Issue	Revision
7.0	Final

The Incremental Entry Capacity Release Methodology Statement

Effective from 1st September 2007

nationalgrid

INCREMENTAL ENTRY CAPACITY RELEASE STATEMENT

Document Revision History

Version/ Revision Number	Date of Issue	Notes
1.0	July 2002	
2.0	August 2003	Minor clarifications and price schedules for new entry points (Milford Haven and Barton Stacey) included
3.0	July 2004	Minor clarifications, price schedules removed to now only appear in the Transportation Statement
4.0	July/August 2004	Changes following consultation responses
4.1	July 2005	Proposed changes consultation
5.0	August 2005	Proposed changes agreed
5.1	14 September 2005	Proposed amendment to include formal consent process prior to adjusting investment lead times
5.2	30 September 2005	Final proposed amendment to include formal consent process prior to adjusting investment lead times incorporating consultation representations
6.0	6th April 2006	Proposals for the introduction of a methodology for the determination of investment costs
6.1	11th May 2006	Final proposals for the introduction of a methodology for the determination of investment costs
6.2	3rd May 2007	Proposals to generate step prices from Transportation Model (following implementation of GCM01) and revise economic test. Updated to reflect Transmission Price Control Review Final Proposals. Format changes and general updating.
7.0	12th June 2007	Changes following consultation responses

About this Document[1]

This document describes the methodology that National Grid Gas NTS ("National Grid") employs to determine whether to release NTS Entry Capacity to Users in the unconstrained period i.e. beyond investment lead times. In particular, it defines under what circumstances National Grid will accept applications for incremental obligated NTS Entry Capacity from Users received through processes described in the Uniform Network Code, and thereby the level of financial commitment required from Users.

This document is one of a suite of documents that describe the release of obligated and incremental NTS capacity by National Grid and the methodologies behind them. The other documents are available on our Charging website at:

http://www.nationalgrid.com/uk/Gas/Charges/statements/

This statement is effective from 1 September 2007.

This document has been published by National Grid in accordance with Special Condition C15 of National Grid's Gas Transporter Licence in respect of the NTS ("the Licence"). National Grid believes the content is consistent with its duties under the Gas Act and is consistent with the Standard Conditions, Standard Special Conditions and Special Conditions of the Licence.

If you require further details about any of the information contained within this document or have comments on how this document might be improved please contact our NTS Gas Access and Charging team on 01926 656310 or 01926 656217 or at:

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[1] At the time of drafting this statement agreement has not been reached on the detail of National Grid's Gas Transporters licence for the period starting April 2007. This document is consistent with National Grid's understanding of initial drafts of the licence and the Authority's Final Proposals. In the event that the licence has not been agreed before the commencement of the QSEC auctions or specific licence references are significantly changed then the relevant section(s) of the previous version of this statement shall apply to the extent that this statement cannot be applied. Sections of this document that are subject to confirmation of the new licence include paragraph 15 (capacity substitutions) and paragraphs 37-46 (investment lead times). National Grid shall notify Shippers prior to the QSEC auctions if any parts of this document are not to apply.

Contents

GENERAL INFORMATION

Background

1. National Grid is the owner and the operator of the gas National Transmission System (NTS) in Great Britain.

2. The NTS plays an important role in facilitating the competitive gas market and helping to provide the UK with a secure gas supply. It is a network of pipelines, presently operated at pressures of up to 85 barg, which transports gas safely and efficiently from coastal terminals and storage facilities to exit points from the system. Exit points are predominantly connections to Distribution Networks (DNs), but also include storage sites, and direct connections to large industrial consumers and other systems, such as interconnectors to other countries.

3. These operations are carried out to meet the needs of the companies that supply gas to domestic, commercial and industrial consumers and to power stations. In 2005/06 1,067 TWh of Gas was transported to these consumers.

4. This publication sets out the methodology that applies for the release of incremental obligated NTS Entry Capacity i.e. capacity to be made available above the prevailing level of obligated entry capacity, beyond investment lead times (the unconstrained period) in response to signals received from Users through processes described in the Uniform Network Code.

5. Details of National Grid and its activities can be found on its internet site at www.nationalgrid.com . An electronic version of this publication, along with the other related statements can be found at the following internet page "http://www.nationalgrid.com/uk/Gas/Charges/statements/".

6. It is important that NG NTS is made aware of potential developments where incremental capacity may be required (at existing or new entry points) at an early stage. This is so that discussions can be held with the customer in relation to any additional work that may be required, including facilitating the physical connection, whether this is at a new or existing entry point. This work is charged for separately as specified in NG NTS's Licence Condition 4B Statement (National Grid NTS Statement of Principles and Methods to be Used to Determine Charges for National Transmission System Connection Services), which is also available on the National Grid website. Contact can be made with the Customer Services team via e-mail to transmission.newgasconnections.nts@uk.ngrid.com.

National Grid's Licence Obligations

7. New and existing Users of the NTS are able to request to purchase NTS Entry Capacity products for any ASEP. Such capacity requests will be considered against the provisions of National Grid's statutory licence obligations and in accordance with its published methodologies.

8. Overriding obligations applicable to this statement are set out in the Gas Act and National Grid's Gas Transporter Licence in respect of the NTS, ("the Licence").

9. Specific obligations in respect of the release of incremental NTS Entry Capacity and applicable to this statement are set out in Special Condition C15 of the Licence. Under this condition, National Grid must prepare and submit to the Authority for approval the Incremental Entry Capacity Release Methodology statement setting out the methodology

by which National Grid will determine whether to make incremental entry capacity available for sale.

Planning Process

10. National Grid believes it is appropriate for it to continue to develop the NTS in a way that provides its customers and Great Britain generally, with a gas transmission system that is robust against supply shocks and which keeps pace with changes in the gas market, such as increasing dependency on imported supplies.

11. National Grid is also required by Special Condition C2 of the Licence, "Long Term Development Statement", to prepare an annual statement, with respect to each of the succeeding 10 years that will forecast;

    - The use likely to be made of the pipe-line system; and

    - The likely developments of that system.

12. National Grid believes it is important to seek wide views on the process for determining how it invests in its network as well as on the underlying assumptions that underpin such investment. An enhanced consultation process is operated under the banner of 'Transporting Britain's Energy' with a view to obtaining industry views on how the industry would like to see the NTS developed.

13. National Grid expects the results of long term auctions to be the primary driver for investment. A sufficiently strong, unambiguous, signal in long term auctions will trigger the sale of entry capacity which National Grid would normally expect to support through investment. This statement describes the process by which such sales of entry capacity might be triggered.

