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CONSULTATION DOCUMENT

Modification Proposals to the Gas Transmission Transportation Charging Methodology

NTS GCM 01:

Alternative Methodologies for Determination of NTS Entry and Exit Capacity Prices

2nd November 2006

Table of Contents

Executive Summary

This document sets out for consultation National Grid NTS's proposed Options for revising the Gas Transmission Transportation Charging Methodology (the "Charging Methodology") in respect of the setting of NTS Entry and Exit Capacity Prices. This includes NTS Entry Capacity Baseline Reserve and Incremental Prices for capacity sold in auctions from 1 April 2007 and NTS Exit Capacity Prices from 1 April 2007 to 30 September 2010[1].

In January 2006 National Grid NTS instigated a review of the gas transmission transportation charging arrangements with the industry via the launch of the gas Transmission Charging Methodology Forum ("TCMF"). One of the key areas of the review has been the methodology by which NTS Entry and Exit Capacity Prices are determined, and the information made available to the industry to understand and replicate the price setting process. This was instigated by Ofgem's open letter of 2nd December 2005 which proposed that, as part of the Transmission Price Control Review, NTS Entry Capacity Reserve Prices are decoupled from Entry UCAs and set on a dynamic basis from 1 April 2007. Ofgem suggested that National Grid NTS therefore develop a charging model which is made available to the industry such that users can repeat the price setting process. A single model for determination of all Entry and Exit capacity prices was stated to be desirable.

In addition, rebalancing of exit capacity tariffs to reflect changes in supply/demand and network configuration has not been undertaken since 2001. This was due to the desire to delay rebalancing on the expectation that NTS exit reform would be implemented in 2002. Subsequent delays to reform have led to a significant divergence in current tariffs and underlying LRMCs in certain locations. It would be beneficial if exit capacity prices are updated based on the same model as developed for entry capacity prices to allow simultaneous entry-exit capacity price setting from 1 April 2007.

In conjunction with the industry through the Gas TCMF, National Grid NTS has therefore developed a range of Options for determination of NTS Capacity Prices. National Grid NTS has developed and run the various modelling Options to allow comparison and better understanding of the models. A Progress Report (Gas TCMF PR 01) has been placed on National Grid NTS's industry information website summarising such analysis and results – this report should be read as part of this Consultation Paper.

This Consultation Paper seeks views on a number of Options for the NTS Capacity Price setting methodology, as summarised below:-

<u>Option 1. Engineering Model Based Approach</u>

This Option represents a continuation of the current approach to setting NTS Exit Capacity Prices (based on Transcost), except for:

- amendments to the Tariff model to avoid potential distortions caused by the point in the process at which negative prices are currently removed. In addition, it is proposed that exit prices are adjusted (by adding the same amount to all prices) rather scaled (by multiplying prices by the same factor) in the process applied to recover TO Allowed Revenue to preserve locational price differentials;

[1] Separate papers have been published discussing the potential amendments to the Charging Methodology to support the implementation of the enduring offtake arrangements in respect of the use of NTS Exit Capacity from 1 October 2010 (see papers NTS GCD 01, 02 and 03).

- year-on-year price capping is not undertaken.

In respect of NTS Entry Capacity Prices, this Option represents a continuation of the current approach to setting incremental entry capacity prices for long term auctions using Transcost/Graphical Falcon, but with reserve prices set by one of the following approaches:

- Option 1a - based on entry prices determined using Transcost, with entry and exit prices determined simultaneously (i.e. using common increment size of 2.834 Mscm/d); or
- Option 1b - based on entry prices determined using Transcost, with entry prices determined using the same methodology as for exit prices except for use of an increment size of 6 Mscm/d to reflect the typical larger size of entry supplies compared to exit flows.

National Grid NTS considers that this Option (either 1a or 1b), if implemented, would improve the current arrangements by overcoming the following identified issues:

- allows capacity prices to be updated and set on a dynamic basis reflective of changes in the gas transmission system and supply/demand forecasts;
- removes potential distortions in the current tariff model caused by the point in the process at which negative prices are removed and scaling is undertaken to recover allowed revenue; and
- improves cost reflectivity by removing annual caps on price movements.

In addition, transparency could be improved under this Option by the release of the Transcost model (with sufficient development time and cost funding to create an external version). However it is not considered that Users would find such a model sufficiently easy to use to inform their decision making in respect of the most efficient and economic location and timescales for connection to and use of the transmission system.

<u>Option 2. Transportation Model Based Approach</u>

This Option represents a new approach to the simultaneous setting of both NTS Entry and Exit Capacity Prices. The Transportation Model minimises the flow distance of gas around a specified network given an assumed pattern of supply and demand. Marginal costs of investment are determined based on an expansion constant (in terms of £/GWhkm), which represents the estimated capital cost of transmission infrastructure required to transport 1 “peak day” GWh over 1 km.

As opposed to using a ten year forecast of supply and demand as under the current arrangements, simplifications are proposed under this Option to avoid potential distortions created by inaccurate long term forecasts and avoid the circularity caused by use of supply forecasts in long term capacity auctions which are designed to signal such supply requirements. This is summarised below:

- NTS Exit Capacity Prices are proposed to be based on analysis of the Base Case supply/demand scenario[2] for the following Gas Year;
- NTS Entry Capacity Prices are proposed to be based on analysis of the Base Case supply/demand scenario and network model for the relevant Gas Year (e.g. for prices used in Long Term auctions this would be based on the forecasts and expected network model for year ahead of when new investment that are signalled through the auction should be completed).

[2] As published in the most recent Ten Year Statement.

To ensure a balanced network, adjustment to the relevant supply level for each aggregate system entry point (ASEP) and for each Gas Year in turn, is proposed to be undertaken by supply substitution. Choices are presented in respect of the relevant supply level to be utilised in the charging model for entry capacity reserve prices:

- Option 2a - The Base Case supply is utilised, or;
- Option 2b - Obligated baseline level of capacity is utilised.

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Similar changes to the current Tariff Model are proposed under this Option as for Option 1.

National Grid NTS considers that this Option (2a or 2b), if implemented, would also overcome the identified issues as for Option 1, but would also:

- present significant improvements in the transparency and repeatability of the capacity charging arrangements and the setting of all capacity prices using a single model. In particular, the Transportation Model can be made available to the industry to replicate the charge setting process[3] and undertake scenario analysis to inform User choice about where and when it would be most efficient and economic to connect to and use the transmission system;
- allow inclusion of the benefits of counter flows ("backhaul") in capacity prices to improve cost reflectivity; and
- allow use of a single year analysis thereby providing improved temporal signals of when it is most efficient and economic to connect to and use the transmission system and avoid price distortions potentially created by inaccurate long term forecasts.

<u>Alternative Options</u>

A number of other Options were also included in the Gas TCMF Progress Report PR01. National Grid NTS also welcomes views on such Options.

One of the key considerations in respect of which of the above Options better achieves the relevant statement objectives under National Grid NTS's GT Licence is the treatment of spare capacity in the determination of Long Run Marginal Costs (LRMCs). Under Option 1, spare capacity is included, whereas under Option 2, spare capacity is not directly included within the model. However spare capacity due to declining terminals is catered for, to an extent, under Option 2a by using flow forecasts to set the supply level such that the discount on the resulting prices increases as the flow forecast decreases below baseline level utilised in Option 2b. In addition, it is possible to include a specific locational discount in the Transportation model under Option 2b to recognise spare capacity (e.g. by reduction of pipe lengths based on engineering assessment of the location and amount of spare capacity), however such approaches are typically difficult to undertake in a transparent manner.

If spare capacity is not appropriately accommodated in prices, resulting in higher capacity charges, than would otherwise be the case, it could discourage the use of currently unutilised NTS investments and, in the extreme, lead to asset stranding. Conversely, if LRMCs are discounted at certain entry/exit points to recognise such unutilised assets, Users of other entry/exit points would be required to fund a proportion of such discounts, thereby creating a cross-subsidy. In addition, the locational targeting of the costs of spare capacity results in Users paying for the

[3] Note that the UNC would need amendment to allow the release of the nodal demand data used to set capacity charges.

capacity that happens to be available in the vicinity, rather than the capacity they utilise. This approach could lead to less predictable and stable charges due to the transient nature of spare capacity.

Views from respondents are specifically sought on the most appropriate treatment of spare capacity and which of the Options would better achieve the relevant methodology objectives in respect of Transportation Charges. National Grid NTS will consider such representations in making its formal proposals to the Authority to seek to implement revised capacity charging arrangements from 1st April 2007.

Representation should be e-mailed to jan.gascoigne@uk.ngrid.com or alternatively by post to Jan Gascoigne, Regulatory Frameworks, National Grid, National Grid House, Gallows Hill, Warwick, CV34 6DA. The closing date for submission of representations is **Thursday 30th November 2006**.

If you wish to discuss any matter relating to this Charging Methodology consultation then please call Eddie Blackburn ☎ 01926 656022.

1 Introduction

1.1 In January 2006 National Grid NTS instigated a review of the gas transmission transportation charging arrangements with the industry via the launch of the Gas Transmission Charging Methodology Forum (Gas TCMF).

1.2 One of the key areas of the review is the methodology by which entry and exit capacity prices are determined, and the information made available to the industry to understand and replicate the price setting process. At present the methodology for determining NTS Exit Capacity and NTS Baseline Entry capacity prices is contained within the Gas Transmission Transportation Charging Methodology (the "Charging Methodology"). The methodology for determining NTS Incremental Entry Capacity price schedules is contained within the Incremental Entry Capacity Release (IECR) methodology statement.

1.3 The review of the capacity charging arrangements was instigated by Ofgem's open letter of 2 December 2005 which proposed that, as part of the TPCR, NTS Entry Capacity Baseline Reserve Prices are decoupled from Entry UCAs and set on a dynamic basis from 1 April 2007. Ofgem suggested that National Grid NTS therefore develop a charging model which is made available to the industry such that users can repeat the price setting process. Ofgem also stated that a single model for determination of all entry and exit capacity prices was desirable.

1.4 In conjunction with the industry through the Gas TCMF, National Grid NTS has developed a range of options for determination of Long Run Marginal Costs (LRMCs) for the purpose of determining NTS Capacity Prices. National Grid NTS has developed and run the various modelling options to allow comparison and better understanding of the models and have fully documented the process. A progress report (Gas TCMF PR01) on this work is available on the National Grid website at http://www.nationalgrid.com/uk/Gas/Charges/.

1.5 This Consultation Paper should be read in conjunction with the Progress Report Gas TCMF PR01, which provides:

- An overview of the current capacity charging arrangements;
- A review of the current arrangements;
- An overview of identified issues;
- A summary of the analysis we have undertaken;
- Links to the results published on the National Grid NTS Gas TCMF website;
- An assessment of the performance of each model.

1.6 This Consultation Paper covers:

- The NTS Exit Capacity Charging Methodology applicable from 1 April 2007 to 30 September 2010;
- The NTS Entry Capacity Charging Methodology applicable to all capacity sold in auctions from 1 April 2007; and
- Inclusion of the methodology for determining Incremental Step Price schedules within the Charging Methodology.

1.7 Separate pricing discussions are being undertaken to seek to revise the Charging Methodology to support development of the enduring exit regime in line with UNC Modification Proposal 0116, if implemented (see NTS GCD 01, 02 and 03). These papers consider the amendment of the NTS Exit Capacity Charging Methodology applicable to all capacity released for use from 1 October 2010. National Grid NTS will consider the representations to these Discussion Papers and this Consultation Paper in respect of undertaking further consultations and formal proposals for charging of NTS Exit Capacity under the enduring arrangements.

2 Background

2.1 As part of the review of the NTS Capacity Charging arrangements, National Grid NTS has explained its current approach, as documented in the Charging Methodology. An explanation of the methodology is also provided in the Progress Report PR 01, Chapter 2.

2.2 The table below summarises ten key questions which were identified as part of the Gas TCMF discussions in relation to the most appropriate methodology for calculation of NTS Capacity Prices. For clarity, the current methodology has been stated against each of these questions.

Table 2-1: Key Questions for Gas Charging Review

Model	Question		Current Exit Methodology	Current Incremental Entry Methodology
TRANSPORT MODEL	1	S&D Scenarios: 1 Year or multiple Years?	Ten Years from Year 0	Ten Years from Year 2
	2	How should incremental costs be modelled?	Transcost	Transcost and Falcon for increments in excess of 12 mscmd
	3	How should spare network capacity be treated?	Spare capacity included.	
	4	Should decrement (back flow) costs be considered?	No backflow cost benefit included.	
TARIFF MODEL	5	How should entry and exit costs be disaggregated?	Solver using a non-negative constraint.	
	6	How should negative costs be treated?	Removed as part of the solver process.	
	7	Should costs be adjusted to 50:50 Entry: Exit and if so how?	LRMCs are not adjusted or constrained to be 50:50 Entry: Exit	
	8	Are zones required?	LDZ Exit Zones are used to map consumer exit points to the appropriate offtakes	Zones are not used for entry
	9	Should prices be adjusted to recover allowed revenue and if so how?	Prices are scaled to recover 50% of TO allowed revenue	Prices are not adjusted.
	10	Should year on year price changes be capped?	+/-30% year-on-year cap on Prices	Incremental capacity prices are not capped or discounted

3 Key Issues

3.1 The Gas TCMF discussions have identified a number of issues with the current arrangements that require consideration as part of any changes to the Charging Methodology. These are explained in the Progress Report PR 01, Chapter 3, and summarised below:

NTS Entry Capacity Reserve Prices

3.2 In December 2005, Ofgem issued an Open Letter on Charging requesting that National Grid NTS give consideration to decoupling the link between Licence defined revenue drivers (Unit Cost Allowances) and reserve prices set from entry capacity auctions from 1st April 2007.

