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Entry Capacity Transfer and Trade Methodology Statement

Effective from 20th April 2023

ENTRY CAPACITY TRANSFER & TRADE METHODOLOGY STATEMENT

Document Revision History

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| 9.2 | March 2019 | Formal Consultation. No further changes following preliminary consultation. |
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About this Document

This document describes the methodology that National Gas Transmission in its role as holder of the Gas Transporter Licence in respect of the NTS (the “Licence”) will utilise when facilitating the transfer of unsold, or the trade of sold, Firm Entry Capacity from one ASEP to another ASEP. In particular, it defines:

- under what circumstances National Gas Transmission will consider such transfers or trades; and
- the process to be undertaken by National Gas Transmission to determine the quantities that it will allow to be transferred.

This document is one of a suite of documents that describe the release of Entry Capacity and Exit Capacity by National Gas Transmission and the methodologies behind them. The other documents are available on the National Gas Transmission website at:

<https://www.nationalgas.com/capacity/capacity-methodology-statements>

This document has been published by National Gas Transmission in accordance with Special Condition 9.17.3(b) of National Gas Transmission’s Gas Transporter Licence (the “Licence”). National Gas Transmission 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.

This statement of the Entry Capacity Transfer and Trade Methodology has been developed in conjunction with relevant UNC modification proposals.

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 Future Markets team at

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GENERAL INTRODUCTION

Background

1. National Gas Transmission is the owner and the operator of the gas National Transmission System (NTS) in Great Britain.
2. The NTS is a network of pipelines, presently operated at pressures of up to 94 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 power stations, 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 and interconnectors.
4. This publication sets out the methodology that applies for the transfer of unsold, and trading of sold, Firm Entry Capacity between NTS Entry Points¹ as more fully defined in the Licence.
5. Details of National Gas Transmission and its activities can be found on the company's internet site at <https://www.nationalgas.com/>. An electronic version of this publication, along with the other related statements can be found at the following web page <https://www.nationalgas.com/capacity/capacity-methodology-statements>

National Gas Transmission's Licence Obligations

6. New and existing Users of the NTS are able to request to purchase NTS Entry Capacity products for any Aggregate System Entry Point ("ASEP"). Such capacity requests will be considered against the provisions of National Gas Transmission's statutory and Licence obligations and in accordance with its published methodologies.
7. Overriding obligations applicable to this Statement are set out in the Gas Act and the Licence.
8. Specific obligations and rights in respect of the transfer and trade of Firm Entry Capacity applicable to this Statement are set out in Special Condition 9.17 of the Licence and are:
 - Prepare an entry capacity trade methodology which National Gas Transmission shall apply for the purpose of facilitating entry capacity trade, including the calculation of entry capacity trade rates.
 - Submit for approval by the Authority a statement of the entry capacity trade methodology.
 - Prepare an entry capacity transfer methodology which National Gas Transmission shall apply for the purpose of facilitating entry capacity transfer, including the calculation of entry capacity transfer rates.
 - Submit for approval by the Authority a statement of the entry capacity transfer methodology.

¹ For the avoidance of doubt, this will not apply to Interconnection Point Capacity at Interconnection Point ASEPs (IP ASEPs).

- Use reasonable endeavours to ensure that the methodologies facilitate the capacity transfer/trade objectives.
- The capacity transfer and capacity trade objectives are to:
 - ensure that entry capacity transfer/trade is effected in a manner consistent with its duties under the Gas Act and which makes efficient and economical use of the NTS;
 - ensure that entry capacity transfer/trade is effected in a manner which is compatible with the physical capability of the NTS;
 - avoid material increases in cost (including entry capacity constraint management costs²) that are reasonably expected to be incurred as a result of facilitating entry capacity transfer/trade; and
 - so far as is consistent with the above three points, to facilitate effective competition between relevant shippers and suppliers.

Due to the high degree of similarity between the transfer and trade methodologies National Gas Transmission has prepared this single document to satisfy the Licence requirements outlined above.

² Where this document refers to constraint management costs this should be read as including other costs that National Grid may take into account when assessing for a material increase in costs. This includes, but is not limited to, CV shrinkage, compressor running costs, increased maintenance costs and costs due to rescheduling of maintenance works.