14. National Grid might consider it necessary to invest in the absence of an unambiguous auction signal should it be deemed necessary to satisfy its wider statutory duties or, if in its opinion, a clear commercial case can be made for such an investment.

15. In addition National Grid will consider whether unsold baseline capacity (as defined in the Licence) can be substituted to NTS Entry Points where demand exceeds the obligated level thereby, potentially, reducing the requirement for investment in the NTS. The process by which such substitutions may be considered will be provided in the "**Entry Capacity Substitution Methodology Statement"**[2].

[2] It is intended that this document will be published in August 2007 following industry consultation and is subject to approval be the Authority.

CHAPTER 1: PRINCIPLES

Purpose of the Methodology Statement

16. This methodology statement has been produced to meet the requirements of Special Condition C15 of the Licence. This condition requires the preparation of a statement setting out the methodology by which National Grid will determine whether to propose making incremental entry capacity available for sale to Users of the NTS. National Grid believes the content is consistent with its duties under the Gas Act and the Licence.

17. For the purpose of this document, incremental entry capacity means capacity in excess of the level of obligated entry capacity determined in accordance with Special Condition C8D of the Licence. The methodology will be applied only for periods when National Grid NTS is able to physically respond to any signal that requires additional investment, consistent with any obligation or incentive arrangement it may have under the Licence in respect of the lead times associated with investment in the NTS (see also the section on investment lead times below).

18. Consistent with the Licence and the Uniform Network Code, NTS Entry Capacity is a firm commercial right that may be offered on a daily basis or multiples thereof: it does not reflect a commitment or obligation upon National Grid to undertake any investment on its network.

Remuneration for Release of Obligated Incremental NTS Entry Capacity.

19. This methodology has been developed in good faith reflecting National Grid's understanding of the statutory obligations attached to both National Grid and the Authority, and its understanding of the regulatory framework which ensures continued remuneration of properly incurred expenditure on regulated assets.

20. For the avoidance of doubt, National Grid believes that any release of obligated incremental NTS Entry Capacity is subject to approval by the Authority, whether explicitly in response to a specific proposal or implicitly through application of the methodology specified in this statement.

21. National Grid believes that, by giving that approval, the Authority accepts that the implications of applying this methodology, including subsequent investment undertaken by National Grid with a view to physically meeting the demand for obligated NTS Entry Capacity, should be reflected in subsequent regulatory decisions, notably regarding proposals to modify the price controls and incentives defined within the Licence.

22. In this context, National Grid believes that any such approval should be regarded as establishing an expectation that associated investment should be reflected in its assumed regulatory asset value[3]; that any proposals for revising the quantities of obligated NTS Entry Capacity should be demonstrably consistent with the NTS Entry Capacity incentive structure (such that the terms on which capacity may have previously been released will not be significantly altered for either National Grid or Users); and that proposals for revising the NTS Entry Capacity buy-back incentive parameters should demonstrably allow for the level of incremental capacity released. National Grid believes this is consistent with the Authority's duty to ensure National Grid is able to finance its functions.

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[3] National Grid understands that, as with the approach to price controls to date, Ofgem would wish to assure itself that any such capital expenditure had been efficiently incurred.

Methodology Objective

23. The primary purpose of this methodology for determining incremental entry capacity volumes is to indicate the way in which National Grid will interpret the results of long term entry capacity auctions in terms of whether or not to seek to allocate obligated incremental entry capacity rights to Users. In considering this, National Grid believes it is appropriate to consider the financial incentives it faces under conditions of the Licence, in particular as a result of the entry capacity investment incentive. However, National Grid also believes it is important for the assessment to be set in the context of its wider obligations. The methodology set out in this statement therefore seeks to describe the circumstances in which National Grid believes there would (or would not) be a sufficient signal from entry capacity auctions to create a presumption in favour of releasing incremental entry capacity.

CHAPTER 2: DECISION MAKING METHODOLOGY

Information from Long Term Entry Capacity (QSEC) Auctions.

24. Information for considering whether or not to release incremental entry capacity will be based on indications of Users' demand for entry capacity as revealed by the relevant process described in Uniform Network Code.

25. In accordance with the Uniform Network Code requirements Users will be invited to indicate, for each of a set of prices, the quantity of entry capacity they wish to acquire (if any) at each ASEP, in each available period. These prices will be published in National Grid's Statement of the Gas Transmission Transportation Charges. The pricing methodology used to generate these prices is included in Chapter 3, and forms part of this methodology.

26. The pricing methodology establishes the prices per unit of capacity which are the minimum National Grid would expect to receive, over a sustained period and for all capacity made available, in order to justify releasing incremental entry capacity at any given ASEP.

27. The P_0 price is that price at which National Grid would release, in response to valid bids, up to the available quantity of obligated entry capacity – all bids will be accepted so long as the available quantity is not exhausted. This minimum available quantity will be calculated and published in accordance with the Licence conditions.

28. The incremental prices for each (P_1 to P_{20}) are based on the long run incremental cost of providing additional entry capacity above the obligated capacity level at each ASEP.

29. As described in Chapter 3, incremental prices have been calculated for each price step by estimating the investment cost associated with physically providing each level of incremental entry capacity, annuitising the cost, and adding this value to the P_0 price. This approach produces price steps whereby the change in National Grid's income from bidders, assuming all of the available quantity is sold at the incremental price step is equal to the estimated cost of providing incremental capacity over the period in question.

Estimated Project Costs

30. For the purposes of determining the required commitment from bidders that would normally trigger the release of incremental capacity, should auction bids satisfy the test given in paragraph 36, an estimated project cost will be calculated for each incremental capacity level from the final incremental step prices as detailed in Appendix 1.

31. The methodology for proposing that obligated incremental entry capacity should be released (described below) compares the strength of market signals for the incremental capacity against the estimated project cost for providing the incremental capacity.

Procedure for Allocating Incremental Capacity

Qualifying Bids

32. In accordance with Uniform Network Code processes, all Quarterly NTS Entry Capacity (QSEC) bids posted by the end of the bid process will be assessed. Only bids that satisfy the relevant User credit requirements as specified in Uniform Network Code will be considered in this procedure.

Obligated Capacity Allocation

33. Where the aggregate quantity specified in valid bids at the P_0 price is less than or equal to the available quantity of obligated entry capacity then capacity will be allocated to satisfy all requests in full. The “available quantity” will be determined in accordance with Special Condition C8D of the Licence.

