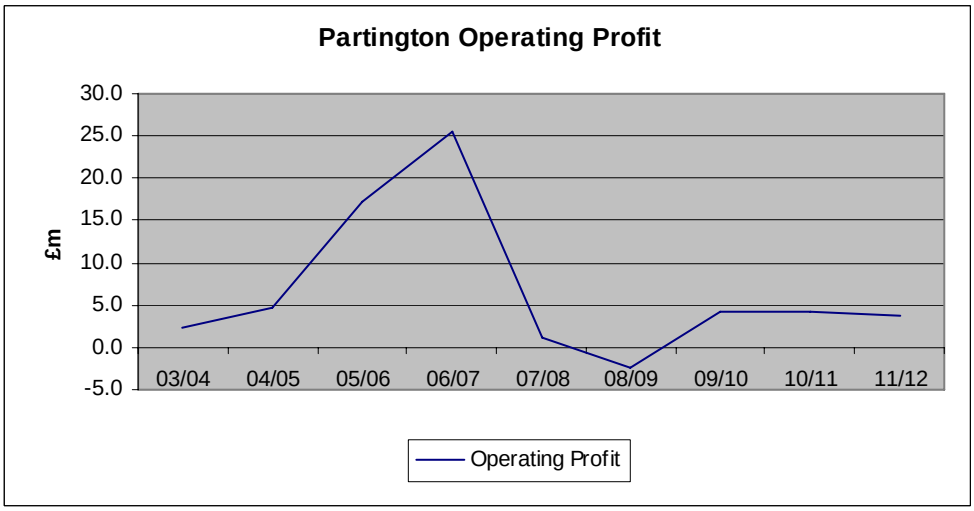
National Grid's Historic and Forecast Income

Income	03/04	04/05	05/06	06/07	07/08	08/09	09/10	10/11	11/12
Operating Margins	3.2	3.2	2.3	2.2	1.4	1.4	1.4	1.4	1.4
SIU's	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Shipper sales	3.1	6.3	23.3	27.6	6.1	3.5	10.3	10.2	9.9
Other*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Regulatory settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
TO settlement	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Capacity income	**6.4**	**9.6**	**25.5**	**29.8**	**7.5**	**4.9**	**11.7**	**11.6**	**11.3**
Commodity income	**1.8**	**0.7**	**1.3**	**3.3**	**0.7**	**0.6**	**2.5**	**2.5**	**2.2**
Total income	**8.2**	**10.3**	**26.8**	**33.1**	**8.2**	**5.5**	**14.2**	**14.1**	**13.4**

Source: National Grid



Source: National Grid Data



Source: National Grid Data

9.5 TPA View

9.5.1 Future Requirements

Partington is of particular interest as National Grid LNG are wishing to invest £38m (at 2004/5 prices) from 2006/7 onwards the major cost being for replacing the cold box (£24m at 2004/5 prices) which they say is long overdue. The issue is however that this site does not have any role in providing network support and therefore provides shipper and OM services which as discussed above will be subject to significant risk with respect to future income. The site is currently the cheapest site with respect to total costs per therm. However with the investment it will be more expensive than Avonmouth, the next cheapest site currently.

The forecast operating profit for Partington is similar to Avonmouth averaging £3.5m. As with all the other sites, there are significant risks to future income, but there is scope to reduce costs as the controllable element is around £4.5m.

Partington is a major hazard site being close to residential property and, whilst NG say there is no forecast work as a result of Buncefield, TPA believes it may be vulnerable to increased costs due to the design of the bunds at Partington.

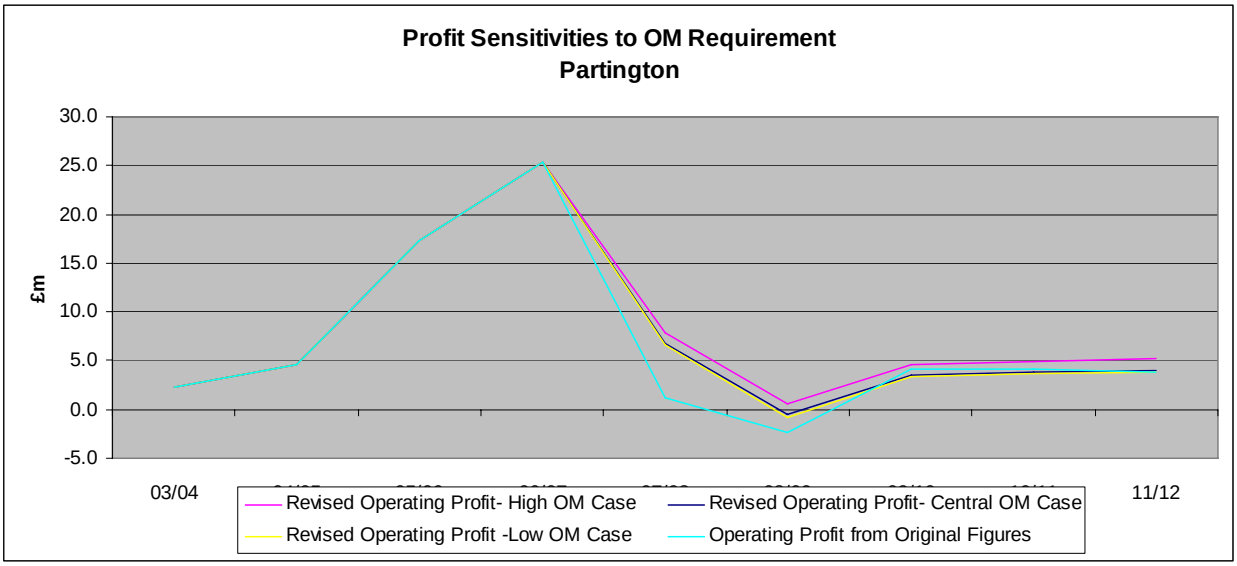
The biggest risk to Partington's role as a supplier of OM is the proposed Canatxx salt storage facility which is expected to receive planning permission in the next 3 months and aims to be operational by summer 2010 and the Ineos storage facility in Cheshire which has just received planning consent and plans to be operational in 2009.