3.3 Since Ofgem must give consideration to such factors as likely demand for the capacity at an entry point and the existing allowances for investment in the area under the TO Price Control in deciding an appropriate UCA, the current UCAs used to set reserve prices are not necessarily a true indication of the relative locational capacity price a User should pay at the entry point.

3.4 Analysis undertaken by National Grid NTS shows that LRMCs have diverged significantly from UCAs due to changes in supply/demand forecasts and the network. This would indicate that UCAs have become less cost reflective over the course of the Price Control. This loss of cost reflectivity may mean that locational pricing signals are being distorted, and hence investment may not be triggered in an efficient way.

NTS Exit Capacity Charge Rebalancing

3.5 Rebalancing of exit capacity tariffs to reflect changes in supply/demand and network configuration has not been undertaken since 2001. This was due to the desire to delay rebalancing on the expectation that NTS exit reform would be implemented in 2002. Subsequent delays to reform have lead to a significant divergence in current tariffs and underlying LRMCs in certain locations.

Transparency and Repeatability

3.6 The application of Transcost and Graphical Falcon engineering models are manually intensive and sensitive to user settings (particularly compressor and regulator parameters) leading to stability and repeatability issues.

3.7 Such engineering models are not easy for a non-expert to use and understand,, and hence do not allow users to easily undertake their own scenario analysis to inform the most efficient and economic location and timescales to connect to and use the transmission system.

Supply and Demand Forecast

3.8 The prices that result from the current methodology are extremely sensitive to the supply and demand forecasts chosen, particularly for the later years of the model, as the base networks in each year depends on the preceding year's base network.

3.9 The use of a ten year forecast combined with the difficulties in generating an accurate forecast may result in unstable prices. In addition, the use of a ten year forecast results in prices being set for long term entry capacity auctions that are effectively based on an assumed outcome of those auctions.

3.10 The averaging of the ten year forecast distorts locational price signals and destroys the temporal pricing signals for incremental capacity (e.g. an exit point locating close to a large new entry point *after* that entry point is commissioned generates more efficient investment signals and is less problematic from a security of supply perspective than if that exit point were to locate at the same site *before* the new entry point was flowing gas.)

3.11 All network analysis requires a balance between supply and demand and this is equally true of charging models. Under the prevailing Charging Methodology the Base Case supply data is adjusted to obtain a supply and demand match given the 1-in-20 demand level. This means that some Entry Points are not at their Base Case supply level within the charging model. This could be overcome by carrying out Entry Point specific analysis for those Entry points that were not at their Base Case levels in the initial analysis and obtaining a supply and demand balance by supply substation. This process could equally be carried out to adjust all Entry Points to the obligated baseline level. For example, where a supply points was not at its Base Case level due to a supply surplus or where a supply point was not at its baseline level, it could be adjusted to that level with the entry point furthest from the entry point in question being adjusted in the opposite direction. Such an approach would ensure that all prices would be generated at a relevant supply level on a consistent basis.

Tariff Model

3.12 The constraint of a minimum permitted charge of 0.0001p/kWh/day which removes negative costs at the optimisation procedure stage may create instability in the entry-exit split which could then lead to distortions to the cost reflectivity of the resulting prices.

3.13 The use of scaling to set Exit Capacity Charges that recover 50% of the allowed TO revenue may distort the locational differentials inherent in the LRMCs.

3.14 The year-on-year price capping rules, applied to NTS Exit Capacity charging, restrict price movements. This does not seem the optimal way to support the objective of cost reflectivity over the longer term, recognising that costs will change from year to year as the supply and demand scenario changes as new entry and exit connections are commissioned.

Single Model for NTS Capacity Charge Determination

3.15 Transcost was designed to model small increments in order to estimate LRMCs. Costs for providing increments above 12 mscmd, for incremental entry capacity price determination purposes, are therefore estimated using the Graphical Falcon network analysis modelling program.

3.16 If a single model is to be used to calculate all capacity prices then a single approach must be adopted. The use of LRICs for incremental Entry Capacity price determination and LRMCs for exit pricing is the key obstacle to a single charging model.

3.17 As more fully explained in the Progress Report, this obstacle could be overcome by considering the LRMC at a revised supply/demand scenario where an entry point was adjusted to an incremental flow rather than using prevailing LRIC methodology. This would allow LRMC based pricing of Entry Capacity increments and would result in all capacity prices being calculated on the same basis and would therefore facilitate the use of a single charging model.

Treatment of Spare Capacity

3.18 One of the key questions discussed as part of the Gas TCMF is the treatment of spare capacity within the Transport model. Under the current arrangements, spare capacity is included within the Transport Model, whereas under a Transportation Model, spare capacity is not directly included within the model. Appendix A to this Consultation Paper explains the difference of approach between these models and discusses the pros and cons of each approach.

3.19 The issue of whether it is appropriate, and if so, how, to include spare capacity within the capacity charging methodology is extremely challenging, ensuring that there is an appropriate balance between the charging methodology objectives in respect of cost reflectivity, promoting competition and avoiding undue discrimination, while ensuring efficient and economic operation of the NTS.

3.20 Above all, capacity charges should be set to provide forward looking Long Run Marginal Costs to provide stable and predictable locational signals to Users to inform their decisions over where and when to bring gas into, or offtake gas from, the NTS. The inclusion of spare capacity within the Transport Model may be seen to undermine these key objectives as inclusion of spare capacity is a transient feature of a network determined by the latest view of forecast supply/demand.

3.21 In contrast, it is important to ensure that the setting of capacity prices does not obviously discourage the use of any genuine spare capacity on the NTS, which could, in the extreme, lead to asset stranding. This issue is most apparent in relation to declining terminals for which actual NTS investment may have previously been undertaken (backed by Users meeting the relevant capacity release test), but then flows subsequently decline. While there is a benefit of signalling where spare capacity is available through capacity charges, this would only be the case if the level of spare capacity modelled is the level available taking into account all reasonable demand requirements i.e. is deemed to be sufficiently stable.

3.22 In addition, where capacity prices are set to not discourage use of genuine spare capacity, thereby resulting in the benefit of previous investments conferred on new Users of certain entry/exit points, then the cost of such investments are recovered from Users at other entry/exit points. Under the current arrangements, this would be through the application of the TO Commodity Charge. There would also be a difference between capacity costs incurred by existing Users that triggered the initial investments and such new Users for the same level of capacity utilisation. The extent of such cross-subsidy is a fundamental consideration in respect of the capacity charging methodology.

4 Options for Consultation

This section sets out a number of options for consultation in respect of the most appropriate methodology for calculation of NTS Entry Capacity Prices from 1 April 2007 and NTS Exit Capacity Prices from 1 April to 30 September 2010.

Option 1 – Engineering Model Based Approach

In the event that this option is implemented, Appendix D presents indicative NTS Exit Capacity Prices and Appendix E indicative NTS Entry Capacity Reserve Prices which would be in place from 1st April 2007.

NTS Exit Capacity Charging Methodology

Transport Model

It is proposed that the current methodology is continued i.e.

4.1 Long Run Marginal Costs (LRMCs) of each entry-exit route are determined using the Transcost Model, as described within the prevailing Charging Methodology.

4.2 For clarity and comparison with other options, this implies the determination of LRMCs for each entry-exit route based on a weighted average of 10 network analyses using the most recent forecast of supply and demand for the next 10 Gas Years.

However the following changes to the investment costs used within Transcost are proposed:

4.3 Investment costs would be calculated from the costs for all NTS investment work carried out over an 8 year period, including NTS investment work carried out during the previous 4 years in addition to the NTS investment planned for the next 4 years.

4.4 The project investment costs will then be adjusted by applying the Structural Steelwork Labour Costs price index to take into account the rates of change in the provision of network infrastructure, such as steel prices, construction costs and general inflation.

4.5 A more detailed description of this process is contained within Appendix B sections 5 to 12.

Tariff Model

The following changes to the current methodology statement are proposed in respect of the determination of NTS Exit Capacity Prices from the LRMCs for each entry-exit route calculated using the Transport Model:

4.6 *Project Management and Operating Costs / Calculation of Annuitised Costs* – The operating costs and the annuity discount factor[4] stated within the current Charging Methodology Statement are proposed to be parameterised and set by reference to the relevant values in National Grid NTS's GT Licence. These are used to convert the LRMC route costs into a LRMC route prices (in pence per peak day kilowatt-hour per day).

[4] The Licence anuitisation factor is currently 0.10772 based on a rate of return of 6.25%.

4.7 *Calculation of NTS Capacity Charges*

- LRMC route prices are proposed to be disaggregated into LRMC reflective Entry and Exit prices using Excel Solver such that in aggregate 50% of route costs are targeted at NTS Entry Points and 50% of route costs at NTS Exit Points (this constraint allows a unique solution to be found as opposed to applying the non-negativity constraint). This will be achieved by ensuring the average positive values of the entry prices equals the average positive values of the exit prices. This step therefore results in “raw” NTS Entry and Exit Capacity Prices.
- These “raw” NTS Exit Capacity prices are then adjusted to ensure recovery of the relevant amount of allowed TO revenue from exit Users, as opposed to scaling under the current arrangements. it is proposed that this is achieved by adjusting additively the “raw” prices such that the resulting positive prices would recover the allowed revenue. This would preserve the locational differentials between the “raw” NTS Exit Capacity prices.
- Any negative prices are set to the minimum level of 0.0001 p/kWh/day as part of the adjustment process.

4.8 *Capacity Charge Re-balancing* - No year-on-year capping of prices would be undertaken.

NTS Entry Capacity Charging Methodology – Reserve Prices

4.9 Under this option, reserve prices for use in Entry Capacity auctions (prior to any discount that may be applied)[5] would be determined using the same approach as proposed for NTS Exit Capacity Prices, except that the adjustment process would not be undertaken.

4.10 However there is a choice of increment size to be used in the Transcost analysis:

- Option 1a - The same increment size as used for exit price determination (2.834 Mscm/d) could be applied, and hence Entry and Exit prices set in a simultaneous manner from the same Transcost runs; or
- Option 1b - A larger increment size could be used reflective of the typical larger entry flows. 6 mscmd is proposed under this option consistent with that used to determine UCA for the 2002 – 2007 Transmission Price Control.

4.11 Reserve Prices would be updated under this option consistent with updates to the NTS Exit Capacity Prices based on the most up-to-date supply/demand forecasts and network models. This process would typically be undertaken to set updated reserve prices for application in entry capacity auctions held in each Gas Year.

[5] Proposals to amend the current discounts applied to the Entry Capacity Reserve Prices will be put forward in a separate Consultation Paper

NTS Entry Capacity Charging Methodology – Step Prices

4.12 Under this option, no changes are proposed to the methodology by which incremental step prices are determined. However it is proposed that this methodology which is currently set out in the Incremental Entry Capacity Release Methodology Statement is included in the Charging Methodology for consistency and clarity[6].

Option 2 – Transportation Model Based Approach

In the event that this option is implemented, Appendices D, E and F present indicative NTS Exit and Entry Capacity Prices that would be in place from 1st April 2007.

NTS Exit Capacity Charging Methodology

Transport Model

It is proposed that:

4.13 NTS Exit Capacity Prices are determined from a Transportation Model that calculates the Long Run Marginal Costs (LRMCs) of transporting gas from each entry point to a "reference node" and from the "reference node" to each relevant offtake point.

- The transportation model minimises the flow distance of gas around the network given the assumed pattern of supplies and demands and the constraint that at any node, demand plus flow to other nodes must equal supply and flow from other nodes.
- Any incremental flow down a line results in a reinforcement requirement, with a standard reinforcement cost. It does not consider the way in which pressure, pipeline diameter / length and flow interact – it simply assumes that, for the standard reinforcement cost, incremental flow can be routed down each existing pipeline route.
- The transportation model calculates the marginal costs of investment in the transmission system that would be required as a consequence of an increase in demand or supply at each connection point or node on the transmission system. The measure of the marginal investment costs is in terms of £/GWhkm, hence marginal changes in flow distances based on increases at entry and exit points are estimated initially in terms of increases or decreases in units of kilometres of the transmission system for a small energy injection to the system.

4.14 The Expansion Constant is determined from the average cost of incremental capacity for 900mm, 1050mm and 1200mm pipeline of 100km length and recompression to 85 bar(g), calculated according to the methodology set out in Appendix B of this document. Based on this methodology, an expansion constant of £2223/GWhkm would be applied for prices effective from 1 April 2007.

[6] Removal of the methodology from the IECR will require a separate consultation.

4.15 Prices for each Gas Year are calculated using the relevant year's 1-in-20 peak Base Case data[7] and network model (e.g. if setting Exit Capacity prices for Gas Year 2006/7, the Base Case supply/demand forecast for 2006/7 and the base network model are used). LRMCs are therefore proposed to be set based on analysis for a single year (as opposed to 10 years under the current arrangements).