Incremental Capacity Allocation

34. In respect of any ASEP where a minimum quantity of incremental capacity is demanded in any quarter National Grid will consider releasing incremental capacity to meet that demand.

35. National Grid will, for the quarter in question plus the subsequent thirty one quarters (or less where this would be beyond the period for which capacity has been offered) determine the net present value[4] (NPV) of the revenue from bids for incremental entry capacity which would be accepted if the given quantity of incremental entry capacity was released.

36. If the NPV equals at least 50% of the “estimated project value”, then National Grid would seek approval from the Authority to designate that quantity of incremental capacity as incremental obligated entry capacity under the terms of the Licence. There would be a presumption that such incremental capacity should be released and allocated to Users. The “estimated project value” for each capacity level will be calculated in accordance with chapter 3 and published alongside incremental step prices. A simple example showing how the NPV test works is given in Appendix 2.

Investment Lead Times

37. Subject to the following paragraphs, following successful bids by Users for incremental NTS Entry Capacity National Grid will investigate opportunities to satisfy the increment by substituting capacity from other ASEPs. Where such opportunities have been exhausted National Grid will undertake such reinforcements as it considers necessary to make incremental NTS Entry Capacity available.

38. National Grid shall release the incremental NTS Entry Capacity for use subject to a default lead time of 42 months. It is anticipated that the application of the default 42 month lead time shall be as outlined within the GT licence. However, where this is not specified, the lead time will apply following completion of the capacity allocation process, i.e. from the 1st December 2007 for a successful bid placed in a September 2007 QSEC auction. As capacity is sold in quarterly units, capacity will be made available from the commencement of the nearest quarter following expiry of the 42 month period.

39. National Grid may release incremental NTS Entry Capacity earlier than the 42 month lead time in response to incentives provided in the Licence[5] under Special Condition C8D regarding accelerated release of incremental obligated entry capacity.

40. National Grid is allowed, in accordance with the Licence, a limited number of opportunities to extend the 42 month lead time for the delivery of NTS Entry Capacity. Such increases to investment lead times may be caused by the length of time required to obtain consents or construction challenges (for example which would require a construction season of more

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4 For the purposes of this methodology, the first period considered will be that where the aggregate volume of valid bids received first exceeds or equals the available obligated quantity plus the quantity of incremental capacity that is being considered. All values will be discounted to this period on a quarterly basis using an annual discount factor of 8.3% (6.25% plus inflation).

5 For information, National Grid has previously released incremental obligated entry capacity within the default timescale, where it was able to do so, in response to National Grid’s incremental entry capacity incentives to release incremental capacity as soon as is practicable.

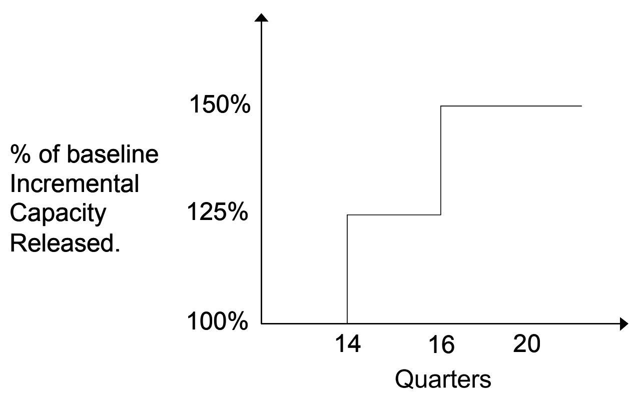
than one year) and are limited in terms of a total cap on the number of months of allowed delay for a total quantity of entry capacity. Where such opportunities have been exhausted National Grid may extend the 42 month lead time for the delivery of NTS Entry Capacity only with the consent of the Authority.

41. Where National Grid assesses that it may be unable to physically deliver all or part of anticipated incremental capacity within a 42 month lead time National Grid will notify bidders of:
- the relevant ASEP(s);
- the amount, if any, of the anticipated incremental capacity that could be released with a 42 month lead time; and
- the revised contractual capacity release date, beyond the typical 42 month lead time, for the remaining anticipated incremental quantity that would be appropriate at the affected entry point.

42. National Grid will only use its allowed extension to capacity release dates to the extent that valid bids for incremental capacity are placed and accepted.

43. The lead time, and above information, will be specified in the relevant QSEC auction letter as a table and in the example format shown in Diagram 1 below:

Diagram 1: Example of format of pre-auction notification of earliest possible release of incremental entry capacity at a given entry point.



44. In the above example, at a given entry point, only 125% of the obligated capacity will be offered for sale as incremental entry capacity with a 42 month lead time. The remaining volume up to 150% of obligated capacity will be made available with a 48 month lead time.

45. In assessing any lead time, National Grid will take into account any preliminary works agreements signed with and underpinned by relevant counter-parties ahead of the relevant auction.

46. In addition to extending the 42 month lead time for the delivery of NTS Entry Capacity National Grid may also reduce the lead time. Such reductions, calculated in the same way as extensions, will provide National Grid with the opportunity to obtain additional allowances for extensions. National Grid will notify relevant Users of such reductions following assessment of the QSEC auction and determination of the necessary investment works required to support successful bids for incremental capacity release.

CHAPTER 3: INCREMENTAL ENTRY CAPACITY PRICING METHODOLOGY

Introduction

47. The objective of the incremental entry capacity pricing methodology is to produce a range of price steps which affords Users an opportunity to reveal their requirement for entry capacity, but which also reflects the estimated investment costs anticipated to be incurred by National Grid for providing Entry Capacity beyond the obligated capacity level identified under the Licence. The underlying cost assumptions are forward looking and are informed by present day cost estimates for pipe laying and associated activities to provide new capacity.

Derivation of Long Run Marginal Costs and Long Run Incremental Costs

48. The Long Run Incremental Cost (LRIC) approach derives costs which represent the cost of providing capacity to transport increments of gas through the NTS. The LRIC methodology uses the Long Run Marginal Cost (LRMC) methodology described within the Statement of the Gas Transmission Transportation Charging Methodology. However, whilst the LRMC methodology considers only the marginal costs associated with a given supply and demand scenario, the LRIC methodology considers various incremental capacity levels above a given obligated capacity level, to calculate the estimated incremental costs of moving from the obligated capacity level to the incremental capacity level.

49. The NTS Capacity Charging Model is used to calculate LRMCs and comprises:

- **The Transport Model** that calculates the LRMCs of transporting gas from each entry point (for the purposes of setting NTS Entry Capacity Prices) to a “reference node” and from the “reference node” to each relevant offtake point.
- **The Tariff Model** that adjusts the LRMCs to maintain an equal split of revenue between Entry and Exit users (where entry prices are used to set auction reserve prices).