9.5.2 Range Analysis

An option for Partington is to close the site, saving the £39m investment and transfer all the remaining OM requirements to one of the other sites. TPA does expect that there will remain a locational requirement but that this requirement can be sustained by using a combination of the existing liquefaction plant and road tankers. TPA also believe that some of the requirement could be reduced following the construction of the Pannal to Nether Kellett pipeline. TPA also assumes that there will be new storage facilities built in the locality that will provide competition for the OM locational service.

Closure of this site will incur clean up costs depending on final usage, currently estimated by NG LNG at £50m., though significantly less if the site can have an indystrial/light industrial use.

The TPA assessment of income from this site is as shown below under the three different scenarios and compared to the previous estimate by NG LNG. These graphs include an assessment of additional income from shipper services that TPA believes will occur. This has been allocated on a pro-rata basis according to the current split shown by NG LNG for the particular year. If based on the split for 2006/7 the results would be very different. However profits are overstated as aggregate site costs are less than total costs for LNG business.


Profit Sensitivities to OM Requirement
Partington
30.0
25.0
20.0
15.0
10.0
5.0
0.0
-5.0
£m
03/04
11/12
Revised Operating Profit- High OM Case
Revised Operating Profit- Central OM Case
Revised Operating Profit -Low OM Case
Operating Profit from Original Figures

Appendix 1 – Terms of Reference

Background

National Grid Gas operates five LNG storage sites at:

Glenmavis
Partington
Avonmouth
Dynevor Arms
Isle of Grain

When the LNG facilities were built they were located towards network extremities. The sites were designed to deliver gas during a few days of high demand thereby reducing the required peak capacity of transmission pipelines delivering gas to the locality. Building local LNG gas storage was considered to be more efficient than building additional pipeline capacity.

During periods of high demand, the facilities enable NGG to ensure that sufficient quantities of gas can be delivered in specific localities to meet firm demand in line with its network planning requirements. The facilities thus provide a geographic monopoly service supporting the transmission network in lieu of building additional pipeline capacity. The facilities also offer contestable services which are used as commercial storage for shippers and OM gas for NGG. The Glenmavis facility supplies LNG for use in the Scottish Independent Networks, which is transported by road tanker.

The Isle of Grain storage site has recently been converted to an LNG importation facility and its liquefaction facilities have been decommissioned. It may however still be efficient to contract network support services from this (and/or other) gas supplies.

We need to specify the appropriate form of control and financial allowance for providing geographic network capacity support services and how provision such services are funded in the price control. To inform this decision we need to understand the efficient costs and revenues associated with the LNG facilities.

Consultant's Work

The first step is to establish whether LNG support is the most efficient method of providing peak capacity to the geographic locations. In order to answer this question it is necessary to establish the costs of providing sufficient network capacity without the use of these LNG storage sites. Such costs are likely to be additional network investment (pipes and compressors) and/or the cost of alternative sources of gas (probably from short/medium term storage). Supply and demand forecasts published in National Grid's Ten Year Statement should be the starting reference, supplemented by data on alternative sources of gas.

The consultant shall establish the cost of providing sufficient network capacity to meet NGG's capacity obligations in the absence of the LNG facilities. This analysis shall be performed for each site on a site by site basis.

It is then necessary to establish future capital and operating costs for the facilities. The consultant shall ask National Grid Gas to provide sufficient historical information and forecasts of future expenditure to allow the consultant to establish the efficient level of costs needed operate and maintain the facilities over the period of the next price control.

The facilities provide commercial services over and above those needed to provide network transmission support. The consultant shall ask National Grid Gas to provide sufficient historic information together with future forecasts to establish estimates the likely income from these services over the period of the next price control. The consultants shall review these forecasts and provide evidence to confirm that they are appropriate or otherwise. The consultants shall also provide its predictions of income and any associated costs incremental to those needed solely to provide the network support service.

The consultants may limit the scenarios considered to those outlined in NGG's Ten Year Statement from the time the Milford Haven projects are delivered. I.e. the planned network post gas year 2008/9.

Work not in scope

The form of control (E.g. opex allowance, SO incentive, inclusion in RAV, etc.) for providing funding for efficient LNG services will be performed by Ofgem. Any work needed to establish historical accounting value of the facilities will also be performed by Ofgem.