Tariff Model

4.16 The following changes to the current methodology statement are proposed in respect of the determination of NTS Exit Capacity Prices from the LRMCs for each reference point to exit route calculated using the Transport Model:

4.17 *Project Management and Operating Costs / Calculation of Annuitised Costs* – The operating costs and the annuity discount factor[8] stated within the current Charging Methodology Statement are proposed to be parameterised and set by reference to the relevant values in National Grid NTS's GT Licence. These are used to convert the LRMC route costs into a LRMC route prices (in pence per peak day kilowatt-hour per day).

4.18 *Calculation of NTS Capacity Charges*

- NTS Exit Capacity Prices are determined from the "raw" reference point to exit route costs, calculated using the Transportation Model, by adjustment to ensure recovery of the relevant amount of allowed TO revenue from exit Users. It is proposed that this is achieved by adjusting additively the prices such that the resulting positive prices would recover the allowed revenue, as opposed to scaling under the current arrangements. This would preserve the locational differentials between the "raw" NTS Exit Capacity prices.
- Any negative prices are set to the minimum level of 0.0001 p/kWh/day as part of the adjustment process.

4.19 *Capacity Charge Re-balancing* - No year-on-year capping of prices would be undertaken.

4.20 *Aggregation into LDZ Exit Zones* - A single exit capacity price is calculated for each Distribution Network (DN) charging zone, as a flow-weighted average of the NTS Exit Capacity Prices determined for each NTS Exit Point within the DN charging zone (rounded to 4 decimal places)[9].

NTS Entry Capacity Charging Methodology – Reserve and Step Prices

Transport Model

4.21 Under this option, LRMCs for determination of NTS Entry Capacity Baseline Reserve Prices and Incremental Step Prices for use in entry capacity auctions (prior to any discount that may be applied)[10] would be based on the same approach as proposed for NTS Exit Capacity Prices (under option 2), except for the following differences:

[7] The Base Case data is consulted on through the Transporting Britain's Energy (TBE) process and is published in the Ten Year Statement.

[8] The Licence anuitisation factor is currently 0.10772 based on a rate of return of 6.25%.

[9] Note that under the current methodology this step is undertaken prior to the application of the Project Management and Operating Costs.

[10] Proposals to amend the current discounts applied to the Entry Capacity Reserve Prices will be put forward in a separate Consultation Paper

In respect of the supply and demand data input into the Transport Model, it is proposed that:

4.22 Prices for each Gas Year are set on the basis of the relevant year's base case data and network model, but with adjustments to the supply flows (see paragraph 4.25) to reflect the capacity level in question (see paragraph 4.23) to maintain a balanced network for charging purposes. For the avoidance of doubt, 1-in-20 peak demand flows will remain unadjusted.

4.23 Entry Capacity <u>Baseline</u> Reserve Prices are set by adjusting supply flows in the Base Case data to reflect either;

- Option 2a - the Base Case supply (capped at the baseline/obligated capacity level) at each NTS Entry Point (this will therefore be equal to or less than the obligated NTS SO Baseline Entry Capacity level as defined by National Grid's NTS Licence)[11]. For the avoidance of doubt the Base Case supply level at Interconnector, LNG importation and storage Entry Points will be the expected maximum capability of the facility;
- Option 2b - the obligated NTS SO Baseline Entry Capacity level, as defined by National Grid's NTS Licence, at each NTS Entry Point.

4.24 Entry Capacity <u>Incremental</u> Step Prices for incremental capacity release are set by adjusting supply flows in the Base Case data to reflect the appropriate incremental capacity level at each NTS Entry Point (the incremental capacity steps as defined by the Incremental Entry Capacity Release Methodology).

4.25 The supply flow at each NTS Entry Point is adjusted to reflect the required capacity level as follows:

- The supply flow is fixed at the capacity level to be provided for the entry point in question
- All other supply flows are adjusted up or down in order of merit to balance the network back to the peak 1 in 20 demand level in the Base Case data

4.26 The supply merit order for each NTS Entry Point reflects the least beneficial alternate supply flow, in terms of enabling capacity provision at that entry point.

4.27 The supply merit order is determined by use of the Transportation Model with the Base Case scenario to calculate pipeline distances from each NTS Entry Point to every other entry point.

4.28 For NTS Entry Points where flow needs to be added to the Base Case flow to align with the required capacity level, the remaining entry point flows are reduced in order of pipeline distance merit, starting with the furthest entry point ending with the entry point with the nearest entry point.

4.29 For NTS Entry Points where flow needs to be reduced from the Base Case flow to align with the required capacity level, the remaining entry point flows are increased in order of pipeline distance merit, starting with the nearest entry point and ending with the furthest entry point.

In respect of network model data used in the Transport Model, it is proposed that:

4.30 The appropriate network model for each period of capacity allocation is used i.e. the network model that includes sanctioned projects expected to be completed by the start of the Gas Year that is being modelled.

[11] This is a change of policy from setting baseline reserve prices from Licence UCAs, uplifted for inflation

4.31 The relevant baseline capacity reserve price for each Gas Year is used to set prices in auctions[12], as summarised below

- For RMSEC and DSEC Baseline Reserve Prices published in respect of Gas Year Y), this means the network model including all projects expected to be completed for the start of Gas Year Y;
- AMSEC Baseline Reserve Prices published in respect of capacity allocation across three Gas Years (Gas Years Y, Y+1, Y+2), this means the network models including all projects expected to be completed for the start of each of these Gas Years;
- For QSEC Baseline Reserve Prices and Incremental Step Prices published in respect of future Gas Years (Gas Years Y+2, Y+3 to Y+16), this means the network model including all projects expected to be completed for the start of Gas Year Y+2.[13]

Table 4-1 summarises the use of network and supply/demand year models for calculation of NTS Entry Capacity Baseline Reserve Prices and Incremental Step Prices applicable from 1 October in calendar Year N (corresponding to Gas Year Y) in chronological order of auction dates and capacity release.

Table 4-1: Gas Years Modelled and Capacity Allocation Periods

<table>
<tr><th rowspan="2">Auction</th><th rowspan="2">Date Held</th><th colspan="2">Gas Day - Capacity Allocation</th><th rowspan="2">Gas Year Modelled</th></tr>
<tr><th>From</th><th>To</th></tr>
<tr><td rowspan="2">QSEC</td><td rowspan="2">September [N]</td><td>1 Apr [N+3]</td><td>30 Sep [N+3]</td><td>Y+2</td></tr>
<tr><td>1 Oct [N+3]</td><td>30 Sep [N+16]</td><td>Y+2</td></tr>
<tr><td>RMSEC</td><td>Sep [N] to Aug [N+1]</td><td>1 Oct [N]</td><td>30 Sep [N+1]</td><td>Y</td></tr>
<tr><td>DSEC
(Day Ahead)</td><td>30 Sep [N] to 29 Sep [N+1]</td><td>1 Oct [N]</td><td>30 Sep [N]</td><td>Y</td></tr>
<tr><td>DSEC
(Within Day)</td><td>1 Oct [N] to 30 Sep [N+1]</td><td>1 Oct [N]</td><td>30 Sep [N]</td><td>Y</td></tr>
<tr><td rowspan="3">MSEC</td><td rowspan="3">February [N+1]</td><td>1 Apr [N+1]</td><td>30 Sep [N+1]</td><td>Y</td></tr>
<tr><td>1 Oct [N+1]</td><td>30 Sep [N+2]</td><td>Y+1</td></tr>
<tr><td>1 Oct [N+2]</td><td>31 Mar [N+3]</td><td>Y+2</td></tr>
</table>

[12] This is a change from the current policy of using a single reserve price for each entry point over all auctions.

[13] Gas Year Y+2 is the last year where investment projects have been triggered by previous auction outcomes.

Table 4-2 summarises the use of network and supply/demand year models for calculation of NTS Entry Capacity Prices from 1 April 2007.

Table 4-2. Network Data Summary

Auction	Date Held	Gas Day - Capacity Allocation		Gas Year Modelled
		From	To	
DSEC (Day Ahead)	1 Apr 2007 to 29 Sep 2007	2 Apr 2007	30 Sep 2007	2006/7
	30 Sep 2007 to 29 Sep 2008	1 Oct 2007	30 Sep 2008	2007/8
DSEC (Within Day)	1 Apr 2007 to 30 Sep 2007	1 Apr 2007	30 Sep 2007	2006/7
	1 Oct 2007 to 30 Sep 2008	1 Oct 2007	30 Sep 2008	2007/8
RMSEC	Apr 2007 to Aug 2007	1 May 2007	30 Sep 2007	2006/7
	Sep 2007 to Aug 2008	1 Oct 2007	30 Sep 2008	2007/8
QSEC	September 2007	1 Apr 2010	30 Sep 2010	2009/10
		1 Oct 2010	30 Sep 2026	2009/10
MSEC	February 2008	1 Apr 2008	30 Sep 2008	2007/8
		1 Oct 2008	30 Sep 2009	2008/9
		1 Oct 2009	31 Mar 2010	2009/10

<u>Tariff Model</u>

4.32 The same process to covert LRMCs into entry baseline reserve prices and incremental step prices is proposed as for NTS Exit Capacity Prices, with the exception that there is no adjustment to prices for revenue recovery purposes.

<u>NTS Entry Capacity Baseline Reserve Prices for New NTS Entry Points</u>

For the avoidance of doubt, no changes are proposed to the current policy in respect of new NTS Entry Points:

4.33 For new NTS Entry Points, where no permanent obligated entry capacity has been sold i.e. where an entry point does not have an obligated baseline entry capacity level (as currently defined National Grid's NTS Licence), the entry capacity baseline reserve price is set at zero.

4.34 Where permanent obligated capacity has been sold at an NTS Entry Point in previous auctions, it is treated consistently with those entry points that have a Licence-defined obligated baseline capacity level.

Alternative Options

4.35 In conjunction with the industry through the Gas TCMF, National Grid NTS developed a range of options for determination of Long Run Marginal Costs (LRMCs) for capacity charging. The four modelling options, not already covered by options 1 and 2 within this document, are detailed below. The models have been developed and run to allow comparison and better understanding of the options. A Progress Report (Gas TCMF PR 01) has been placed on National Grid NTS's industry information website summarising the analysis and results

<table>
<tr><th>Model</th><th colspan="3">Transport Model</th><th colspan="2">Tariff Model</th></tr>
<tr><td>Model A</td><td>Transcost</td><td>Spare Capacity, No Backhaul</td><td rowspan="3">2.834 mscmd increment</td><td>Solver with non-negative constraint</td><td>Exit prices scaled to allowed revenue</td></tr>
<tr><td>Model C</td><td>Transcost</td><td>Spare Capacity & Backhaul proxy</td><td>Solver with 50-50 Constraint</td><td rowspan="3">Exit prices adjusted to 2006/7 allowed revenue</td></tr>
<tr><td>Model D</td><td>Transcost</td><td>Backhaul proxy and No-spare capacity</td><td>Solver with 50-50 Constraint</td></tr>
<tr><td>Model F2</td><td>Transportation Model</td><td>Backhaul and No-spare capacity</td><td>Pipe diameter specific Exp. Factors</td><td>Reference node adjusted to 50-50</td></tr>
</table>

4.36 National Grid NTS invites views on all the alternate charging model options outlined in the Gas TCMF progress report Gas TCMF PR 01. Models B and F1 (document within the Gas TCMF progress report) represent options 1 and 2 (contained within this consultation document) respectively.

5 Discussion

This section presents National Grid NTS's views in respect of the extent to which the options set out under section 4 would achieve the relevant methodology objectives under National Grid NTS's GT Licence and the EU Gas Regulations (as summarised under Appendix C).

Cost Reflectivity

5.1 Under National Grid NTS' GT Licence, the relevant methodology objectives define cost reflectivity as "charges which reflect the costs incurred by the licensee in its transportation business". This specifically applies to all transportation charges except those established by auctions.

5.2 It is important to note the difference of approach between the Transcost Model (option 1) and Transportation Model (option 2) in respect how each determines LRMCs and hence the degree to which each model is deemed "cost-reflective". It is considered that the licence definition of costs reflectivity is open to interpretation, but in many respects may fit closer with a Transportation Model approach.

<u>Treatment of Spare Transmission Capacity</u>

5.3 **Option 1** - Prices generated from the Transcost model are more reflective of the incremental investment costs that will be incurred than option 2. This results in Users paying for capacity on the basis of capacity that happens to be available in the local vicinity. When peak spare capacity is present, recovering the costs associated with this capacity via other charges will therefore lead to cross subsidies, and could therefore be argued to be less cost reflective in this respect.

5.4 If a single year is modelled with Transcost, and therefore without taking out spare transmission capacity, the resulting charges are volatile and will not, over a period of time, be reflective of costs incurred in adding capacity. Costs may be minimal when there is spare capacity and at an annuitised LRMC when there is congestion, which over time would not cover the cost of the investment. Generating prices from a ten year model might reduce the volatility but would mean that prices were reflective of the average cost over the ten year period rather than a specific year. This would be inconsistent with the period when exit capacity is being procured and the period for which entry capacity is procured in the medium and short term auctions.