These models are described in more detail in Appendix 1.

50. Prices for each Gas Year are calculated using the relevant year’s 1-in-20 peak base case supply and demand data and network model (e.g. if setting entry capacity prices for Gas Year 2007/8, the base case supply/demand forecast for 2007/8 and the base network model are used).

51. The P_0 price for each ASEP is set equal to the NTS Entry Capacity Baseline Reserve Price, determined in accordance with the Gas Transmission Transportation Charging Methodology.

52. Price steps above P_0 (i.e. P_1, P_2 and so on) which reflect incremental capacity are set by adjusting supply flows from the base case data to reflect the appropriate incremental capacity level at each NTS Entry Point.

53. For each price step, the marginal distances (i.e. the distance which an incremental entry flow would travel) derived from this process are compared to the marginal distance corresponding to the obligated capacity level.

54. The differential between the marginal distances is then used to calculate the capital cost of accommodating the incremental entry flow (for that price step). The capital costs are annuitised and adjusted to reflect the ASEP calorific value.

55. The price steps are also adjusted to ensure that a progression of prices is established i.e. there is a minimum price step size between successive price steps. This is required to allow a cleared price to be established in the auction.

56. Normally, this results in a price progression that increases with the increment of capacity (an ascending price curve). A price progression that decreases with incremental capacity level may also be observed, usually for new ASEPs where connecting pipeline costs are added to the initial price progression (see below).

Incremental Step Sizes for Existing NTS Entry Points

57. Subject to paragraph 60, the incremental step sizes to be offered at auction are dependent upon the obligated entry capacity at each ASEP defined by the Licence. In accordance with the Uniform Network Code (Section B – 2.2.3 (c) & (d)), twenty increments will be offered.

58. For the avoidance of doubt, the obligated entry capacity level incorporates:

- Initial NTS SO Baseline Entry Capacity as defined by the Licence
- Incremental obligated capacity that has previously been released
- Entry capacity that has been substituted to or from the ASEP as a result of National Grid's Entry Capacity Substitution Methodology

59. Price steps will usually be based on releasing capacity increments equal to 2.5% of the obligated entry capacity level at the relevant ASEP. For example, the second price step (P_2) represents the minimum price at which valid bids for at least 105% of obligated capacity would need to be received before National Grid would consider releasing incremental entry capacity equivalent to 5% of the obligated capacity level at that ASEP.

60. Fewer increments will be specified at the smallest ASEPs. At Entry Points that have an obligated capacity level that is less than 300GWh per day then the following will apply;

- In the first instance National Grid will determine the number of 15GWh increments required to offer no less than 50% of the obligated capacity level. The chosen increment size approximates to the increment that would be required if 300GWh is offered in 20 equal sized increments.
- No less than five increments are permitted. In instances where the application of a 15GWh increment infers that less than five increments will be required then a quantity that is equivalent to no less than 50% of the obligated capacity level at the relevant Entry Point will be divided into five equal sized increments.

61. Additional price steps might be required in circumstances where demand is expected to exceed 150% of the obligated level. Broadly this circumstance can arise at locations that have previously experienced high demand and at new entry points where no obligated entry capacity has previously been released.

62. At entry points where the planning process has signalled to National Grid's satisfaction that more than 50% capacity above the obligated level may be demanded in a given year,

National Grid would set price steps on the basis of quantities which were expected to exceed the indicated demand.

Incremental Step Sizes for New NTS Entry Points

63. From time to time demand may emerge for entry capacity at new ASEPs. When, through its planning process, a requirement for a new ASEP has been demonstrated to National Grid's satisfaction, a price schedule will be published for subsequent long-term auctions. Preservation of commercial confidentiality is an important consideration when developing a new entry point and therefore National Grid will publish price steps that seek to preserve confidentiality with respect to expected deliverability.

64. The number of price steps will be fixed and the aggregate size will be subject to a range of uncertainty as follows;

- The minimum number of price steps will be 20 increments of 15GWh each.
- The maximum number of price steps will be 20 increments of equal size, which in total are equivalent to 150% of the capacity requirement signalled to National Grid through its planning process.

65. If a new ASEP is developed, National Grid would expect Ofgem to initiate the process necessary to modify the Licence such that the ASEP concerned is identified in the Licence.

66. The methodology, which applies for new ASEPs, is consistent with the methodology outlined above for existing entry points, except that there are two main differences:

- Price steps at locations that have a zero obligated entry capacity level, such as new ASEPs, will commence at an initial price of zero.
- In the case of National Grid building any connecting pipe, the extension costs will be annuitised and added to each of the incremental step prices (P_1 to P_{20})

Pricing Recalculation

67. From time to time, when National Grid believe that there has been a substantial change to cost drivers, including the supply/demand balance, investment cost assumptions or network topology, it will be appropriate for National Grid to recalculate price schedules in light of any change. It is not anticipated that release of non-obligated capacity would normally trigger such a re-calculation unless the release is for a sustained period.

Appendix 1: NTS Capacity Charging Models for Derivation of NTS Capacity Charges and NTS Entry Capacity Step Prices.

The Transport Model

Model Input Data

68. The transport 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, based on analysis of peak conditions on the transmission system. The measure of the investment costs is in terms of £/GWhkm, a concept used to calculate marginal costs, 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.

69. The transport model requires a set of inputs representative of peak 1-in-20 conditions on the transmission system:

- Nodal forecast 1-in-20 peak day supply and demand data (GWh)
  - Distribution Network and Direct Connect (e.g. power stations) offtake demands
  - ASEP supplies
- Transmission pipelines between each node (km)
  - Existing pipelines
  - New pipelines expected to be operational at the beginning of the gas year under analysis
- Identification of a reference node

Model Inputs

70. The nodal supply data for the transport model will be derived from the supply/demand match set out in the Ten Year Statement. The supply figures at Storage and Interconnector entry points will be set at a level less than or equal to the expected entry point capability. The aggregate storage and Interconnector flows will be adjusted such that a supply and demand balance is achieved.

71. Nodal demand data for the transport model will be based on demand that DN Users have forecast to occur at the National 1-in-20 peak day demand level and the booked capacity for directly connected consumers.

72. National Transmission System network data for the charging year will be based on data taken from National Grid's Ten Year Statement.