Timeframe

Ofgem will publish the next transmission price control consultation paper in June and it is intended that the results of this study will be included in this paper. A preliminary assessment of the costs and revenues is required by 28th April. The final report from this work shall be completed by June 30th.

Appendix 2 – Questions Submitted to NGG LNG and NGG TSO

The following questions were submitted to Transmission System Operator

TPA - FBPQ

Q No. (Note 1)	Topic (Note 2) (Inc any reference to NG documents)	Date Submitted to NG	Question
TP4196	Forecast Opex - Operating Margins	08-Jun-06	Please provide a breakdown of the different elements of the margin and how it is allocated to the different OM services e.g. on a site by site basis for storage services and list any other sources for OM services? Of particular interest is to understand if there is any need for location specific OM services and if there are any restrictions that are imposed on the type of service that can be used to meet the OM requirement. What has been the historical usage of operating margins, since the introduction of the Network Code, for what reason was it used and which site provided the service? We would also like to understand if there is any interaction between the determination of OM requirements and the calculation of the flow margin requirement. Will the availability of the new pipelines for Milford Haven and Pannal to Nether Kellett have any impact on the need for OM? What is the forecast requirement for OM (preferably by categor
TP4197	Forecast Opex - Operating Margins	08-Jun-06	We are interested in understanding the whole process of purchasing and utilisation of the OM service. Is there for example any flexibility in the way the different service elements are built up from first principles to accommodate different combinations of services available in the market place? We are also interested in understanding how the recent OM tender was analysed and the basis for rejecting the service provider on the grounds of "The tender was deemed not compliant as the deliverability requirements could not be guaranteed due to the physical performance characteristics of the facility at Humbly Grove". Could the tenderer for example have provided a partial service with the remainder being provided by another source? Is there a cost above which the service would no longer be considered to be an acceptable insurance for extreme events?
TP4198	Forecast Opex - Operating Margins	15-Jun-06	Could NG please advise if the stored gas for Operating Margins forms part of the Safety Reserve or is in addition to it?
TP4199	Forecast Opex - Operating Margins	11-Jul-06	Please provide the split of the locational/non-locational OM requirement by site as at the present time
TP4200	Forecast Opex - Operating Margins	11-Jul-06	Please provide the Figures for the future Modelling Chart provided in the presentation on 7th July, broken down by site if possible.
TP4201	Forecast Opex - Operating Margins	11-Jul-06	Please provide your assessment of the impact on Linepack of the increased future capacity in relation to Milford Haven and the Easington to Nether Kellett pipeline
TP4202	Forecast Opex - Operating Margins	11-Jul-06	Please confirm what Linepack information is available to the shipping community
TP4203	Forecast Opex - Operating Margins	11-Jul-06	Please provide the slides from July 7th presentation in electronic format (non-adobe, please)

TP4217 was also raised on the 18th August 2006 - With respect to the Isle of Grain OM contract – does it give the right for NGG SO to book space/deliverability up to a certain capacity, but not the obligation? How do prices compare to C3 prices?

The following questions were submitted to National Grid LNG

Q No.	NG Topic	Topic	Date Submitted to NG	Question
ST8001	LNG	LNG Direct Operating Costs	03-May-06	For all 4 sites individually, please provide the Actual Opex for years 2003/4, 2004/5 and Forecast Opex for 2005/6, 2006/7 and the 5 years of the FBPQ period. Opex should be related to site activities (staff, labour, utilities, maintenance etc)
ST8002	LNG	LNG Overheads	03-May-06	Please set out the overheads that are applied to the 4 LNG sites from the National Grid LNG Head Office and Corporate Overheads. Together with TP8001 we should be able to see the total cost base for the 4 LNG facilities individually and to understand how overheads are allocated.
ST8003	LNG	LNG capex	03-May-06	For all 4 sites individually, please provide the Actual Capex/Repex for years 2003/4, 2004/5 and Forecast Capex/Repex for 2005/6, 2006/7 and the 5 years of the FBPQ period. Please identify all capex projects >100k
ST8004	LNG	LNG income	03-May-06	For all 4 sites individually, please provide the Actual Income for years 2003/4, 2004/5 and Forecast Income for 2005/6, 2006/7 and the 5 years of the FBPQ period. Income should be split into appropriate categories such as Shipper Sales, Constrained LNG, Operating Margins, Related to Scottish Independent Undertakings (SIU), Other.
ST8005	LNG	Asset values	03-May-06	Please advise as to what the residual asset values are for the 4 facilities and associated information (date of construction, costs remaining in RAB when they were taken out of the RAB)
ST8006	LNG	LNG P&L	03-May-06	Based on the information in TP8001 - TP 8005 above, please set out the P&L for the LNG business in the 9 years in question
ST8007	LNG	Income sensitivities	03-May-06	Please set out income sensitivities for each facility individually. We are interested in the forecast utilisation at Dynevor and Partington in particular after 2008.
ST8008	LNG	Cost of Decommissioning	03-May-06	Please set out the estimated costs to decommission the facilities in the event that they are not required.
ST8009	LNG	Cost of Supplying Glenmavis from the new Milford Haven LNG facilities	03-May-06	We understand that National Grid transported LNG from Dynevor to Glenmavis during 2005. Please estimate the costs of transporting LNG from Milford Haven to the SIU (assuming that an LNG loading facility was built at Milford Haven). We want to compare the economics of Glenmavis supplying the SIU to them being supplied from Milford Haven LNG.
ST8010	LNG	Change in legislation	03-May-06	Please advise if there are any changes in legislation or regulation that could impact the LNG facilities, eg safety related regulations as a result of the Buncefield fire
ST8011	LNG	Sales of the LNG business	03-May-06	Please advise about the cost of contracting for interruption of LNG services, at all or any of the sites