CHAPTER 1: PRINCIPLES

Purpose of the Methodology Statement

9. For the purpose of this document:
 - Entry Capacity Trade (“Trade”) means the process by which previously allocated firm entry capacity rights; and
 - Entry Capacity Transfer (“Transfer”) means the process by which unsold NTS entry capacity rights;are moved from one ASEP to another ASEP where all obligated entry capacity (i.e. capacity that National Gas Transmission is obligated, under the Licence, to make available) has been sold. For the avoidance of doubt this will not apply to Interconnection Point Capacity at Interconnection Point ASEPs (IP ASEPs) .
10. This Methodology Statement has been produced to meet the requirements of Special Condition 9.17 of the Licence in respect of the preparation of a statement setting out the methodology by which National Gas Transmission will facilitate the entry capacity transfer/trade objectives and determine an entry capacity transfer or entry capacity trade rate (an “Exchange Rate”) in respect of, and to facilitate;
 - the trade of capacity between NTS Entry Points or
 - the transfer of capacity between NTS Entry pointsNational Gas Transmission believes the content is consistent with its duties under the Gas Act and is consistent with the Licence.
11. For the purpose of this Statement a capacity Exchange Rate means a rate at which either the sold firm entry capacity rights offered by Users or unsold obligated entry capacity rights (as appropriate) shall, if the Trade or Transfer is completed, be reassigned between two different ASEPs. It represents the amount by which the firm entry capacity at a “Donor” ASEP would need to be reduced so as to provide one additional unit of firm entry capacity at a “Recipient” ASEP. In making capacity available at a Recipient ASEP, in a quantity determined in accordance with this methodology, National Gas Transmission will have complied with its obligation to provide obligated entry capacity at the Donor ASEP and such traded or transferred capacity will not be available for sale in future auctions.
12. Where capacity is reallocated at a Recipient ASEP(s) from a Donor ASEP(s) any capacity Transferred from the Donor ASEP(s) will be deemed to have been sold at the relevant Donor ASEP for the purposes of determining the level of capacity that National Gas Transmission is obliged to release in future auctions (in accordance with the Licence). Likewise, any capacity that is Traded from Donor ASEPs to a Recipient ASEP will continue to be treated as having been sold at the Donor ASEP for the purposes of determining future capacity release. Therefore such Transferred or Traded capacity will not be available for sale at the Donor ASEP in future auctions for the relevant period of the Transfer or Trade.
13. Determination of an Exchange Rate requires fixed supply / demand scenarios against which potential Transfer and Trades can be assessed. Acceptable Exchange Rates are, therefore, dependent upon previously accepted Transfer and Trades. Hence, in order to maximise potential Exchange Rates this methodology assumes that a sequence for assessing Recipient ASEPs (and the Transfer / Trade quantity) has been established prior to calculating Exchange Rates. In the event that this assumption is not satisfied then the Methodology Statement will not be valid.

14. The methodology described in this Statement has been developed to best meet the capacity trade and capacity transfer objectives detailed in paragraph 8. Specifically:
- a “material increase in cost” will occur where a transfer or trade is anticipated, in accordance with the assumptions and analysis defined in this methodology, to result in a network failure requiring constraint management action. Any increase in constraint management costs in excess of that expected in the absence of any proposed transfer or trade is considered a “material increase”.
 - For the avoidance of doubt, any constraint management costs arising from circumstances that National Gas Transmission has considered, in applying this methodology, unlikely to occur will be considered “non-material”. This does not mean that such circumstance and costs will not occur.
15. The rationale for the process described in this Statement is to ensure that the NTS is efficiently and economically used. In particular it is intended to ensure that:
- a) the sale of capacity does not create a situation whereby sold capacity at a location where it is no longer required prevents the release of additional capacity, above obligated levels, elsewhere due to National Gas Transmission’s on-going commitment in respect of the sold capacity; or
 - b) obligated capacity levels do not create requirements whereby unsold capacity at a location is effectively sterilised³ and cannot be reallocated to support demand for additional capacity above obligated levels elsewhere.

The purpose is, therefore, to maximise the availability of firm capacity at locations where demand for capacity exists. This process applies to capacity available in the constrained period (i.e. within investment lead times) as demand for additional capacity cannot be met by investment on the system within such timescales.

16. Consistent with the Licence and Uniform Network Code, firm entry capacity is a commercial right that may be offered on a daily basis or multiples thereof: it does not reflect a commitment or obligation upon National Gas Transmission to undertake any investment on its network, including, but not limited to the provision of a physical connection to the NTS.