73. The use of the reference node enables the marginal costs to be considered as those supply costs generated from a notional change in flow *from* any node *to* the reference node. The costs generated from a notional change in flow from the reference node to any node are the negative of these supply costs.

74. It may be demonstrated that the choice of the reference node does not affect the final tariffs, after they have been adjusted to recover revenue (for exit charges) or to maintain a

defined entry-exit split of revenue (for entry prices) i.e. it determines the magnitude of the marginal costs but not the relativity. For example, if the reference point were put in the North of Scotland, all nodal supply marginal costs would likely be negative. Conversely, if the reference point were defined at Land's End, all nodal supply marginal costs would likely be positive. However, the relativity of costs between nodes would stay the same. For information, the reference node has been set at Peterborough.

75. The model calculates the marginal costs of investment by determining flow distances (or shadow prices) at each node. This type of model does not require a parameter to be entered to determine the size of flow increment that should be injected to generate incremental costs of investment.

Model Outputs

76. The transport model is an optimisation model that calculates the minimum total network flow distance (in GWhkm) given a set of supply and demand flows i.e. it takes the inputs described above and uses a transport algorithm to derive the pattern of balanced network flows that minimises distances travelled by these flows from a supply node or to a demand node, assuming every network section has sufficient capacity.

77. The marginal cost values are expressed solely in km as they are flow gradients i.e. they represent the sensitivity of the total network flow distance value to a change in supply or demand at any node (Total Flow Distance ÷ Change in Nodal Flow implies units of GWhkm ÷ GWh = km).

78. The model computes a marginal cost for supply at each node (which may be positive or negative in relation to the reference node). The marginal cost for demand at each node is then the equal and opposite of the nodal marginal cost for supply. A negative marginal cost represents a marginal benefit or avoided cost at that point.

The Tariff Model

The Initial Nodal Marginal Distances

79. The key inputs to the Tariff Model are the marginal costs of supply and the marginal costs of demand calculated from the transport model. These are used to set the Initial Nodal Marginal Distances (InitialNMkm):

$$InitialNMkm_{Si} = LRMC_{Si} \quad \text{and} \quad InitialNMkm_{Dj} = -LRMC_{Dj}$$

Where

$InitialNMkm_{Si}$	=	*Initial nodal marginal distance for supply i (km)*
$InitialNMkm_{Dj}$	=	*Initial nodal marginal distance for demand j (km)*
$LRMC_{Si}$	=	*Long run marginal cost of flow to reference node from supply i (km)*
$LRMC_{Dji}$	=	*Long run marginal cost of flow to reference node from demand j (km)*

80. The Initial Nodal Marginal Distances are adjusted to either maintain an equal split of revenue between Entry and Exit users where prices are used to set auction reserve prices, or to recover a target level of revenue, where prices are set as administered rates. This section describes how the nodal marginal distances are used to calculate entry long run incremental costs for each ASEP.

81. Long run incremental costs are calculated for an ASEP by determining the difference between adjusted nodal marginal distances for each incremental capacity level and the obligated capacity level.

82. The differences in the adjusted marginal distances are converted into unit (incremental) costs (£/GWh) by multiplying it by the Expansion Constant. These unit costs can then be converted into daily prices by applying the annuitisation factor contained within the Licence. An adjustment to reflect the calorific value at the ASEP is also applied.

83. The price schedule is established by adding each incremental price to the P_0 price to establish a price for each incremental level of capacity.

The Expansion Constant

84. The expansion constant, expressed in £/GWhkm, represents the capital cost of the transmission infrastructure investment required to transport 1GWh over 1km. Its magnitude is derived from the projected cost of an 85barg pipeline and compression for a 100km NTS network section. The 100km distance was selected as this represents the typical compressor spacing on the NTS.

85. Calculated from first principles, the steps taken to derive the expansion constant are as follows:

a) National Grid determines the projected £/GWhkm cost of expansion of 85barg pressure pipelines and compression facilities, based on manufacturers' budgetary prices and historical costs inflated to present values. Pipeline and compression costs are determined in accordance with the NTS Transportation Charging Methodology.

b) An average expansion constant is calculated from the largest three pipeline diameter/compressor sections (network sections n = 1, 2, and 3). The selection of expansion constants calculated from these three network sections is based on recent and expected future projects on the transmission system. The pipe diameters used are:

D_1 = *900 mm*

D_2 = *1050 mm*

D_3 = *1200 mm*

c) The maximum daily flow that can be facilitated through each of the three network sections is calculated. This is based on assumptions of an 85barg inlet pressure and a minimum outlet pressure of 38barg and is calculated from the Panhandle A pipe flow equation (a standard flow equation used within the gas industry).

$$Q_n = K_{flow} \times \left(\frac{T_{std}}{P_{std}}\right) \times D_n^{2.6182} \times \left(\frac{P_1^2 - P_{2,n}^2}{G^{0.8538} \times T_{av} \times L \times Z_{av}}\right)^{0.5394}$$

Where

Q_n = *Flow for network section n (mscmd)*

K_{flow} = *Constant (0.0045965)*

T_{std} = *Standard temperature (291.4°K)*

P_{std}	=	*Standard pressure (1.01325 bar_a)*
D_n	=	*Diameter for network section n (mm)*
P_1	=	*Pipe absolute inlet pressure (86.01325 bar_a ~ 85 bar_g)*
$P_{2,n}$	=	*Pipe absolute outlet pressure for network section n (bar_a)*
G	=	*Gas specific gravity (0.6)*
T_{av}	=	*Pipeline average temperature (285.4°K)*
L	=	*Pipe length (100 km)*
Z_{av}	=	*Average gas compressibility (0.85)*

d) The maximum daily energy flow is calculated from the volumetric flow using a standard planning CV of 39MJ/m3 and the planning flow margin of 5%.

$$Capacity_n = \frac{Q_n \times CV}{((1+FM)\times 3.6)}$$

Where

$Capacity_n$	=	*Daily capacity for network section n (GWh)*
Q_n	=	*Flow for network section n (mscmd)*
CV	=	*Calorific Value (39 MJ/m3)*
FM	=	*Flow margin (5%)*
3.6	=	*Converts 10^6 MJ to GWh*

e) The compressor power requirement to recompress back to 85barg is calculated from the flow and the inlet and outlet pressures. The inlet pressure for the compressor is the outlet pressure of the pipe section for each pipe diameter D.

$$Power_n = \left(\frac{\gamma}{\gamma - 1}\right)\frac{K_{power} \times Z_{av} \times T_{av} \times Q_n}{\eta}\left[\left(\frac{P_{out}}{P_{in,n}}\right)^{\frac{\gamma-1}{\gamma}} - 1\right](1+FM)$$