ST8012	LNG	Commercial Developments	03-May-06	Are there any new service proposals or other commercial developments that are being considered by National Grid related to the LNG facilities? How do these proposals impact on income forecasts and residual asset valuation?
ST8013		Operating Costs	16-Jun-06	In the spreadsheet provided in ST8001, please could you provide more information on the following: i) Revenue projects, please give details and some breakdown, including an explanation of the increase in costs in 05/06. ii) What is commodity cost and what is the basis for the significant increase in commodity costs in the last three years of the forecast iii) Please explain the reduction in staff costs through the first years 03/04 to 06/07 - how was this acheived and what were the corresponding changes in headcount. iv) Why is there a reduction in insurance costs (05/06) ? v) The 'Other Revenue' line is detailed to include tanker slots, but the data is just a line of zeros. Please could you confirm that this is correct and explain.
ST8014		Capex	16-Jun-06	Please confirm whether the 05/06 Capex for Partington liquefaction plant has been spent?
ST8015		Physical Characteristics	16-Jun-06	Please could you provide us with some basic physical characteristic information to ensure we have the latest up to date picture: This should include for each site, no of tanks, capacity and deliverability, no of liquefaction plants, etc and performance metrics of the plant. NB We have based our analysis so far on the information from the website, but would like some more details as described particularly in relation to the trends in performance of the liquefaction trains including the new one at Glenmavis. How much more efficient is the new plant at Glenmavis?
ST8016		Capex	16-Jun-06	Please could you provide the reasoning for replacing Partington liquefaction ahead of Avonmouth
ST8017		Site Disposal Costs	16-Jun-06	Please provide details of forecast minimum disposal costs for the four sites and specify the assumption for end use that has been used to arrive at this cost.
ST8018	LNG	Previous Correspondence with Ofgem	31-Jul-06	At the first meeting on the 17th May NG were requested to provide previous correspondence with Ofgem on the subject of the funding for Glenmavis and future funding mechanics. Could NG please send copies of this correspondence to Ofgem.
ST8019	LNG	LNG Capex	18-Aug-06	Please can we have a copy of NG LNG presentation 17th May
ST8020	LNG	LNG Income	18-Aug-06	What are the volumes of OM bookings at the LNG sites that were used to prepare the income forecasts for OM? We have the income, but we want to compare these volumes to the OM volumes from NGG SO
ST8021	LNG	LNG Costs	18-Aug-06	Are 'Commodity costs' in LNG opex the variable costs of regasifying LNG – ie fuel gas? Why do they increase later in the period?
ST8022	LNG	LNG Bookings	18-Aug-06	Please provide data for 2nd LNG auction in April 2006

Appendix 3 – Operating Margins

Description

The general description provided by National Grid is that Operating Margins (OM) are needed to maintain system pressures under certain operational circumstances. This includes periods immediately after a supply loss or sharp change in demand, before other measures become effective, and in the event of plant failure or the orderly rundown of the system.

This OM requirement is currently provided by putting gas into certain storage facilities that are best suited to provide the type of service that is required for the specific element of OM.

The different elements are described in more detail below[2].

- 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 this context will be the minimum associated with operational requirements.
- 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.
- 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.

The table below shows the current planned requirements for 2006/7.

	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	

This shows that it is intended to make provision of OM in all the LNG facilities.

TPA Commentary on Operating Margins

TPA attended a meeting with National Grid on the 7th July 2006 to review a series of questions raised on Operating Margins to allow TPA to carry out a detailed analysis of the way that OM is calculated and procured. National Grid provided comprehensive presentations on the

[2] Taken from the National Grid document "Operating Margins 2006/7"

determination, acquisition and utilisation of Operating Margins for National Grid. The subject areas covered in the presentation are shown below:

- OM determination
- Historic usage
- Locational and non-locational profiles and monitors
- Interactions and future sensitivities
- OM service acquisition and management of the OM tender

Some key points of note from the material provided by National Grid are set out below:-

General

- The biggest total provision of OM is for Orderly Rundown (900 GWh (out of a total of 1600 GWh) of which 350 GWh is in LNG)
- NG believes that there remains a significant locational requirement – mainly linked to infrastructure failure (sub-terminal, compressor, pipe) – split into 4 areas of the country.
  - National Grid stated that the locational market for OM is expected to be limited to the current sites that are used for this purpose, suggesting that there will be no competition. Leaving aside the C3 pricing constraints, in terms of availability of new services it is not possible to accept that there will never be any competition for these services.
- The table below shows an approximate breakdown of National Grid Gas's locational / non-locational requirement for 2006/7.