5.5 **Option 2** – In contrast, the prices generated from the Transportation Model are reflective of both the costs that have been incurred in making physical system capacity available (through the assumptions in the Expansion Constant) and the actual marginal costs that would be incurred by incremental capacity release relative to the prevailing system capacity. Calculating prices on a single year analysis with a Transportation Model will therefore result in Users paying differentially for the capacity they hold and potentially use during the relevant Gas Year.

<u>Backhaul Benefit</u>

5.6 **Option 2** - A key benefit of this option is that the Transportation Model is more easily able to accommodate the beneficial effects of counter-flows than option 1 due to the fact that it does not include spare capacity. This effects in particular the prices set for northerly exit points as explained below.

Generating Entry and Exit Charges from Route Costs

5.7 **Option 1** - In the prevailing Charging Methodology, the Excel Solver is used to generate Entry and Exit prices from a route cost matrix produced by Transcost. The solver iteratively calculates a set of entry and exit prices which minimises the difference between the entry plus exit prices and the route costs estimated by Transcost. This process would be retained within option 1.

5.8 Through analysis presented at the Gas TCMF, National Grid NTS has demonstrated that entry plus exit costs can only exactly match the route costs when a model does not include spare transmission capacity but does include a backhaul benefit equal to the avoided cost of investment[14]. It is the presence of spare peak transmission capacity and the lack of a backhaul benefit inherent in the Transcost approach combined with the latest supply and demand scenario that produces the counter intuitive allocation of costs to northern exit points and southern entry points demonstrated via the Gas TCMF analysis[15]. A number of Tariff model changes were investigated to attempt to remove these pricing distortions but none were successful.

Exit Tariff Adjustment

5.9 **Options 1 and 2** - It is National Grid NTS's view that the objective of NTS Entry and Exit Capacity Prices is to provide price signals to Users in relation to the relative cost associated with providing capacity at different locations around the network. The advantage of the proposed Tariff model approach common to both options 1 and 2, where exit prices are adjusted (additive) rather than scaled (multiplicative), is that it preserves the locational price differentials between Entry points and between Exit points and hence preserves the relative cost-reflectivity.

Decoupling of Revenue Drivers

5.10 **Options 1 and 2 -** National Grid NTS's view is that removing the link between UCAs for incremental revenue determination and NTS Entry Capacity Baseline Reserve Prices, common to both options 1 and 2, and setting prices using annually updated LRMCs would be more cost reflective than allowing reserve prices to continue to be set from revenue drivers, where those revenue drivers may not be updated over the formula period and may therefore become less cost reflective over time.

Exit Rebalancing

5.11 **Options 1 and 2 -** Rebalancing of exit capacity tariffs to reflect changes in supply/demand and network configuration has not been undertaken since 2001. This was due to the desire to delay rebalancing on the expectation that NTS exit reform would be implemented in 2002. Subsequent delays to reform have lead to a significant divergence in current tariffs and underlying LRMCs in certain locations. The benefit of updating exit capacity prices would be delivered under both options 1 and 2.

[14] Gas TCMF Analysis Report October 2006– Section 5

[15] Gas TCMF Analysis Report October 2006– Section 7

<u>Removal of Exit Price Capping</u>

5.12 **Options 1 and 2 -** Prices are inherently driven by the supply & demand changes and hence subject to change year-on-year. The prevailing exit capacity price capping rules limit the year-on-year change and hence erode genuine cost reflectivity. The proposed Tariff model would increase cost reflectivity by removing year-on-year price capping. This can in part be justified by the move to a single year model as the price capping rules are mainly removing the impact of forecast error.

Promoting Efficiency and Avoiding Undue Preference

<u>Single Year Model Price Signals</u>

5.13 **Option 2** - A single year model will allow National Grid NTS to generate both locational and temporal pricing signals to Users. For example, where a large new entry project is anticipated to come on stream, exit users will be able to determine when connection to the NTS in the same locality is most efficient in terms of capacity provision (as local exit prices will be predictable and likely to fall after the entry point first flows onto the NTS). National Grid can therefore avoid investment to continue to meet its security of supply obligations where users can make more informed choices regarding the timing of their connection to take advantage of lower prices in the future. This would not be the case for prices based on ten years of data.

5.14 In addition, a single year model will avoid the circularity caused by entry capacity auction prices being based on future network and supply/demand data which are, by their very nature, forecasts of auction outturns.

<u>Supply Data</u>

5.15 **Option 2** - All network analysis requires a balance between supply and demand and this is equally true of charging models. Under the prevailing Charging Methodology the supply forecasts are adjusted to obtain a supply and demand match given the 1-in-20 demand level. This means that some Entry Points are not explicitly at their Base Case supply levels within the charging model.

5.16 This could be overcome under option 2 by carrying out Entry Point specific analysis for those Entry points that were not at their Base Case levels in the initial analysis and obtaining a supply and demand balance by supply substitution.

5.17 For example, where an Entry points was not at its Base Case level due to a supply surplus or where a supply was not at its Baseline level, it could be adjusted to that level with the entry point furthest from the entry point in question being adjusted in the opposite direction.

5.18 This approach ensures that all prices would be generated at a consistent supply level hence avoiding the undue preference that might be conferred by pricing some Entry Points based on reduced flows. For the avoidance of doubt the Base Case supply level at LNG importation and storage Entry Points will be the expected maximum capability of the facility.

<u>Decoupling of Revenue Drivers:</u>

5.19 **Options 1 and 2** - The removal of the link between UCAs and prices, common to both options 1 and 2, would also ensure that the most economic and efficient locational signals for capacity between entry points are maintained over the course of the formula period. This would help users to make informed choices about where it is more efficient to signal their capacity requirement, in terms of the operation of the NTS.

5.20 **Options 2a/2b -** Entry pricing based on UCAs would result in stable prices even where entry terminal flows are forecast to decline. Pricing based on the baseline/obligated level (option 2b) reflects the requirement on National Grid to release up to the baseline level of capacity on each gas day, and also reduces the sensitivity of the prices to forecasts of supply flows. Pricing based on forecast Base Case flows, capped at the baseline/obligated capacity level (option 2a), will ensure that where entry terminal (or exit point) flows are forecast to decline, the resulting prices will reduce hence creating an incentive to utilise any spare capacity released as a result of declining flows.

Stability and Predictability

5.21 **Option 1** - Prices are inherently driven by the supply and demand scenario and hence subject to change. Transcost (option 1) was developed to replicate and simplify the decision making used in determining network investment with Falcon. Transcost was developed when flow patterns in the network were stable and when network load was forecast to grow steadily. At the time, due to the stable flow pattern, the choice of network configuration and compressor and regulator parameter setting within Transcost were simply based on the prevailing flow direction. By contrast, due to unstable and uncertain patterns of flow forecast in the near future, the choice of network configuration and compressor and regulator parameters is more time consuming and requires more sophisticated and arguably subjective network analysis. In particular, the choice of model parameters can influence the way that spare transmission capacity is generated for different flow scenarios.

5.22 **Option 2** - At first sight, the Transportation Model might be perceived to be less cost reflective than a model which reflects the full physical realities of a gas transmission system. Replacing Transcost and Falcon within the charging process with a Transportation Model (option 2) removes the potential for subjectivity and sensitivity in the generation of capacity prices as the parameters that lead to instability (the choice of network configuration and compressor and regulator parameters) would no longer be modelled.

Spare Transmission Capacity

5.23 **Option 2b** - While the Transportation model does not explicitly include spare transmission capacity, pricing based on forecast Base Case flows, capped at the baseline/obligated capacity level (Option 2b), will ensure that where entry terminal (or exit point) flows are forecast to decline, the resulting prices will reduce hence creating an incentive to utilise any spare capacity released as a result of declining flows. The implications of removing spare capacity are discussed in more detail in appendix A. If this approach is not sufficient then further discounts to baseline capacity could be applied. Discounts to Entry Capacity reserve prices are to be discussed in consultation paper NTS GCM 02.

Consistency

5.24 **Option 2 -** Implementation of option 2 from 1st April 2007 will ensure that all entry and exit NTS Capacity Prices are set on a consistent basis with prices being determined from a single transparent charging model.

Promoting Competition

Transparency

5.25 **Option 2** - It is National Grid's view that competition can be promoted in terms of the development of the Gas Transmission Transportation Charging Methodology by making it simple and easy to understand such that prices can be replicated and forecast by Users. While at first sight, the Transportation Model might be perceived to be less cost reflective than a model which reflects the full physical realities of gas transmission system, there are significant benefits in term of transparency and predictability. Using a single year's forecast would allow the prices for the remaining years of the ten year plan to be forecast by both National Grid NTS and the wider industry. It is anticipated that this feature of the revised methodology would give greater confidence to users and reduce risk associated with price uncertainty hence promoting competition and reducing barriers to entry. National Grid believes the use of a single charging model (option 2) will allow it to make more consistent estimates of LRMCs and therefore avoid undue preference in capacity pricing. The single charging model also allows both National Grid NTS and the users to easily make quick assessments of the value of incremental capacity, therefore enabling the user to make informed decisions about purchasing capacity.

Single Charging Model

5.26 **Option 2 -** If a single model is to be used to calculate all capacity prices then a single approach must be adopted. The prevailing use of LRICs for incremental entry capacity pricing (see the Incremental Entry Capacity Release Methodology Statement) and LRMCs for exit pricing is the key obstacle to a single charging model. This obstacle would be overcome through this proposal by basing prices on the Entry LRMCs calculated from revised supply/demand scenarios where each entry point was adjusted to the baseline plus incremental flow rather than using prevailing LRIC methodology. This would allow a LRMC based pricing approach for all entry capacity prices, resulting in all NTS entry and exit capacity prices being calculated on the same basis. The proposal would therefore facilitate the use of a single charging model.

Summary

5.27 In summary, the introduction of the Transportation model (option 2) to replace Transcost and Falcon would:

- Allow entry and exit capacity prices to be determined by a single model (as opposed to using a combination of Transcost and Graphical Falcon);
- Avoid the transparency and repeatability issues of engineering based models, and therefore improve predictability;
- Be simpler and easier to use and more transparent;
- Give greater confidence to Users and reduce risks associated with price uncertainty thereby promoting competition and reducing barriers to entry;
- Avoid the costs associated with making Transcost and Falcon publicly available.

5.28 However, such an approach would be a fundamental change in the treatment of spare capacity within the capacity charging methodology (as discussed in more detail in Appendix A). As the availability of peak spare transmission capacity reduces, these issues become less relevant in the capacity charging debate.

6 Questions for Consultation

National Grid NTS invites views in respect of which the options set out under section 4 would best achieve the relevant charging objectives under National Grid NTS GT Licence and the EU Gas Regulations, specifically that:

<u>Transport and Tariff Model Changes</u>

Q1. LRMCs are calculated from either;

- **(a) Option 1: The Engineering model Transcost, consequentially including peak spare capacity but excluding any backhaul benefit, or;**
- **(b) Option 2: a Transportation model of the NTS, consequentially excluding spare transmission capacity and including a backhaul benefit equal to the avoided cost of reinforcement, or;**
- **(c) An alternative approach outlined in the Gas TCMF Progress Report GTCMF PR 01.**

Q2. NTS Capacity Prices are determined from either;

- **(a) Option 1: a ten year Supply & Demand forecast using the current Gas Year's Base Case data and network model, or;**
- **(b) Option 2: a single year Supply & Demand forecast using the relevant Gas Year's Base Case data and network model for the capacity released.**

Q3. Baseline Entry capacity prices are determined either;

- **(a) Option 1: using a single analysis of the Base Case scenario adjusted to the 1-in-20 demand level, or;**
- **(b) Option 2: from the TYS base case scenario, with Entry point specific analysis, such that each NTS Entry Point was at the relevant supply level and a supply/demand balance achieved via supply substitution.**

Q4. Views are invited as to whether the relevant supply level referred to in Q3, used to determine Baseline Entry Capacity prices, should be either;

- **a) Option 2a: the Base Case supply (capped at the baseline/obligated capacity level) at each NTS Entry Point (this will therefore be equal to or less than the obligated NTS SO Baseline Entry Capacity level as defined by National Grid's NTS Licence), or;**
- **b) Option 2b: the obligated NTS SO Baseline Entry Capacity level, as defined by National Grid's NTS Licence, at each NTS Entry Point.**

Q5. Incremental Entry Capacity prices are determined either;

- **(a) Option 1: the prevailing methodology, or;**
- **(b) Option 2: using the TYS Base Case scenario, from a series of Entry Point specific analyses with the relevant NTS Entry Point adjusted to the obligated capacity plus step increment level and a supply/demand balance achieved via supply substitution.**

Q6. Entry and Exit LRMCs be calculated from either;

(a) Option 1: route costs disaggregated into Entry and Exit costs using the Excel Solver such that in aggregate 50% of route costs are targeted at NTS Entry Points and 50% of costs at NTS Exit Points (the average positive values of the entry LRMCs equals the average positive values of the exit LRMCs), or;

(b) Option 2: the cost from a "reference node" to each relevant offtake point and the cost from each entry point to the "reference node" and that the LRMCs is adjusted to give a 50:50 split between average positive value of these adjusted Entry & Exit costs, or;

(c) the prevailing methodology.

Q7. LRMCs are converted into prices using the anuitisation factor set out in National Grid's NTS Transportation Licence.