Where

$Power_n$	=	*Compressor power for network section n (MW)*
$P_{in,n}$	=	*Compressor absolute inlet pressure for network section n(bar_a)*
P_{out}	=	*Compressor absolute outlet pressure (86.10325 bar_a)*
K_{power}	=	*Constant (0.0040639)*
Z_{av}	=	*Compressibility (0.85)*
T_{av}	=	*Average gas temperature (285.4°K)*
Q_n	=	*Flow for network section n (mscmd)*
γ	=	*Isentropic index (1.363)*
η	=	*Compressor adiabatic efficiency (80%)*
FM	=	*Flow margin (5%)*

f) The capital cost of the pipe for each network section is calculated from the pipe cost equation, the pipe diameter and the pipe length of 100km.

$$Pipe\_Cost_n = L \times (D_n \times Pipecost\_diameter\_factor + Pipecost\_constant\_factor)$$

Where

$Pipe\_Cost_n$	=	*Capital cost for pipe in network section n (£m)*
L	=	*Length (100 km)*
D_n	=	*Diameter for network section n (mm)*
Pipecost_diameter_factor	=	*Capital cost factor (£m/km/mm)*
Pipecost_constant_factor	=	*Capital cost factor (£m/km)*

g) The capital cost of recompression from the minimum pressure up to 85barg is calculated from the compressor power requirements.

$$Compressor\_Cost_n = Power_n \times Power\_Unit\_Cost$$

Where

$Compressor\_Cost_n$	=	*Capital cost for compression in network section n (£m)*
$Power_n$	=	*Compression power for network section n (MW)*
Power_Unit_Cost	=	*Unit cost for additional power at existing stations (£m/MW)*

h) An allowance for engineering and project planning costs is included at 15%. Project management costs are variable costs that are dependent upon many factors including location, timing, type and size of investment, however, size of investment is the main indicator of the scale of expected project management costs.

$$Project\_Cost_n = Project\_Factor * (Pipe\_Cost_n + Compressor\_Cost_n)$$

Where

$Project\_Cost_n$	=	*Project costs for network section n (£m)*
Project_Factor	=	*15%*
$Pipe\_Cost_n$	=	*Capital cost for pipe in network section n (£m)*
$Compressor\_Cost_n$	=	*Capital cost for compression in network section n (£m)*

i) The total cost is the pipe cost plus the compressor cost plus the project costs (£).

$$Total\_Cost_n = Pipe\_Cost_n + Compressor\_Cost_n + Project\_Cost_n$$

Where

$Total\_Cost_n$	=	*Total cost for network section n (£m)*
$Pipe\_Cost_n$	=	*Capital cost for pipe in network section n (£m)*
$Compressor\_Cost_n$	=	*Capital cost for compression in network section n (£m)*

j) The unit cost is the total cost divided by the maximum energy flow (£m/GWh).

$$Unit\_Cost_n = Total\_Cost_n / Capacity_n$$

Where

$Unit\_Cost_n$	=	*Total unit cost for network section n (£m/GWh)*
$Total\_Cost_n$	=	*Total cost for network section n (£m)*
$Capacity_n$	=	*Daily capacity for network section n (GWh)*

k) The expansion constant is calculated by dividing the unit cost by the pipe section length of 100km (£/GWhkm). The expansion constant for each pipe diameter section is dependent on the minimum pressure. A higher pressure will reduce the compressor power requirement and hence will reduce the compression cost but will also reduce the maximum pipe flow. An optimum minimum pressure is calculated for each pipe diameter such that the pipe diameter specific expansion constants are minimised.

$$Specific\_Expansion\_Constant_n = 10^6 \times Unit\_Cost_n/L$$

Where

$Specific\_Expansion\_Constant_n$	=	*Expansion constant for network section n (£/GWhkm)*
L	=	*Length (100 km)*
10^6	=	*Conversion factor from £m to £*
$Unit\_Cost_n$	=	*Total unit cost for network section n (£/GWh)*

l) The final expansion constant is a simple average of the individual pipeline expansion constants.

$$EC = \frac{\sum_{n=1}^{3} Specific\_Expansion\_Constant_n}{3}$$

Where

EC	=	*Expansion constant (£/GWhkm)*
$Specific\_Expansion\_Constant_n$	=	*Expansion constant for network section n (£/GWhkm)*

Supply/Demand Scenario

86. Prices are set on the basis of the 1-in-20 peak base case supply and demand data for Gas Year Y+2, but with adjustments to the supply flows to reflect the capacity level in question. Demand flows remain unadjusted from the base case.

87. To determine the entry price at the incremental capacity level offered at an entry point, the supply scenario is adjusted for each entry point as follows:

- The supply flow is adjusted to 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

88. Each entry point will be analysed in this way in turn e.g. for 25 entry points, a maximum of 25 sets of analysis will be required. Each analysis set comprises a run to determine the LRMC at the obligated capacity level, and up to 20 runs to determine the LRMCs at each incremental capacity level.

Supply Merit Order

89. 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.

90. The supply merit order is determined by use of the Transport Model with the base case scenario to calculate pipeline distances from each NTS Entry Point to every other entry point.

91. 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.

92. 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.

Network Model

93. The network model includes all existing pipe sections plus sanctioned projects expected to be completed by the start of the Gas Year Y+2. Any connection that has been paid for and hence is included at zero value in the NTS Regulatory Asset Base (RAB) will be included at zero length.

Entry-Exit Price Adjustment

94. The first step of the Tariff Model is to adjust the Initial Nodal Marginal Distances (InitialNMkm) such that the predefined 50:50 split between entry and exit is obtained. This is done for each capacity level and each ASEP.

95. An additive constant Adjustment Factor (AF) must be calculated which, when added to each Initial Nodal Marginal Distance, gives a revised marginal distance for each supply (NTS ASEP) and for each demand (NTS offtake). The calculation simultaneously removes the negative marginal distances by collaring the Initial Nodal Marginal Distances at zero.