Breakdown of Locational Requirement for OM

	2006/7	Approx Non-Locational	Approx Locational
Avonmouth	350	199	151
Dynevor	160	82	78
Grain	186	74	112
Glenmavis	135	51	83
Partington	266	107	159
Rough	455	455	0
MRS	98	98	0
Total	**1648**	**1066**	**583**

Source: National Grid

- Historic OM utilisation is small, but it was clear that the existence of OM facilities is incorporated in the overall design of the transmission network. For example, Peterstow compressor as entirely electrically driven, was only possible because of the existence of LNG at Dynevor downstream, providing back-up for failures in electricity supply to Dynevor.
- The highest historical usage occurs in the period December to January. However, there has not been any severe weather since OM was introduced to permit any validation of what might happen in a severe winter.

- Forecast requirements are highly dependent on the assumptions of supply availability – orderly rundown increases substantially as availability falls (90% to 80% represents 500 GWh of orderly rundown). It is therefore highly sensitive to the assumptions that National Grid make about the reliability of new import schemes. With the potential for significant supply surpluses it would appear that the marginal changes in requirements shown by National Grid in their forecasts do not seem to reflect this radical change in both supply availability and supply diversity.
- Orderly rundown requirements require gas to be made available and therefore demand side response products are not suitable, though they are for other requirements.
- National Grid SO has made it clear that they have an open mind to alternatives, but currently there are very limited offerings that meet their operational criteria. They argue Operational needs preclude the use of a multitude of small service offerings because of the sheer complexity of the logistics requirement to manage many small sites in an urgent or emergency situation (not that there are many service providers anyway at this time).
- National Grid stated that they would pay any price for OM to ensure safety – but C3 prices currently cap the cost to them for LNG services. The point, however, is that there will be a limit on how much the shipper will be prepared to pay in order to have a certain level of reliability and safety for their customers. Furthermore National Grid accepts in their 2006/7 Operating Margins report that they have 217 GWh of OM that could be transferred from LNG to MRS. They state that this is not done on the grounds that they wish to guarantee meeting their Safety Case obligations. However TPA assumes that this could be secured in MRS or Rough.

Drivers for change in level of OM Booking:

TPA have identified a number of factors that it believes will impact the level of OM bookings, applying the existing methodology (ie no change to Safety Case). These are as follows:

Potential Reductions:

- Multiple event provision (which is intended to cover occasional significant problems – supply loss, compressor trips, forecast changes) contains a large proportion for compressor trips. This element is based on National Grid Gas's detailed analysis of the performance of existing compressor stock, but the introduction of new electric compressors and the effect they have on reliability will only be reflected in the calculations once they have some historical data to use. National Grid however stated that additional compression units at a site did improve the reliability statistics and hence the IPPC programme will significantly reduce this element.
- Reduction in compressor running hours reduces impact of compressor failures.
- Future OM requirements will decline as the new importation projects go ahead and there is a supply surplus. However National Grid is being cautious as to the impact of new imports until they have some experience. TPA believes that this is an overly conservative approach given that it is highly likely that gas from new sources will be made available in the high demand Nov – Mar period which drives the OM volumes.
- 1 in 50 demands have been reduced as a result of higher gas prices, which will see a reduction in the overall OM requirement than forecast.

- At present, if a specific field fails, say at Bacton, the buyer is often not aware of this. As a result, the system moves out of balance and National Grid Gas uses OM to make up within

day shortfalls, usually from Rough. With instant flow metering information availability at entry from Oct 06, it can be expected that shippers or producers will take over the OM role themselves – the shipper will want to avoid being out of balance. TPA believes that this metering will also progressively improve the performance of offshore facilities, and together these 2 factors will reduce the level of OM required in relation to offshore alerts.

- Decline in UKCS means that offshore failures are becoming less important. TPA believes that modern LNG importation facilities, with redundancy, with no gas processing, with no gas compression, are highly reliable, much more so than offshore facilities or onshore gas processing plants.

Potential Increases:

- None identified

Possible areas of double provision

- NG agrees that there is some overlap between OM categories e.g. Supply Losses and Orderly Rundown. The methodologies used are all about the possibility of coincident events, for example the occurrence of a severe winter and a major supply failure. In this case the major supply failure would immediately trigger a Gas Supply Emergency which would in turn lead to Orderly Rundown. In their presentation NG indicated that 350 GWh of LNG is required for Orderly Rundown, 356 GWh of LNG is provided to cover Major Events (which are primarily supply related and all for the winter only) and 100 GWh to cover for multiple event supply failures. Clearly the statistical probability of these requirements all being needed in one particular year would be significantly greater than 1 in 50 as Orderly Rundown is only needed when conditions are worse than 1 in 50 by definition. TPA accepts that if any LNG usage has occurred within year it cannot be recovered completely during the year because of the long liquefaction times. However there would clearly be justification to reduce the need for LNG in one or all of these categories and still maintain a safe system in accordance with the requirements of the NG Safety Case.
  - TPA estimates that it would be possible to eliminate all the provision of OM for Major Events as any of these events would be so severe that if they occurred in winter there is a very high probability that a Gas Supply Emergency would have to be declared. The impact of removing this double provision is a reduction in OM of 356 GWh.
- There is considered by National Grid to be no link between the calculation of OM and Flow Margins. They are therefore determined entirely independently on the assertion that OM provides gas and FM purely capacity. This again raises the issue of the impact on the overall security level of providing a blanket FM allowance which in many circumstances of OM usage will provide additional security, over and above the minimum accepted industry standard.
- The Safety Reserve and associated Safety Monitor do not make any allowance for the gas that is stored for OM purposes. This is another example of providing for co-incident events and hence increasing the overall security standard. Furthermore the Safety Reserve relates to a 1 in 50 demand level that is not the total firm demand under 1 in 50 conditions, but excludes most DM loads (except priority loads and Ireland), a substantial reduction as indicated by the safety monitor in Appendix 5.
- Basis for all the calculations of the OM requirement is 1 in 50. However there are many cases in the analysis where it is assumed that co-incident events occur as stated above (1