Q8. The raw Exit Prices are adjusted such that the positive values can be used to set prices to recover allowed revenue and that the negative prices are removed as part of the adjustment step.

Q9. No year-on-year capping of NTS Exit Capacity prices is included in the methodology.

<u>Implementation</u>

Q10. The combined Transport and Tariff model used by National Grid NTS to determine NTS Capacity Prices, be made publicly available.

Q11. The Incremental Entry Capacity price determination methodology is included within the Gas Transmission Transportation Charging Methodology.

Q12. This proposal is implemented for price determination in relation to all exit capacity from 1st April 2007 to 30th September 2010

Q13. This proposal (NTS GCM 01) is implemented for price determination in relation to all entry capacity auctioned from 1st April 2007.

The closing date for submission of your responses is **Thursday 30th November 2006**.

Your response should be e-mailed to jan.gascoigne@uk.ngrid.com or alternatively by post to Jan Gascoigne, Regulatory Frameworks, National Grid, National Grid House, Gallows Hill, Warwick, CV34 6DA. If you wish to discuss any matter relating to this Charging Methodology consultation then please call Eddie Blackburn ☎ 01926 656022.

Responses to this consultation will be incorporated within National Grid NTS's conclusion report. If you wish your response to be treated as confidential then please mark it clearly to that effect.

Appendix A - Treatment of "Spare" Capacity

Introduction

1. In the event that a Transportation model was used for setting gas transmission entry and exit capacity charges, this approach would be fundamentally different from the current capacity charging methodology on the basis that it does not directly model spare capacity which may be inherent in the network.
2. This appendix explains the difference in such approaches and discusses whether it is appropriate to continue including spare transmission capacity within the Transport Model.

Background – Transport Models

Current Arrangements (Transcost/Falcon)

3. NTS Entry Capacity Incremental Prices and Exit Capacity Charges are based on the estimated Long Run Marginal Cost (LRMC) of reinforcing the transmission system to transport additional gas between entry and exit points. The LRMC approach employed derives forward-looking charges, which are intended to provide economically efficient signals to system Users.
4. A model, known as Transcost, is used for most capacity levels[16] to estimate LRMCs for a given increment size[17] for each entry-exit route based on a close approximation to the physical network and a 10 year forecast of 1-in-20 peak supply / demand.
5. Transcost simplifies the decision making employed by Falcon analysts to determine necessary and sufficient reinforcements to support a given supply/demand case whilst sustaining minimum system pressures at NTS offtakes and not breaching maximum operating pressures.
6. Costs are generated based on the optimum investment (pipe or compression) identified to maintain minimum system pressures for a notional increase in flow along each entry-exit route given the supply and demand scenario.
7. Investment is identified only when minimum system pressures are breached i.e. when the available unutilised capacity has been utilised. Therefore, the more constrained a route is in terms of available capacity, the higher the level of investment necessary.
8. The consequence of this approach is that where actual NTS investment has previously been undertaken (backed by Users meeting the relevant capacity release test) and flows subsequently decline, or investment has been undertaken for a scenario other than the 1-in-20 peak, apparent "spare" capacity becomes available at the 1-in-20 peak scenario. The benefit of such spare transmission capacity is released to Users in the local vicinity by setting "lower" capacity charges. This is the case at terminals such as St Fergus.

[16] In respect of the setting of incremental price schedules for incremental NTS entry capacity, Falcon is used for increments > 12 Mscm/d due to limitations of the Transcost model.

[17] For exit, an increment of 2.834 Mscm/d is used. For entry, increments of 1.5 Mscm/d up to 12 Mscm/d are used within Transcost and then 3 increment sizes within Falcon.

9. It should be noted that the spare transmission capacity generated through use of Transcost for any one supply/demand scenario may not necessarily manifest itself in a different supply/demand scenario, as it is intrinsically linked to the system pressures achieved in the analysis. In other words, the level and location of unutilised capacity is determined by both the flow patterns in the system and the pressures around the system.

Transportation Model Approach

10. The Transportation Model is based on a simplified form of the actual network (using only network nodes, and the length of the pipeline segments between nodes). It minimises the aggregate energy flow around the network for a given supply/demand scenario.
11. Investment costs are estimated by expansion constants (expressed in terms of £ per GWhkm), which are intended to reflect the long run forward-looking marginal cost of providing additional capacity on the transmission system.
12. The model assumes that, for a standard reinforcement cost, incremental flows can be routed down each existing pipeline route (i.e. capacity is "unlimited"). The marginal costs at each node are the marginal reinforcement cost to a reference node. These costs represent the nodal Entry costs and the negative of these costs represent the Exit costs.
13. Spare capacity is not included in such a model as all incremental flows result in incremental locational costs (for flows in the direction of the prevailing flow).
14. The consequence of this approach is that where investment has previously been undertaken (backed by Users meeting the relevant capacity release test) and flows subsequently decline, or investment has been undertaken for a scenario other than the 1-in-20 peak, spare physical capacity becomes available in the 1-in-20 peak scenario and the benefit of such spare transmission capacity is conferred on all Users. Hence at St Fergus, higher charges would result compared to the Transcost approach.

Single Year or Multi-year Modelling and the Treatment of Spare Transmission Capacity

15. Currently, gas charges are based on network modelling over a ten year period. The modelling incorporates the actual capacity on the network – and hence, takes into account spare transmission capacity.
16. The timescale of modelling and the treatment of spare transmission capacity are two areas of the charging regime that are linked – changes in one area may require a change in the other in order to remain consistent.
17. If charges are only based on a single year of modelling, the inclusion of spare transmission capacity will tend to result in unstable charges as a result of the lumpiness of network investment. There tends to be step changes in investment costs as demand grows from one year to the next.

18. For example, in areas which currently have spare transmission capacity, charges will start at or close to zero, and will remain at such levels until spare entry or exit capacity is utilised. Once capacity is fully utilised, charges will tend to reflect investment costs[18], and will tend to remain at this level until the network is reinforced. Following reinforcement, charges will tend to return to zero.

19. If the investment costs in such a regime were calculated as a 45 year annuity of total investment costs, then this would be likely to imply a significant under-signalling of long run marginal costs for areas with spare transmission capacity, as this 45 year annuity would only actually be payable for a small number of years in any investment cycle.

20. Hence, if charges are based on a single year of modelling, it would be appropriate to model the network with no spare transmission capacity. Such a model would tend to exhibit more stable charges, year on year, as the underlying network model would be stable. Any changes in charges would mainly be observed from large changes to the supply scenario used in the model.

21. If spare transmission capacity is included in the charging model, it is more appropriate to average charges over a number of years. It should be noted, however, that multi-year models do not necessarily produce stable charges as uncertainties in supply/demand forecasting may also act to destabilise charges.

Discussion

Availability of Unutilised Capacity

22. There are issues in respect of the determination of unutilised capacity on a network, and hence the Users that would obtain the benefit from the inclusion of spare transmission capacity.

23. 1-in-20 peak demand modelling - The current transmission charging methodology is based on analysis at the 1-in-20 peak demand level as this reflects the obligations upon National Grid to develop the system as stated in licence standard special condition A9. The benefits of spare transmission capacity are therefore only included at peak demand conditions. Off-peak demand may result in a requirement to transport gas supplies from certain locations over greater distances. This may result in a quantity of spare entry capacity being available at the peak demand level yet a lesser or zero quantity being available away from peak demand.

24. For example: at peak, St Fergus flows travel far shorter distances than off-peak (when they may travel as far as Kenn offtake in the South West). Reinforcement may therefore be required for off-peak conditions to support St Fergus flows.

25. At peak, LNG sites are used to support pressures at the extremity of the system, but these flows are not observed off-peak. Again, reinforcement may be necessary to support these extremity pressures off-peak, when storage flows are unlikely to be counter flows, and hence apparent spare exit capacity is available at peak.

[18] Assuming the approach did not change, this investment cost would be represented by the value of an annuity over the economic lifetime of the assets in question

26. Therefore there is a question as to how much spare entry or exit capacity can be guaranteed to be present over all reasonable network conditions, as shippers at terminals where there is spare entry capacity at peak may not always be driving economic use of the system off-peak, if that spare entry capacity "disappears".

27. Conversely shippers that are effectively targeted with the costs of congestion at peak (under a security-of-supply driven planning scenario), may not be realising the benefits of shipping gas from the same entry location when that congestion is not apparent off-peak under normal operating scenarios.

28. <u>Consistency with flow flex release</u> - National Grid has undertaken detailed analysis over a range of supply scenarios in regard to the level of exit flexibility capacity that can be supported throughout the gas year, to inform discussions on exit reform. This has identified that 22 Mscm flex may be sustained nationally, without significant operational risks, subject to zonal maxima.

29. Since flex capacity arises from the under-utilisation of transmission capability (but not necessarily in a uniform way across the system), there is no certainty that spare transmission capability will be available for entry Users on any day if National Grid is obligated to provide pre-defined national/zonal flex capacity levels on each gas day.

30. <u>Transparency and repeatability</u> - Engineering decision-making is required to model spare transmission capacity (which affects where the spare entry or exit capacity manifests itself and is necessarily subjective in nature). This is due to such engineering models requiring the establishment of regulator and compressor settings.

<u>*Determination of Users that should pay for/benefit from unutilised capacity*</u>

31. In the event that the system has unutilised capacity due to historical NTS investments, then the costs of such investments can be recovered from Users by:

    a. Socialising the costs and charging all Users by the same additional amount. This is achieved through capacity charge adjustments to or by levying a commodity charge to recover allowed revenue; or

    b. Locationally targeting the costs of spare transmission capacity. This results in Users paying for the capacity that happens to be available in the vicinity.

32. If spare capacity is excluded when calculating capacity charges then this results in users paying differentially for the capacity they use.

33. If spare capacity is included when calculating capacity charges then this results in users benefiting from the capacity that happens to be identified in the vicinity given the supply and demand scenario used. This benefit would represent a discount on the costs of the capacity utilised and is funded from charges levied on all Users hence creating a cross subsidy.

Impact on Exit Users

34. This Appendix presents data on the impact on administered exit charges of using the current Transcost model, including spare capacity, compared to a model which models backhaul but not spare capacity (Transportation Model).

35. It can be seen that the Transcost based charges cause significant changes to exit charges (-0.0150 to 0.0200 p/kWh/day change) compared to the Transportation Model based charges (+/- 0.0050 p/kWh/day change). To illustrate the relative impact of these potential changes, this can be compared to the highest exit charge in force for 2005/6 is 0.0308 p/kWh/day (SW3).

36. The larger changes due to the Transcost model may be a result of not rebalancing exit charges since 2001. At that time, flow patterns were envisaged to be stable and capacity constraints were anticipated at St Fergus. This scenario probably generated prices more consistent with the Transportation Model as spare capacity was not seen under peak conditions.

37. Since this time, flow patterns have changed significantly, and so the decision making encoded into Transcost may no longer be sophisticated enough to cope with current forecasts. The disaggregation of costs in the Excel Solver now also generates spurious cost allocations, notably to the detriment of exit Users, due to the sparsity of the LRMC matrix (which in turn is caused by the inclusion of spare capacity assumptions in Transcost)

38. This results in the charges from the latest Transcost analysis not reflecting the true cost of additional flows or additional capacity rights at certain exit points. The exit points that are mostly likely to be disadvantaged from using Transcost based charges are the Scottish and Northern exit points, with the Southern and South Western exit points benefiting the most.

39. Of particular concern are offtakes located near entry points, which exhibit counter-intuitive charges. For example, the power stations located near to St Fergus and Teesside terminals would not require any reinforcement were they to increase their peak load, but yet they would attract the largest changes in prices (from minimal prevailing charges) were Transcost to be maintained as the capacity charging model. These results can be explained by the inclusion of spare capacity in the model, creating low prices for entry, yet making exit prices high to compensate.

40. In addition pricing signals for South West offtakes are favourable – even ahead of the commissioning of Milford Haven. This would indicate that a new load should locate in South Wales, since prices are expected to fall from relatively high levels. However, were such a load to appear before the reinforcements for Milford Haven were complete, National Grid would face increased risks in terms of security of supply.

41. This behaviour is due to the averaging required from a multi-year supply/demand forecasting approach (adopted to smooth the instability of charges generated using a model which includes spare capacity). It would be more appropriate for pricing signals to indicate that it is more favourable to locate in South Wales *after* Milford Haven flows i.e. to include both locational and temporal signals. Such signals can only be generated from a single year model (which is not consistent with inclusion of spare capacity).

42. In contrast, the exit charges resulting from the Transportation Model are more consistent with expected patterns of investment, give locational and temporal pricing signals and result in smaller changes from prevailing exit charges. Scottish and Northern loads show reductions in charges, which are consistent with the backhaul effects they introduce. Although South Western and Central exit points exhibit initial increases in prices that reflect that these offtakes are furthest from existing entry points, entry flows from Milford Haven are expected to reduce these charges, were they to be applied as administered charges going forward, notwithstanding changes in allowed revenues.

Impact on Entry Users

43. The prevailing baseline entry reserve prices are based on the Licence UCAs. The impact of moving to reserve prices based on LRMCs calculated from Transcost and the Transportation Model are presented at the end of this appendix.