96. The Adjustment Factor is calculated such that the average marginal distances (flow distances) for supply and demand are equal.

$$\sum_{Si=1}^{n_S}\left(\frac{Max\left[0, InitialNMkm_{x,Si} + AF_x\right]}{n_S}\right) = \sum_{Dj=1}^{n_D}\left(\frac{Max\left[0, InitialNMkm_{x,Dj} - AF_x\right]}{n_D}\right)$$

97. The Nodal Marginal Distance (NMkm) for the entry point in question is then the Initial Nodal Marginal Distance for that entry point plus the Adjustment Factor.

$$NMkm_{x,EntryPoint} = InitalNMkm_{x,EntryPoint} + AF_x$$

Where

$InitialNMkm_{x,Si}$	=	*Initial nodal marginal distance for supply i for price step x (km)*
$InitialNMkm_{x,Dj}$	=	*Initial nodal marginal distance for demand j for price step x (km)*
AF_x	=	*Adjustment factor for price step x(km)*
$NMkm_{x,EntryPoint}$	=	*Nodal marginal distance for the entry point for price step x (km)*
n_S	=	*Number of supply charging points (-)*
n_D	=	*Number of demand charging points (-)*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
i	=	$1,\ldots n_S$
j	=	$1,\ldots n_D$
x	=	*1,2,…n and the obligated level*
n	=	*the highest incremental capacity level considered for the entry point*

Incremental Distances

98. The Nodal Marginal Distances for each supply being considered at each incremental capacity level are converted to Nodal Incremental Distances by calculating the difference between the Nodal Marginal Distance at the incremental level and the Nodal Marginal Distance at the obligated capacity level.

$$NIkm_{x,EntryPoint} = NMkm_{x,EntryPoint} - NMkm_{Obligated,EntryPoint}$$

Where

$NIkm_{x,EntryPoint}$	=	*Nodal incremental distance for the entry point for price step x (km)*
$NMkm_{x,EntryPoint}$	=	*Nodal marginal distance for the entry point for price step x (km)*
$NMkm_{Obligated,EntryPoint}$	=	*Nodal marginal distance for the entry point at the obligated capacity level (km)*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	$1,2,\ldots n$
n	=	*the highest incremental capacity level considered for the entry point*

Entry Capacity Step Prices

99. The Nodal Incremental Distances are converted to capital costs by multiplying by the Expansion Constant, and annuitised using the annuitisation factor specified in the Licence (which means that the cost is spread evenly over the expected life of the asset taking into account the required rate of return). Annuitised costs are converted from £/GWh/year to p/kWh/day by dividing by 365 and multiplying by 100.

100. Annuitised costs are adjusted to recognise the different calorific values of gas entering the system using ASEP specific calorific values.

101. The initial incremental step price is calculated by adding the annuitised cost for the incremental capacity step to the baseline reserve price.

$$Price_{0,EntryPoint} = ReservePrice_{EntryPoint}$$

$$Price_{Obligated,EntryPoint} = Max\left[0.0001, \left(\frac{NMkm_{Obligated,EntryPoint} \times AnF \times EC \times 100}{10^6 \times 365} \times \frac{39}{CV_{EntryPoint}}\right)_{4dp}\right]$$

$$InitialPrice_{x,EntryPoint} = Price_{Obligated,EntryPoint} + \left(\frac{NIkm_{x,EntryPoint} \times AnF \times EC \times 100}{10^6 \times 365} \times \frac{39}{CV_{EntryPoint}}\right)_{4dp}$$

Where

$Price_{0,EntryPoint}$	=	*Final Entry Price for the entry point for price step 0 (p/kWh/day)*
$ReservePrice_{EntryPoint}$	=	*Baseline reserve price for the entry point calculated according to the Gas Transmission Transportation Charging Methodology*
$Price_{Obligated,EntryPoint}$	=	*Price for the entry point at the obligated capacity level (p/kWh/day)*
$NMkm_{Obligated,EntryPoint}$	=	*Nodal marginal distance for the entry point at the obligated capacity level (km)*
$InitialPrice_{x,EntryPoint}$	=	*Initial Entry Price for the entry point for price step x (p/kWh/day)*
$NIkm_{x,EntryPoint}$	=	*Nodal incremental distance for the entry point for price step x (km)*
AnF	=	*Licence annuitisation factor (-)*
EC	=	*Expansion constant (£/GWhkm)*
10^6	=	*Conversion factor from GWh to kWh*
100	=	*Conversion factor from £ to pence*
365	=	*Conversion factor from annual to daily price*
39	=	*Standard calorific value (MJ/m^3)*
$CV_{EntryPoint}$	=	*Calorific value for the entry point (MJ/m^3)*
4dp	=	*Rounding to 4 decimal places of precision*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	*1,2,…n*
n	=	*the highest incremental capacity level considered for the entry point*

Application of Baseline Reserve Prices

102. The relevant baseline capacity reserve price for each Gas Year is used to set prices in auctions. For QSEC Baseline Reserve 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.

New Entry Points

103. In the event that a connecting pipe is required, the initial price schedule calculation in paragraph 101 will be replaced by the following calculation:

$$InitialPrice_{x,EntryPoint} =$$

$$Price_{Obligated,EntryPoint} + \left(\left\{ \frac{NIkm_{x,EntryPoint} \times EC \times 39}{10^6 \times CV_{EntryPoint}} + \frac{Connection\,Cost_{x,EntryPoint}}{Capacity_{x,EntryPoint}} \right\} \times \frac{AnF \times 100}{365} \right)_{4dp}$$

Where

$InitialPrice_{x,EntryPoint}$	=	*Initial Entry Price for the entry point for price step x (p/kWh/day)*
$Price_{Obligated,EntryPoint}$	=	*Price for the entry point at the obligated capacity level (p/kWh/day)*
$NIkm_{x,EntryPoint}$	=	*Nodal incremental distance for the entry point for price step x (km)*
AnF	=	*Licence annuitisation factor (-)*
EC	=	*Expansion constant (£/GWhkm)*
$ConnectionCost_{x,EntryPoint}$	=	*Connection cost for the entry point for price step x (£m)*
$Capacity_{x,EntryPoint}$	=	*Capacity level for the entry point for price step x (GWh)*
10^6	=	*Conversion factor from GWh to kWh*
100	=	*Conversion factor from £ to pence*
365	=	*Conversion factor from annual to daily price*
39	=	*Standard calorific value (MJ/m^3)*
$CV_{EntryPoint}$	=	*Calorific value for the entry point (MJ/m^3)*
4dp	=	*Rounding to 4 decimal places of precision*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	*1,2,…n*
n	=	*the highest incremental capacity level considered for the entry point*

Ascending and Descending Price Schedules

104. The process for determining prices given above will usually result in an increasing price progression with increasing capacity level (an ascending price curve). However, especially in the case of new entry points where economies of scale may be present when including

connecting pipe costs, a price progression that decreases with the incremental capacity level may be observed.