in 50 winter combined with an offshore supply failure). This raises the question as to the probability of these events occurring co-incidentally (ie: at the same time). Does this lead to providing for greater than 1 in 50 security levels?

TPA Assessment of the OM requirement

TPA does not believe that National Grid Gas has provided justification for its High Case. TPA believes that there is no case for substantial increases in OM given the supply/demand and other factors and hence does not believe that the National Grid SO High Case is well founded.

TPA has therefore developed cases around the National Grid Gas Central Case as follows:

TPA High equals NG Central
TPA Central equals NG Central minus double counting and Hornsea shift (down to minimum locational requirement)
TPA low equals TPA Central minus TPA assessment of potential further OM reductions (96 GWh – see justification below) and remove Dynevor locational requirement after 2007/8.

We have considered the possibility of reducing the amount of OM provision for Orderly Rundown on the basis that there is essentially an increased proportion of gas supply from non-storage facilities if you take demand as being 1 in 50 severe, excluding DM loads (except priority and Ireland) instead of total firm demand. However this is something that should be considered by National Grid as part of the overall review of OM methodology suggested above.

The resultant figures for the three scenarios produced by TPA are given below.

TPA Future OM Assessment range to 2015/16 (GWh)*

	High	Central	Low
2006/07	1648	1292	1292
2007/08	1589	1233	1137
2008/09	1528	1172	1062
2009/10	1347	991	922
2010/11	1451	1095	992
2011/12	1583	1227	1111
2012/13	1696	1340	1216
2013/14	1849	1493	1369
2014/15	2018	1662	1538
2015/16	2151	1795	1671

Source: TPA Assessment

* 2006/07 data as per the OM booking as published in March 2006

Future OM Assessment to 2015/16 – TPA Central Case by site*

Booking	Avonmouth	Dynevor	Grain	Glenmavis	Partington	Rough	MRS	Total
2006/07	350	160	186	135	266	455	98	1648
2007/08	88	31	87	81	176	455	315	1233
2008/09	89	31	45	81	159	455	312	1172
2009/10	61	31	45	44	87	455	268	991
2010/11	66	31	45	65	129	455	304	1095
2011/12	106	36	45	93	181	455	311	1227
2012/13	140	46	45	117	225	455	312	1340
2013/14	185	60	45	148	289	455	311	1493
2014/15	235	75	45	182	358	455	312	1662
2015/16	274	87	45	209	413	455	312	1795

Source: TPA Assessment

All the TPA Cases for total NG LNG bookings are presented below.

TPA Future OM Assessment range for NG LNG total bookings to 2015/16 (GWh)*

	High	Central	Low
2006/07	911	911	911
2007/08	850	376	296
2008/09	834	360	263
2009/10	654	223	126
2010/11	758	291	194
2011/12	891	416	314
2012/13	1003	528	417
2013/14	1157	682	571
2014/15	1325	850	739
2015/16	1458	983	872

TPA have developed some options that challenge the assumptions regarding the need for locational OM. The issue with respect to these requirement is two-fold. Firstly the need to take the reductions that we propose as a result of double-counting across the locational/non-locational requirements and secondly to assess if there is still a locational need at any of the sites.

Impact of Double-Counting

As stated above TPA believe that the provisions for Major Events duplicate the provision for Orderly Rundown. NG have stated that the majority of this usage is locational. Therefore this provision will be deducted from the locational requirement pro-rata to the current locational provision.

This adjustment is shown in the table below for 2006/7.

* 2006/07 data as per the OM booking as published in March 2006

Revised Locational Breakdown of OM Requirement (GWh)

	2006/7	Approx Non-Locational	Approx Locational	% Locational
Avonmouth	260	199	61	23%
Dynevor	113	82	31	27%
Grain	119	74	45	38%
Glenmavis	84	51	33	39%
Partington	169	107	62	**37%**
Rough	455	455	0	
MRS	98	98	0	
Total	**1298**	**1066**	**232**	

Source: TPA Analysis

TPA believe that it is possible that there could be further savings from double-counting but the type of analysis needed to ascertain how much would require replicating the analysis carried out by NG in determining their requirements. It would therefore be more appropriate if NG were to complete a thorough review of their methodologies addressing the following factors.