44. A Transcost based approach taking into account spare capacity would give a larger benefit to Users at the northern triangle NTS entry points but would increase all other entry points and would penalise smaller entry points particularly in the south where spare entry capacity is believed to be available.

45. Supplies are declining at the northern triangle NTS entry points and hence the reduced LRMCs generated by Transcost suggest that spare system capacity may be sufficiently stable in relation to these entry points.

Price Stability and Investment signals

46. Entry and exit capacity charges seek to reflect the long run costs imposed on the transmission system by Users to provide signals to inform investments in the long term.

47. Where there is genuine spare capacity as a result of supplies or demands declining, seen over all reasonable supply/demand scenarios, increased usage of under-utilised routes may be facilitated at lower cost compared to routes which are more fully used. Hence it could be argued that capacity charges should be set to encourage use of such spare capacity i.e. based on costs associated with flow increases.

48. Even if such genuine spare capacity could be identified, the amount and location on any particular day is a dynamic characteristic of the network. Modelling spare capacity results in charges which are more susceptible to short run influences (e.g. “lumpy” nature of system investments which might provide more capacity than immediately required) at the expense of more stable and predictable long-run signals.

49. The prices generated from the Transportation Model, as a result of excluding spare capacity, are more reflective of both the costs that have been incurred in making physical system capacity available and the true marginal costs that would be incurred by incremental capacity release relative to the prevailing system capacity.

50. Removing spare capacity also removes the requirement to model engineering parameters (such as flow settings on control valves and multijunction configurations) hence simplifying the process through making it more stable and repeatable. The adoption of the Transportation model within the NTS capacity charging methodology would therefore provide more stable and predictable long-run signals to Users.

Conclusions

Benefits from removing spare capacity

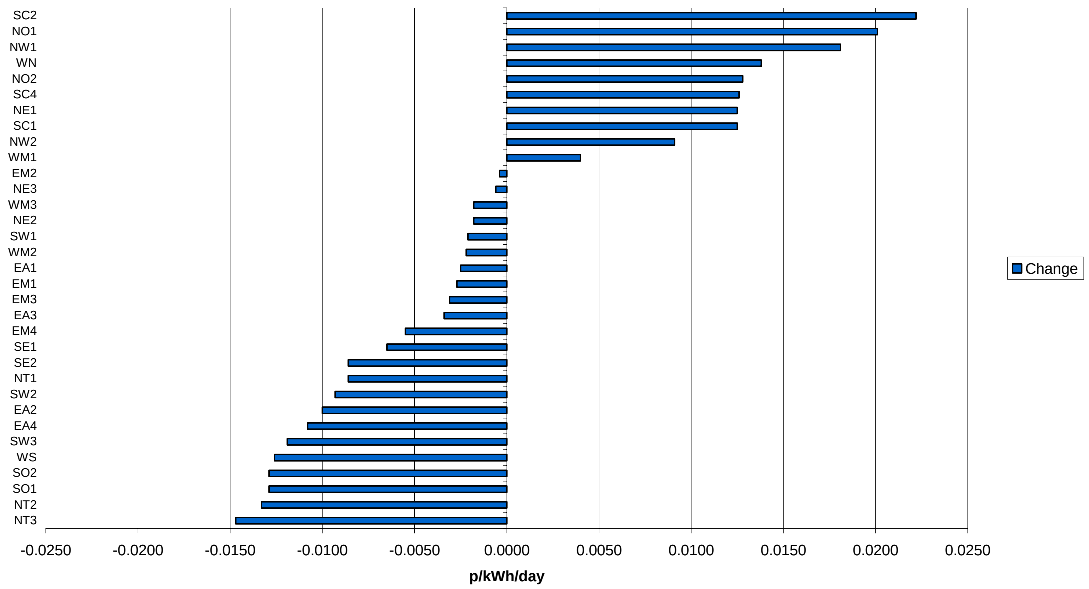
- Users pay for the capacity that they utilise.
- Allows use of a single year forecast of supply and demand, as opposed to a multi-year model, to avoid price distortions as a result of uncertainties in forecasts while not introducing pricing instability;
- Increases transparency by removing the need for subjectivity in the determination of the amount and location of spare capacity, and therefore which Users obtain a benefit from the inclusion of spare capacity, (due to choice of supply/demand scenario(s), and compressor and regulator settings);
- Avoids a benefit to Users transporting gas from entry points that appear to have a quantity of spare capacity at peak but a lesser or zero quantity in normal operation off-peak. Unutilised system capability identified at peak may not be fully available on every day of the gas year.
- Minimises the impact of rebalancing exit charges, which, for some Users, would be significant and/or not consistent with the cost of increasing either flow or capacity rights;
- Increases stability and predictability of long run marginal costs thereby supporting the provision by Users of efficient and economic investment signals.

Adverse consequences of removing spare capacity

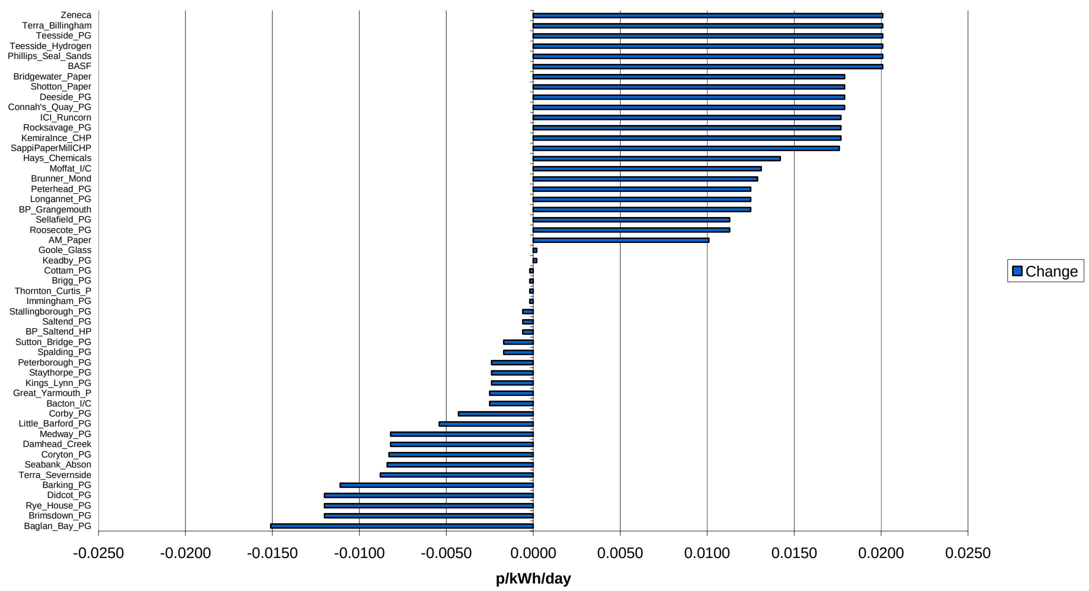
- Users at declining entry points would see higher capacity charges, which could affect shipper choice over where and when they intend to bring gas to the UK. This could lead, in the extreme, to asset stranding.

The following graphs show the impact of Transcost (spare capacity) and the Transportation model (no spare capacity) on prices. Positive values indicate an increase and negative values a decrease.

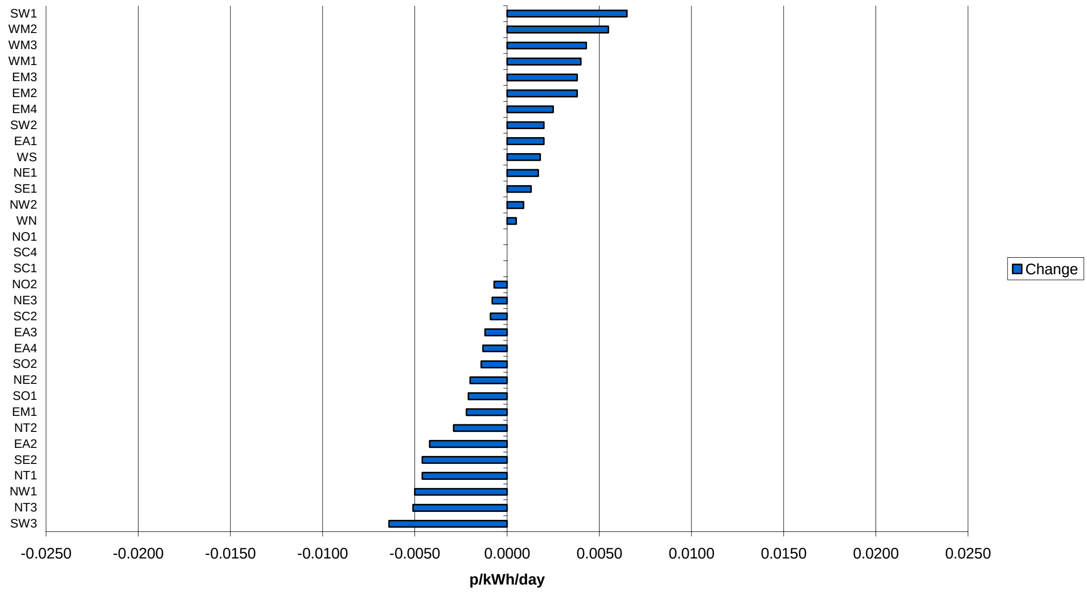
Impact of Re-balancing NTS DN Exit Prices based on Transcost LRMCs



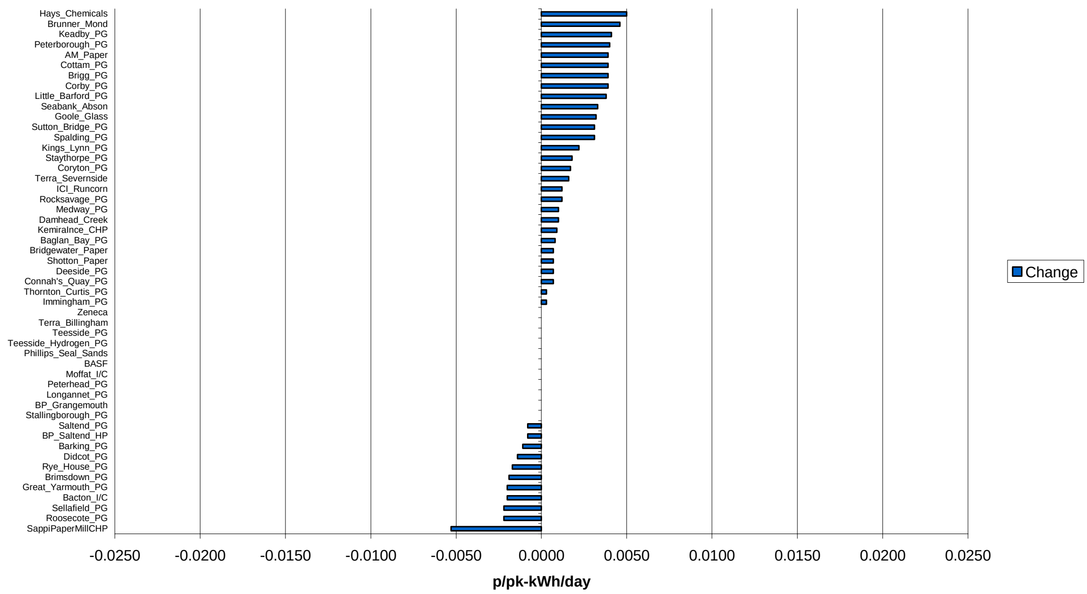
Impact of Re-balancing NTS DC Exit Prices based on Transcost LRMCs