105. In order to test for the presence of an ascending or descending curve, the price at the highest capacity level to be offered (P_n) will be compared to the P_1 price.

106. An ascending price curve is detected if $P_n \geq P_1$ and a descending price curve is detected if $P_n < P_1$.

107. The final incremental step price is determined by ensuring that there is a difference of at least 0.0001 p/kWh/day between each incremental step price. This is required to ensure a monotonic price schedule is generated so that a unique clearing price may be determined for incremental capacity allocation.

108. If the ASEP has an ascending price curve the final incremental step prices are calculated (starting at P_0 and working forwards through the price steps) using the following equation:

$$Price_{x,EntryPoint} = Max\lfloor 0.0001 + Price_{x-1,EntryPoint}, InitialPrice_{x,EntryPoint} \rfloor$$

Where

$Price_{x,EntryPoint}$	=	*Final Entry Price for the entry point for price step x (p/kWh/day)*
$InitialPrice_{x,EntryPoint}$	=	*Initial Entry Price for the entry point for price step x (p/kWh/day)*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	*1,2,…n*
n	=	*the highest incremental capacity level considered for the entry point*

109. Otherwise, the ASEP has a descending price curve[6], so the final incremental step prices are calculated (starting from the highest price step and working backwards through the price steps) using the following equation:

$$Price_{n,EntryPoint} = InitialPrice_{n,EntryPoint}$$

$$Price_{x,EntryPoint} = Max\lfloor 0.0001 + Price_{x+1,EntryPoint}, InitialPrice_{x,EntryPoint} \rfloor$$

Where

$Price_{x,EntryPoint}$	=	*Final Entry Price for the entry point for price step x (p/kWh/day)*
$InitialPrice_{x,EntryPoint}$	=	*Initial Entry Price for the entry point for price step x (p/kWh/day)*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	*n-1,…2,1*

[6] For the avoidance of doubt, the P_0 price step remains unchanged in this process.

n	=	*the highest incremental capacity level considered for the entry point*

Estimated Project Costs

110. For the purposes of determining the required commitment from bidders that would normally trigger the release of incremental capacity, should auction bids satisfy the test given in paragraph 36, an estimated project cost will be calculated for each incremental capacity level from the final incremental step prices as follows:

$$ProjectCost_{x,EntryPoint} = InitialPrice_{x,EntryPoint} \times \frac{365}{100 \times AnF} \times IncCapacity_{x,EntryPoint}$$

Where

$ProjectCost_{x,EntryPoint}$	=	*Estimated project cost for the entry point for price step x (£m)*
$InitialPrice_{x,EntryPoint}$	=	*Initial Entry Price for the entry point for price step x (p/kWh/day)*
AnF	=	*Licence annuitisation factor (-)*
100	=	*Conversion factor from £ to pence*
365	=	*Conversion factor from annual to daily price*
$IncCapacity_{x,EntryPoint}$	=	*Incremental capacity level for the entry point for price step x (GWh)*
EntryPoint	=	*The entry point being analysed (a node in the set of supplies)*
x	=	*1,2,…n*
n	=	*the highest incremental capacity level considered for the entry point*

Appendix 2: Example of the NPV test

This example is provided as an indication of how the methodology to release incremental entry capacity is applied. It should not be taken as being indicative of actual step prices, project costs, or the ease with which release of capacity may be triggered.

Assume:

1. for simplicity there are only 5 price steps
2. the obligated volume is 100GWh/d
3. Q1 is April 2011

If National Grid publish the following Price Schedule to apply in a QSEC auction.

Available (GWh)	Price Label	Price (p/kWh/d)	Estimated project cost (£m)
150	P_5	0.06	20
140	P_4	0.05	16
130	P_3	0.04	12
120	P_2	0.03	8
110	P_1	0.02	4
100	P_0	0.01	0

Assume the following bids are obtained through the auction:

Supply			Demand																		
Available (GWh)	Price Label	Price (p/kWh/day)	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	Q14	Q15	Q16	…	…	Q32
150	P_5	0.06	100	100	120	120	110	100	100	100	100	100	100	100	100	100	100	100	…	…	100
140	P_4	0.05	100	100	120	120	110	100	100	100	100	100	120	100	100	100	100	100	…	…	100
130	P_3	0.04	100	100	130	130	120	100	130	130	100	100	130	125	100	100	110	110	…	…	100
120	P_2	0.03	100	100	135	135	120	100	135	131	110	100	132	125	100	100	120	120	…	…	100
110	P_1	0.02	100	100	140	135	130	100	140	140	120	100	134	125	100	100	131	131	…	…	100
100	P_0	0.01	100	100	145	140	131	100	140	140	131	100	135	130	100	100	140	140	…	…	100

Therefore, there is a signal to release 130GWh per day from Q3. The clearing price for Q3 and Q4 would be P3, P1 for Q5, P3 for Q7 and Q8 and so on. This means that there is a signal for 30GWh per day of incremental entry capacity. The NPV test is applied as below:

			Apr-11	Jul-11	Oct-11	Jan-12	Apr-12	Jul-12	Oct-12	Jan-13	Apr-13	Jul-13	Oct-13	Jan-14	Apr-14	Jul-14	Oct-14	Jan-15	Apr-15		Jan-19
			Q1	**Q2**	**Q3**	**Q4**	**Q5**	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**	**Q12**	**Q13**	**Q14**	**Q15**	**Q16**	**Q17**		**Q32**
Incremental Capacity to release	**GWh**	**(a)**	0	0	30	30	30	0	30	30	20	0	30	30	0	0	20	20	0		0
Clearing Price	**p/kWh/d**	**(b)**	0.01	0.01	0.04	0.04	0.02	0.01	0.04	0.04	0.02	0.01	0.04	0.01	0.01	0.01	0.03	0.03	0.01		0.01
Days per quarter	**day**	**(c)**	91	92	92	91	91	92	92	90	91	92	92	90	91	92	92	90	91		90
Incremental Revenue	**£m**	**(a)*(b)*(c)/100**	0.00	0.00	1.10	1.09	0.55	0.00	1.10	1.08	0.36	0.00	1.10	0.27	0.00	0.00	0.55	0.54	0.00		0.00
NPV Test	**£m**	**50% Estimated Project Cost**	**6**																		
NPV of Revenue (based on Quarterly discount factor of 2.01%)	**£m**	**2.01%**	**6.63**																		

As the NPV of the revenues (£6.16m) > 50% * Assumed Project Value (£6m), the NPV test is passed and 30GWh/d would be released from Q3 as Obligated Incremental Entry Capacity.