- Interaction between the flow margin and OM analysis with particular emphasis on the utilisation of linepack in parts of the network where OM provision is made available to assess if there is any duplication of provision of gas delivery (whether from linepack or gas storage facilities).
- Consider a wholly risk based approach to assessing the minimum OM requirements to manage single events and then set a minimum security standard that is met by combining these risks, rather than simply treating them all as single events and adding the requirements. The minimum standard should be consistent with the standard set for the Safety Reserve. A control case to be developed for comparison whereby removal of all OM is assessed.
- Take account of actual risk rather than perceived risk. For example the reliability of LNG importation terminals should use world data on availability and reliability not wait until experience is gained to gather data.
- The demand basis for assessing requirements should be 1 in 50 severe demand as required under the Safety Reserve, i.e. excluding all DM load (except priority load and Ireland)

<u>Locational need – ongoing</u>

Following the completion and commissioning of the new LNG importation terminals it is very unlikely that Dynevor will be of any value from a locational perspective. The provision for compressor failure would no longer be necessary as it was only really able to support Peterstow compressor when gas is flowing west. The normal operation will be east west when the importation facility is operational. Any supply failures from the Milford Haven area will be served by the linepack in the new pipeline from Milford Haven. TPA therefore believes that there is no locational provision needed at Dynevor after the commissioning of the Milford Haven LNG facilities.

<u>Non-locational split</u>

NG have stated that they need to secure 217 GWh of LNG which could actually be provided in MRS. This suggests that given the choice this provision could be made in Hornsea. It is therefore proposed to assume that for the purposes of the Central Case that 217 GWh of non-locational LNG is moved to Hornsea on a pro-rata basis.

Revised Non-Locational Breakdown of OM Requirement (GWh)

	2006/7	Approx Non-Locational	Approx Locational	% Locational
Avonmouth	174	113	61	35%
Dynevor	77	46	31	40%
Grain	87	43	44	51%
Glenmavis	62	29	33	53%
Partington	122	61	61	**50%**
Rough	455	455	0	
MRS	315	315	0	
Total	**1292**	**1062**	**230**	

Source: TPA Analysis

Further Future Savings

There are several areas identified in this report where we believe there is downward pressure on the requirements for OM. Examples of these are:-

- Installation of additional electrically driven compressors
- Reduction in reliance on compressors
- Instantaneous flow-metering at terminals which will alert shippers to failures and allow them to use their own stored gas
- Reduced reliance on north sea production which is not as reliable as LNG

TPA has carried out a very high level quantitative assessment of the impact of these trends in the market and changes to the operating environment based on the assumption that there will be a 25% reduction to the current values. The changes are shown below.

Breakdown of Current OM Requirement (GWh) by type and proposed changes for TPA Low Case

	2006/7	**Potential Adjustment**	**Reason**
Major Events	356	-356	Double Counting (see above)
Multiple Events – Supply loss	96	-25	Improved reliability of imports
Multiple Events – compressor trips	227	-57	Reduced trips electrical comps
Multiple Events – forecast changes	58	-14	Greater shipper focus caused by high gas prices
Orderly Rundown	911	**0**	
Total	**1648**	452	

Source: National Grid and TPA Analysis

Appendix 4 – Description of Constrained LNG

During periods of high demand, the Constrained LNG facilities allow National Grid to ensure that sufficient quantities of gas can be delivered in specific locations at the extremities of the NTS to meet firm demand in line with its 1 in 20 peak day Licence obligation.

Under the Uniform Network Code (UNC) arrangements, National Grid secures the transmission support it requires from LNG facilities by "constraining" them, ie. Constrained LNG. At present. Shippers who book capacity at a constrained site have their rights to use that capacity restricted by National Grid in the following two ways:

- National Grid requires shippers to maintain specified minimum inventories of gas in store (which decline over the winter) that reflect the volumes of gas that National Grid may require to be entered into its pipeline system on a 1 in 20 peak day and in a 1 in 50 severe winter.
- National Grid has the right to require that shippers with holdings at the site flow gas onto the system under certain circumstances. At the beginning of each year, National Grid is required to produce a Constrained Storage Statement that specifies the threshold demand flow at particular points on the network that may prompt it to exercise this right.

In return, National Grid provides these Users with a rebate on their transportation charges for rights to move gas from the constrained facility onto the NTS.