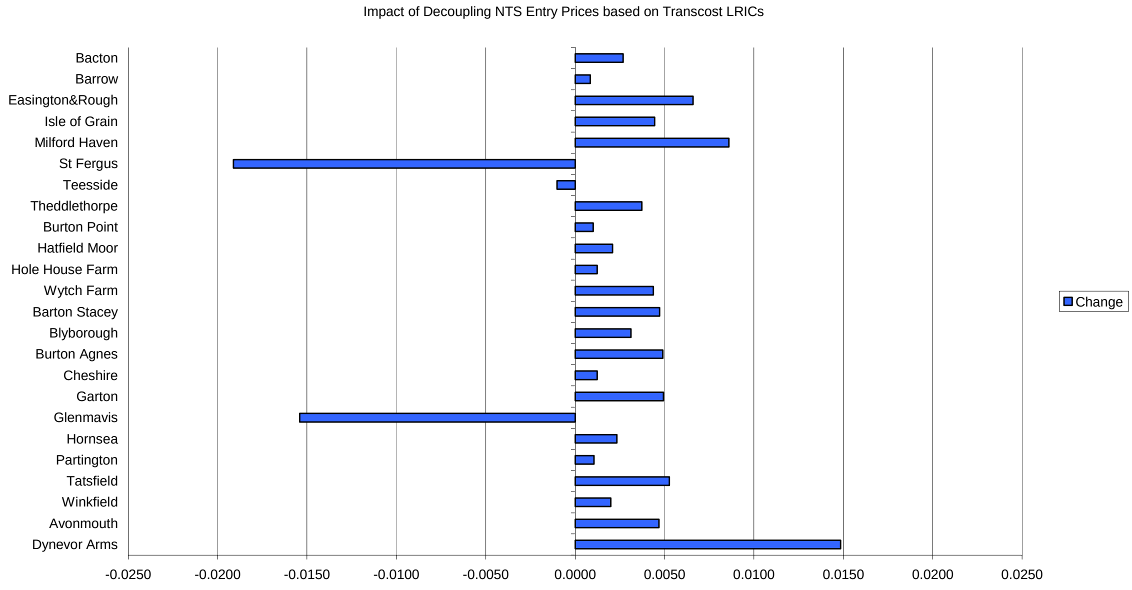


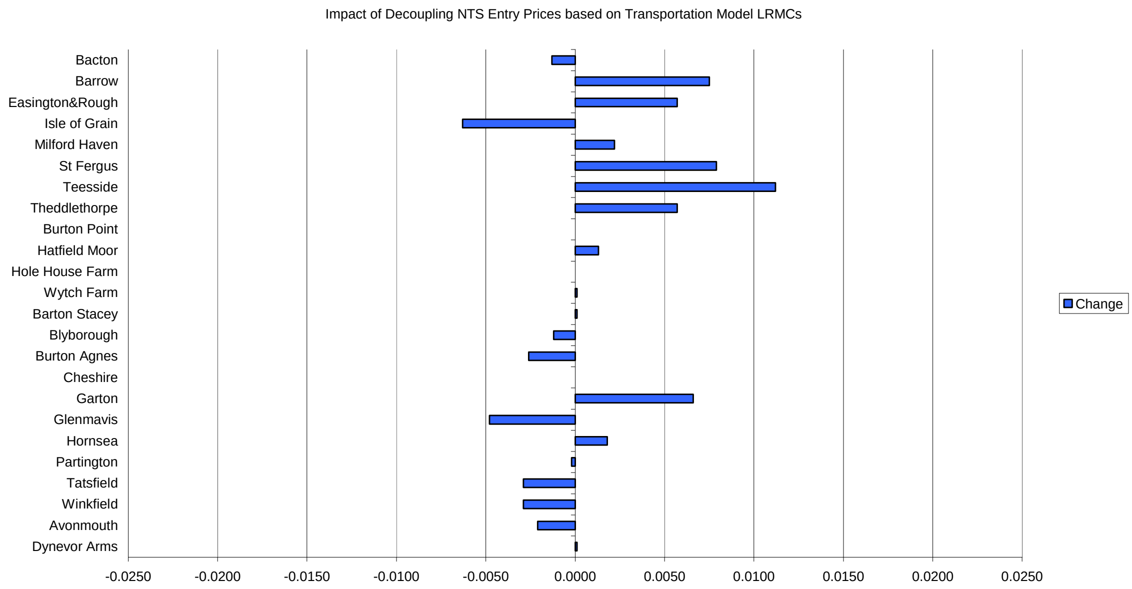
Impact of Re-balancing NTS DN Exit Prices based on Transportation Model LRMCs



Impact of Re-balancing NTS DC Exit Prices based on Transportation Model LRMCs




Impact of Decoupling NTS Entry Prices based on Transcost LRICs
Bacton
Barrow
Easington&Rough
Isle of Grain
Milford Haven
St Fergus
Teesside
Theddlethorpe
Burton Point
Hatfield Moor
Hole House Farm
Wytch Farm
Barton Stacey
Blyborough
Burton Agnes
Cheshire
Garton
Glenmavis
Hornsea
Partington
Tatsfield
Winkfield
Avonmouth
Dynevor Arms
-0.0250
-0.0200
-0.0150
-0.0100
-0.0050
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
Change


Impact of Decoupling NTS Entry Prices based on Transportation Model LRMCs
Bacton
Barrow
Easington&Rough
Isle of Grain
Milford Haven
St Fergus
Teesside
Theddlethorpe
Burton Point
Hatfield Moor
Hole House Farm
Wytch Farm
Barton Stacey
Blyborough
Burton Agnes
Cheshire
Garton
Glenmavis
Hornsea
Partington
Tatsfield
Winkfield
Avonmouth
Dynevor Arms
-0.0250
-0.0200
-0.0150
-0.0100
-0.0050
0.0000
0.0050
0.0100
0.0150
0.0200
0.0250
Change

Appendix B – Expansion Constant Calculation

1. Expansion Constants are utilised in the Transportation Model to represent the estimated typical capital cost of the transmission infrastructure required to transport 1 peak day GWh over 1 km. The incremental cost is then determined by multiplying pipe lengths by the appropriate expansion constant. Table A-1 below provides the expansion constants for 900mm, 1050mm and 1200mm pipe diameter based on the following assumptions:
   (a) latest forecast cost of pipelines;
   (b) 100km feeder duplication (parallel pipeline, same diameter) i.e. assumes compressor required every 100km on average;
   (c) maximum inlet pressure per pipe section of 85bar;
   (d) optimum outlet pressure per pipe diameter with a minimum of 38 bar
2. Project management costs are included in the figures and are based on 15% of investment costs.
3. Operating costs, currently at 1.5%, are factored into the prevailing Licence anuitisation factor of 0.10772.
4. The single expansion constant for use in the Transportation model is based on an average of the expansion constants for pipe diameters of size 900 to 1200mm typically used over recent years and planned to be built to reinforce the system. Use of an average increases price stability and price determination repeatability compared to using actual pipe lengths built.

Table B-1: Estimated Investment Costs (September 2006)

Description	Cost (£M)
Pipeline (per km length)	0.0012507 × diameter (mm) - 0.01507
Compressor – existing site (per MW)	0.875

Table B-2: Expansion constants used in the Transportation Model (September 2006)

Pipe Diameter (mm)	A Pipe Cost (£M)	B Compressor Cost (£M)	C Maximum Capacity (GWh)	$=10^6$*((A+B)/C)/100 Expansion constant (£/GWhkm)
1200	148.58	49.59	1069	1853
1050	129.82	40.82	783	2179
900	111.06	32.37	544	2635
Average				2223

<u>**Investment Cost Methodology**</u>

5. This methodology utilises the costs from all NTS investment work carried out over an 8 year period, including NTS investment work carried out during the previous 4 years in addition to the NTS investment planned for the next 4 years. If there are fewer than 5 projects for a particular diameter of pipeline, the number of years' worth of data being considered to determine the formula will be extended.

6. Linear regression techniques will be used to determine the best fitting trend line to allow for the prediction of the pipeline cost as a cost per kilometre using the diameter of the pipeline in mm as the independent variable.
7. The project investment costs will then be adjusted by applying the Structural Steelwork Labour Costs price index to take into account the rates of change in the provision of network infrastructure, such as steel prices, construction costs and general inflation. This index is available from the DTI via their website. www.DTI.Gov.UK/construction/stats This process will produce costs per kilometre and per megawatt of compressive power which relate to the appropriate construction year.
8. The pipe cost data from the various investment projects will be plotted on a scatter graph showing pipeline diameter versus calculated cost per metre. A trend line will be added to the graph to provide the best fit and allows a new formula to be derived for predicting pipeline costs per kilometre.
9. The compressor cost data from the various investment projects will be averaged to allow a new formula to be derived for predicting compressor unit costs per MW of compressive power.
10. The final pipe cost formula derived from this process is in the form:-

    Cost (£M/km) = a * diameter (mm) + b / km
11. The pipe cost constants ‘a’ and ‘b’ will be established by National Grid NTS each year using investment data as specified above and will be specified to 6 decimal places.
12. The results from applying this methodology including the compressor unit cost and values ‘a’ and ‘b’ will be released by National Grid NTS when new prices are published.

Appendix C - Licence Relevant Objectives and EU Gas Regulations

The National Grid Gas plc Gas Transporter Licence in respect of the NTS requires that proposed changes to the Charging Methodology shall achieve the relevant methodology objectives.

Where transportation prices are not established through an auction, prices calculated in accordance with the methodology should:

1) Reflect the costs incurred by the licensee in its transportation business;
2) So far as is consistent with (1) properly take account of developments in the transportation business;
3) So far as is consistent with (1) and (2) facilitate effective competition between gas shippers and between gas suppliers.

Where prices are established by means of auctions, either

4) No reserve price is applied or
5) Reserve prices are calculated at a level that promotes efficiency, avoids undue preference in the supply of transportation services and promotes competition between gas shippers and between gas suppliers.

National Grid NTS is obliged to keep the NTS Charging Methodology under review at all times for the purposes of ensuring that it achieves the relevant objectives.

National Grid NTS also has an obligation to use all reasonable endeavours to ensure that obligated entry capacity is offered for sale in at least one clearing auction *providing that this does not contravene wider Licence obligations including methodology objective (5) listed above.*

EC Regulation 1775/2005 on conditions for access to the natural gas transmission networks (binding from 1 July 2006) states that the principles for network access tariffs or the methodologies used to calculate them shall:

- Be transparent
- Take into account the need for system integrity and its improvement
- Reflect actual costs incurred for an efficient and structurally comparable network operator
- Be applied in a non-discriminatory manner
- Facilitate efficient gas trade and competition
- Avoid cross-subsidies between network users
- Provide incentives for investment and maintaining or creating interoperability for transmission networks
- Not restrict market liquidity
- Not distort trade across borders of different transmission systems.

All but the last of the principles listed above map onto the objectives for National Grid's Transmission Transportation Charging Methodology. In terms of cross border trade, the Regulation recognises that funding for network investment may require different tariffs across different transmission systems.

Appendix D – Indicative NTS Exit Capacity Prices for 1st April 2007

Introduction

This appendix sets out the indicative NTS TO Exit Capacity Prices, under options 1 and 2, which would apply from 1 April 2007 for the use of the NTS. Option 1 is based on Transcost analysis of an increment of 2.834 Mscm/d (100 Mscf/day), consistent with the prevailing Charging Methodology.

These prices have been calculated based on Ofgem's latest Price Control formula proposals (issued 25th September 2006) and the prevailing Licence anuitisation factor. It should be noted that final prices will be subject to the outcome of Ofgem's Transmission Price Control Review and that the maximum allowable revenue from April 2007 will not be known until conclusion of the price control. In the latter case default arrangements would apply in the interim.

Units

Capacity prices are expressed and billed in pence per peak day kilowatt hour per day.

NTS Exit Capacity Prices

NTS TO exit capacity prices apply to loads supplied through existing NTS offtakes into Distribution Networks (DNs) and to large loads and interconnectors supplied directly from the NTS. The exit zone for a DN supply point is determined by its post code.

For new loads supplied directly from the NTS, the exit zone prices provide an indication of the likely level of prices. However, in general, an individual exit zone is created with its own price for new NTS offtakes.

At present, National Grid NTS makes no charge for NTS Exit Capacity at NTS Storage points. This is on the basis that the transportation service to the storage points is interruptible. If a firm transportation service to storage were provided, a TO exit capacity charge would be payable.

There are four small towns in Scotland where LNG needs to be transported by road tanker to supply end users on distribution systems which are not physically connected to the main gas network. For these locations, NTS TO Exit Capacity Prices are calculated on the basis that they are allocated to exit zone SC4, the location of the LNG storage site which supplies them.

Table D1 Indicative DN NTS TO Exit Capacity Prices 1st April 2007 (Pence per peak day kWh per day)

Network	DN Exit Zone	Transportation Model (Option 2)	Transcost (Option 1)
East of England	EA1	0.0084	0.0014
	EA2	0.0103	0.0041
	EA3	0.0058	0.0018
	EA4	0.0159	0.0056
	EM1	0.0027	0.0018
	EM2	0.0075	0.0028
	EM3	0.0170	0.0061
	EM4	0.0133	0.0026
North of England	NE1	0.0043	0.0153
	NE2	0.0016	0.0016
	NE3	0.0018	0.0016
	NO1	0.0001	0.0159
	NO2	0.0001	0.0111
London	NT1	0.0236	0.0232
	NT2	0.0159	0.0056
	NT3	0.0153	0.0084
North West	NW1	0.0074	0.0246
	NW2	0.0125	0.0153
Scotland	SC1	0.0001	0.0109
	SC2	0.0001	0.0204
	SC4	0.0001	0.0109
South of England	SE1	0.0182	0.0105
	SE2	0.0236	0.0232
	SO1	0.0186	0.0095
	SO2	0.0262	0.0198
Wales & the West	SW1	0.0207	0.0033
	SW2	0.0249	0.0135
	SW3	0.0340	0.0340
	WN	0.0165	0.0299
	WS	0.0273	0.0025
West Midlands	WM1	0.0155	0.0104
	WM2	0.0183	0.0048
	WM3	0.0175	0.0034

Table D2 Indicative NTS TO Exit Capacity Prices - Direct Connects (p/kWh/day)

NTS Site	Transportation Model (Option 2)	Transcost (Option 1)
AM Paper	0.0113	0.0111
Baglan Bay PG	0.0293	0.0024
Barking PG	0.0157	0.0055
BASF Teesside	0.0001	0.0158
BP Grangemouth	0.0001	0.0109
BP Saltend (HP)	0.0018	0.0016
Bridgewater Paper	0.0148	0.0305
Brigg PG	0.0073	0.0031
Brimsdown PG	0.0168	0.0031
Brunner Mond	0.0118	0.0117
Connahs Quay PG	0.0143	0.0305
Corby PG	0.0132	0.0024
Coryton PG	0.0159	0.0055
Cottam PG	0.0073	0.0031
Deeside PG	0.0163	0.0305
Didcot PG	0.0220	0.0137
Goole Glass	0.0048	0.0076
Great Yarmouth PG	0.0036	0.0012
Hays Chemicals	0.0133	0.0124
ICI Runcorn	0.0164	0.0305
Immingham CHP	0.0027	0.0017
Keadby PG	0.0058	0.0060
Kemira Ince	0.0161	0.0305
Kings Lynn PG	0.0088	0.0014
Kingsnorth PG	0.0153	0.0065
Little Barford PG	0.0149	0.0018
Longannet PG	0.0001	0.0109
Medway PG	0.0154	0.0065
Peterborough PG	0.0117	0.0015
Peterhead PG	0.0001	0.0109
Phillips Seal Sands	0.0001	0.0158
Rocksavage PG	0.0164	0.0305
Roosecote PG	0.0001	0.0111
Rye House PG	0.0175	0.0031
Saltend PG	0.0020	0.0016
Sappi Paper Mill	0.0079	0.0243
Seabank PG	0.0234	0.0147
Sellafield PG	0.0034	0.0111
Shotton Paper	0.0155	0.0305
Spalding PG	0.0089	0.0015
Stallingborough PG	0.0035	0.0020
Staythorpe PG	0.0103	0.0017
Sutton Bridge PG	0.0101	0.0015
Teesside Hydrogen	0.0001	0.0158
Teesside PG	0.0001	0.0158
Terra Billingham	0.0001	0.0158
Terra Severnside	0.0235	0.0147
Thornton Curtis PG	0.0027	0.0020
Zeneca	0.0001	0.0158

Table D3 Indicative NTS TO Exit Capacity Prices - Storage (p/kWh/day)

Interconnectors	**Transportation Model (Option 2)**	**Transcost (Option 1)**
Bacton I/C	0.0001	0.0012
Moffat I/C	0.0001	0.0110
Storage Sites		
Avonmouth	0.0234	0.0147
Barton Stacey	0.0255	0.0181
Dynevor Arms	0.0276	0.0025
Garton	0.0018	0.0016
Glenmavis	0.0001	0.0109
Hatfield Moor	0.0056	0.0060
Hole House Farm	0.0127	0.0124
Hornsea	0.0001	0.0015
Partington	0.0111	0.0111
Rough	0.0002	0.0016

Appendix E – Indicative NTS Entry Baseline Reserve Prices

This appendix sets out the indicative NTS TO Entry Capacity baseline reserve prices, under each option, which would apply from 1 April 2007 for the use of the NTS. These prices have been calculated based on the prevailing licence baselines and anuitisation factor. It should be noted that final prices will be subject to the outcome of Ofgem's Price control review.

	Transcost		**Transportation Model**						**UCAs**
	2.834 Mscm/d	**6 Mscm/d**	**Base Case Level**			**Obligated Level**			**(Ofgem Proposed 0 - 50 GWh)**
	Option 1a	**Option 1b**	**Option 2a**			**Option 2b**			
Coastal Terminals	07/08 to 08/09	07/08 to 08/09	06/07	07/08	08/09	06/07	07/08	08/09	07/08 to 08/09
Bacton	0.0096	0.0083	0.0080	0.0101	0.0106	0.0080	0.0101	0.0106	0.0185
Easington & Rough	0.0084	0.0072	0.0084	0.0086	0.0089	0.0084	0.0086	0.0091	0.0081
Theddlethorpe	0.0059	0.0047	0.0058	0.0060	0.0062	0.0108	0.0101	0.0103	0.0220
St Fergus	0.0031	0.0028	0.0375	0.0356	0.0323	0.0414	0.0390	0.0370	0.0069
Teesside	0.0001	0.0001	0.0106	0.0087	0.0055	0.0162	0.0170	0.0172	0.0078
Barrow	0.0014	0.0011	0.0095	0.0074	0.0039	0.0106	0.0104	0.0090	0.0096
Importation Facilities									
Milford Haven	0.0223	0.0212	0.0001	0.0164	0.0149	0.0001	0.0164	0.0149	0.0537
Isle of Grain	0.0097	0.0085	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0102
Onshore Fields and Connections									
Hatfield Moor	0.0041	0.0030	0.0035	0.0037	0.0067	0.0035	0.0037	0.0067	0.0158
Wytch Farm	0.0048	0.0041	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	tbc
Burton Point	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0286
Hole House Farm	0.0012	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0330
0.0060									
Garton	0.0072	0.0060	0.0098	0.0090	0.0094	0.0098	0.0090	0.0094	0.0118
Cheshire	0.0012	0.0009	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0091
Hornsea	0.0088	0.0076	0.0089	0.0091	0.0093	0.0089	0.0091	0.0093	0.0133
Glenmavis	0.0031	0.0028	0.0204	0.0186	0.0163	0.0204	0.0186	0.0163	tbc
Partington	0.0014	0.0011	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	tbc
Barton Stacey	0.0054	0.0046	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0315
Constrained LNG									
Avonmouth	0.0058	0.0051	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	tbc
Dynevor Arms	0.0170	0.0160	0.0001	0.0001	0.0034	0.0001	0.0001	0.0034	tbc

Appendix F – Indicative NTS Incremental Entry (QSEC) Step Prices

This appendix sets out the indicative NTS TO Entry Capacity baseline reserve and incremental step prices which would apply from 1 April 2007 for the use of the NTS under both options 2a and 2b. These prices have been calculated based on the prevailing licence baselines and anuitisation factor. It should be noted that final prices will be subject to the outcome of Ofgem's Price control review.

Pence/kWh/day

	Coastal Terminals & Importation Facilities							
	Bacton	Easington & Rough	Theddlethorpe	St Fergus	Teesside	Barrow	Milford Haven	Isle of Grain
2.5%	0.0114	0.0092	0.0104	0.0372	0.0173	0.0091	0.0150	0.0002
5.0%	0.0115	0.0093	0.0105	0.0373	0.0174	0.0092	0.0151	0.0003
7.5%	0.0116	0.0095	0.0106	0.0374	0.0175	0.0093	0.0152	0.0004
10.0%	0.0117	0.0098	0.0107	0.0389	0.0176	0.0103	0.0153	0.0005
12.5%	0.0118	0.0102	0.0109	0.0390	0.0177	0.0104	0.0159	0.0006
15.0%	0.0119	0.0103	0.0110	0.0391	0.0178	0.0105	0.0165	0.0007
17.5%	0.0120	0.0104	0.0111	0.0401	0.0179	0.0106	0.0166	0.0008
20.0%	0.0121	0.0105	0.0112	0.0417	0.0180	0.0107	0.0167	0.0009
22.5%	0.0125	0.0106	0.0115	0.0418	0.0181	0.0108	0.0168	0.0010
25.0%	0.0126	0.0107	0.0116	0.0419	0.0182	0.0115	0.0169	0.0011
27.5%	0.0127	0.0108	0.0117	0.0420	0.0183	0.0135	0.0170	0.0012
30.0%	0.0128	0.0109	0.0118	0.0421	0.0184	0.0137	0.0171	0.0013
32.5%	0.0129	0.0110	0.0119	0.0422	0.0185	0.0138	0.0172	0.0014
35.0%	0.0148	0.0111	0.0120	0.0423	0.0186	0.0139	0.0173	0.0015
37.5%	0.0149	0.0112	0.0121	0.0424	0.0187	0.0140	0.0174	0.0016
40.0%	0.0150	0.0114	0.0122	0.0425	0.0188	0.0141	0.0175	0.0017
42.5%	0.0153	0.0124	0.0123	0.0426	0.0189	0.0142	0.0176	0.0018
45.0%	0.0156	0.0125	0.0124	0.0427	0.0190	0.0143	0.0177	0.0019
47.5%	0.0157	0.0126	0.0125	0.0428	0.0191	0.0144	0.0178	0.0020
50.0%	0.0158	0.0127	0.0126	0.0429	0.0192	0.0145	0.0179	0.0021
Baseline 06/7 (GWh)	1745	1062	848	1677	761	712	950	218
Baseline 07/8 (GWh)	1745	1062	848	1677	761	712	950	218
Baseline 08/9 (GWh)	1745	1062	848	1677	761	712	950	453

Pence/kWh/day

Onshore Fields and Connections							
Hatfield Moor		Wytch Farm		Burton Point		Hole House Farm	
10%	0.0068	10%	0.0002	10%	0.0002	10%	0.0002
20%	0.0069	20%	0.0003	20%	0.0003	20%	0.0003
30%	0.0070	30%	0.0004	30%	0.0004	30%	0.0004
40%	0.0071	40%	0.0005	40%	0.0005	40%	0.0005
50%	0.0072	50%	0.0006	50%	0.0006	50%	0.0006
Baseline 06/7 (GWh)	55		3		55		26
Baseline 07/8 (GWh)	55		3		55		26
Baseline 08/9 (GWh)	55		3		55		26

Pence/kWh/day

Storage Sites													
Garton		Cheshire		Hornsea		Glenmavis		Partington		Barton Stacey	
2.5%	0.0095	7.5%	0.0002	8.33%	0.0094	10%	0.0164	6.25%	0.0002	10%	0.0002
5.0%	0.0096	15.0%	0.0003	16.67%	0.0095	20%	0.0165	12.50%	0.0003	20%	0.0003
7.5%	0.0097	22.5%	0.0004	25.00%	0.0096	30%	0.0166	18.75%	0.0004	30%	0.0004
10.0%	0.0098	30.0%	0.0005	33.33%	0.0097	40%	0.0186	25.00%	0.0005	40%	0.0005
12.5%	0.0099	37.5%	0.0006	41.67%	0.0099	50%	0.0187	31.25%	0.0006	50%	0.0006
15.0%	0.0100	45.0%	0.0007	50.00%	0.0100			37.50%	0.0007		
17.5%	0.0101	52.5%	0.0008					43.75%	0.0008		
20.0%	0.0102	60.0%	0.0009					50.00%	0.0009		
22.5%	0.0103	67.5%	0.0010								
25.0%	0.0104	75.0%	0.0011								
27.5%	0.0105	82.5%	0.0012								
30.0%	0.0106	90.0%	0.0013								
32.5%	0.0107	97.5%	0.0014								
35.0%	0.0108	105.0%	0.0015								
37.5%	0.0109	112.5%	0.0016								
40.0%	0.0110	120.0%	0.0017								
42.5%	0.0111	127.5%	0.0018								
45.0%	0.0112	135.0%	0.0019								
47.5%	0.0113	142.5%	0.0020								
50.0%	0.0114	150.0%	0.0021								
Baseline 06/7 (GWh)	420		214		175		99		215		90
Baseline 07/8 (GWh)	420		214		175		99		215		90
Baseline 08/9 (GWh)	420		214		175		99		215		90

Pence/kWh/day

Constrained LNG			
Avonmouth		Dynevor Arms	
10%	0.0002	10%	0.0035
20%	0.0003	20%	0.0036
30%	0.0004	30%	0.0037
40%	0.0005	40%	0.0042
50%	0.0006	50%	0.0045
Baseline 06/7 (GWh)	149		50
Baseline 07/8 (GWh)	149		50
Baseline 08/9 (GWh)	149		50

Pence/kWh/day

New Entry Points

GWh	Blyborough (Welton)	Burton Agnes (Caythorpe)	Tatsfield	Winkfield	Canvey	GWh	Fleetwood
65	0.0015	0.0089	0.0001	0.0001	0.0001	65	0.0001
130	0.0016	0.0090	0.0002	0.0002	0.0002	130	0.0002
195	0.0017	0.0091	0.0003	0.0003	0.0003	195	0.0003
260	0.0018	0.0097	0.0004	0.0004	0.0004	260	0.0004
325	0.0052	0.0103	0.0005	0.0005	0.0005	325	0.0005
390	0.0057	0.0104	0.0006	0.0006	0.0006	390	0.0006
455	0.0058	0.0105	0.0007	0.0007	0.0007	455	0.0020
520	0.0059	0.0106	0.0008	0.0008	0.0008	520	0.0036
585	0.0060	0.0107	0.0009	0.0009	0.0009	585	0.0037
650	0.0063	0.0108	0.0010	0.0010	0.0010	650	0.0038
715	0.0064	0.0109	0.0011	0.0011	0.0011	715	0.0039
780	0.0066	0.0110	0.0012	0.0012	0.0012	780	0.0041
845	0.0068	0.0111	0.0013	0.0013	0.0013	845	0.0047
910	0.0070	0.0112	0.0014	0.0014	0.0014	910	0.0048
975	0.0071	0.0113	0.0015	0.0015	0.0015	975	0.0049
1040	0.0072	0.0114	0.0016	0.0016	0.0016	1040	0.0050
1105	0.0073	0.0115	0.0017	0.0017	0.0017	1105	0.0051
1170	0.0074	0.0116	0.0018	0.0018	0.0018	1170	0.0056
1235	0.0075	0.0117	0.0019	0.0019	0.0019	1235	0.0058
1300	0.0076	0.0118	0.0020	0.0020	0.0020	1300	0.0059
Baseline 06/7 (GWh)	0	0	0	0	0		0
Baseline 07/8 (GWh)	0	0	0	0	0		0
Baseline 08/9 (GWh)	0	0	0	0	0		0