Appendix 5 – Description of the Safety Reserve

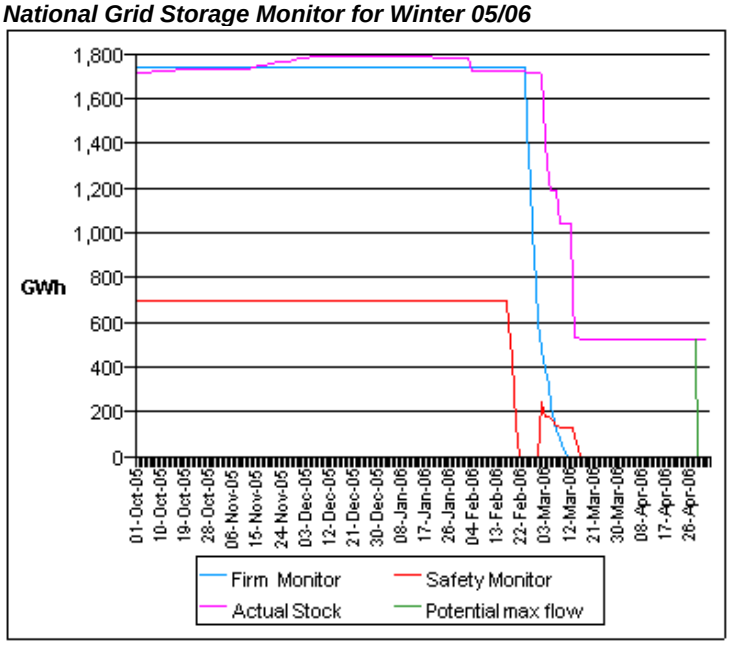
To ensure that sufficient gas is held in storage to preserve the ongoing safe operation of the gas transportation system, the concept of safety monitors was introduced into the National Grid Gas, Gas Safety Management Regulations (GS(M)R) Safety Case. The Uniform Network Code (UNC) requires NGG to publish the safety monitors and to provide regular reporting of actual storage stock levels for comparison with these monitors. 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 GS(M)R). In addition, the UNC requires NGG to calculate and publish firm gas monitors based upon the forecast demands of firm consumers. The firm gas monitors are published solely for the purpose of providing further information to the market.

The consumers protected by these monitors are described in section 2.1.4 above.

The full methodology for calculating the monitor levels is provided in the NGG document entitled "Safety and Firm Gas Monitor Methodology – November 2005".

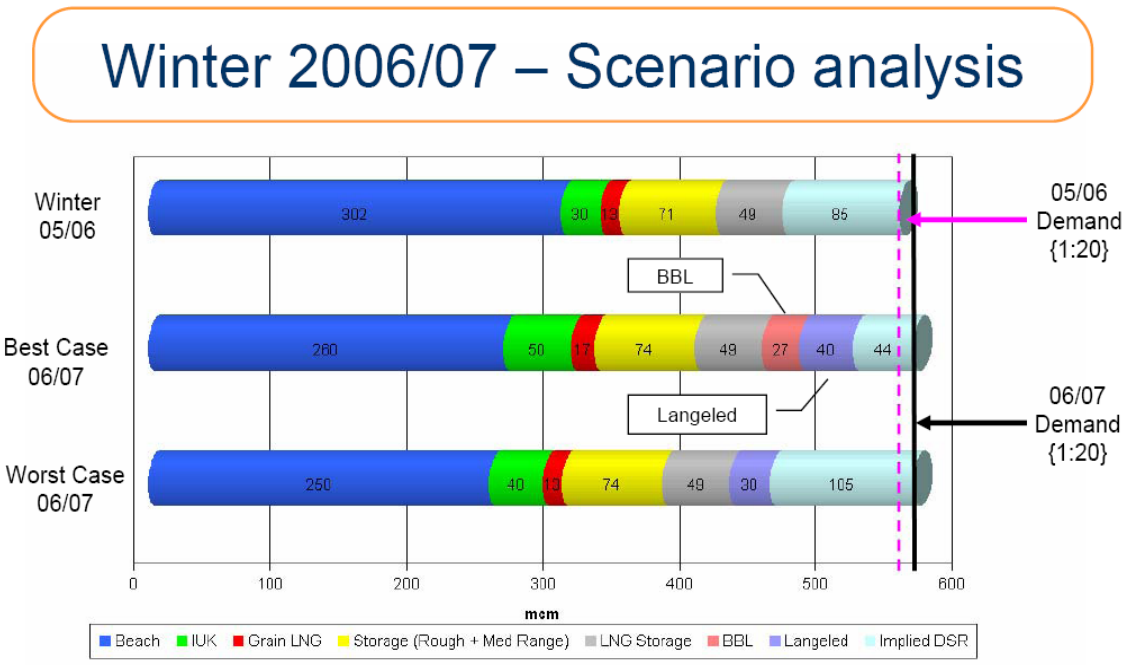
The safety monitor for short range storage for this winter just passed is shown below.

National Grid Storage Monitor for Winter 05/06



Source: National Grid Daily Report from website

What the short range storage safety reserve achieves is not so much a volume of gas in store, but a high level of deliverability to ensure needle peaks of demand can be met in severe weather, as this type of storage has high deliverability and low storage volumes, with limited ability to refill. Fill times are in the range 100 to 300 days from empty. The situation with regard to deliverability next winter is illustrated by the diagram below taken from the Ofgem presentation - 22nd March 2006 – Winter 2005/6 experience and issues for 2006/7.



Source: Ofgem Winter Experience Presentation

This demonstrates that for next winter at least LNG has a role in meeting 1 in 20 peak day requirements for gas supply.

The current stipulation for the safety reserve in short term storage is a level of 26%, which equates to the equivalent of 730 GWh of capacity (assuming this level is related to the maximum physical capacity of all four LNG sites (2808 GWh) – need to check this), which is lower than the maximum physical capacity of Avonmouth (NG website shows 876 GWh). However the maximum made available in this years auction was 566 GWh, which allows for the minimum OM booking by NG. The OM booking is not part of the safety reserve but is an additional quantity of gas held in reserve by NG on the basis that OM can be utilised under most circumstances at any time of the year (apart from orderly run down which is needed after all the safety reserve has been utilised to manage safe shutdown of the network).

Appendix 6 – 17th May Presentation – National Grid LNG

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