³ Sterilised refers to capacity at an ASEP that National Grid has an obligation to make available, this could either be sold or unsold capacity, which is not needed at the applicable ASEP. Hence it is sterilised because it cannot be used to support capacity demands at other ASEPs.

CHAPTER 2: METHODOLOGY

Introduction

17. This Methodology Statement is intended to explain the step by step approach that National Gas Transmission will undertake in order to determine capacity Exchange Rates in support of Transfer and Trades. Transfer and Trade of capacity between ASEPs will be undertaken so as to maximise the availability of firm NTS Entry Capacity at ASEPs of higher value as demonstrated by shipper bids. It does not describe the processes by which a User may request a capacity Transfer or Trade. Nor does it describe the processes that National Gas Transmission will undertake to validate any request or to implement a Transfer or Trade. These processes are detailed in the Uniform Network Code.
18. The methodology uses network analysis techniques, including transient analysis (and may use other entry capacity buy-back risk assessment tools available to National Gas Transmission) to identify the capability limits of the NTS and thereby assesses the expected cost and risk of constraint management actions being required under prevailing conditions and again in the event of a Transfer or Trade. The methodology has been developed to meet the Licence condition that no material increase in costs⁴ is reasonably expected as a result of the Transfer or Trade whilst maximising the effective use of the NTS at ASEPs where Users value capacity most. By undertaking assessments using a limited range of demand levels and limiting the analysis to certain gas supply scenarios National Gas Transmission is accepting a degree of increased risk that on any Day the capability at any ASEP may be below that assumed. Based on these assumptions, National Gas Transmission has for the time being taken the view that this increase is not material.
19. The obligation placed upon National Gas Transmission to “avoid material increases in cost” is not limited to capacity buy-backs and other constraint management actions. National Gas Transmission may become aware of other factors, including, but not limited to, CV shrinkage losses. Where National Gas Transmission cannot facilitate Transfer and Trades without a reasonable risk of incurring a material increase in these costs then Transfers and Trades will be scaled back or rejected.

Derivation of Base Data

Demand

20. The capability of any ASEP is partly dependent upon the system demand i.e. the ability of the NTS to accept gas at ASEPs partly depends upon how much is being offtaken (e.g. at LDZ offtakes, large directly connected loads and interconnectors). At times when demand is lower the capability of ASEPs will also be lower, assuming a constant supply pattern.
21. Daily demand varies significantly throughout the year and within individual months. Hence, when assessing the risk of incurring additional costs for one or more gas days (i.e. constraint management costs) as a result of relocating tranches of capacity for a given Period, a fundamental part of the process is to determine the appropriate range of demand to be considered in subsequent network analysis and modelling.

⁴ In accordance with incentive arrangements in the Licence a proportion of these costs may be borne by Users and hence, potentially, by consumers.

22. For the purpose of this Methodology Statement a “Period” is the duration over which capacity is to be relocated, e.g. monthly or daily. The frequency by which Transfer and Trades will be undertaken may differ from the Period. Both the Period and the frequency will be consistent with the UNC processes for Transfer and Trade.
23. National Gas Transmission will determine the appropriate range of demand to be used in determining Exchange Rates from historical records and demand forecasts for the particular Period in question.

Indicative demand levels are provided in Appendix 1 and are determined as described below.

24. National Gas Transmission will, for the relevant Period, identify
- the highest daily demand for each of the previous five (5) years;
 - the lowest daily demand for each of the previous five (5) years; and
 - the forecast demand for a cold season for the relevant Period. This data is updated annually and can be found on National Gas Transmission’s website at: <https://www.nationalgas.com/data-and-operations/transmission-operational-data>

To avoid using extreme scenarios that could limit the potential Exchange Rate the average of the five annual high levels and the average of the five annual low levels will be determined.

Analysis will be undertaken within the range set by the forecast level and the historic averages. National Gas Transmission may adjust these values to take account of any significant⁵ changes in demand. Any such adjustments will be documented.

National Gas Transmission will identify one or more demand levels under which Exchange Rate analysis will be undertaken. In determining how many demand levels are required National Gas Transmission will consider:

- the range between the demand levels identified and whether multiple analysis is required to provide sufficient reassurance that any potential Transfer or Trade will not result in a material increase in costs;
- the time taken to undertake analysis; with the aim of minimising such time period; and
- the outcome of previous Transfer and Trade calculations, e.g. whether analysis at different demand levels had significantly different results.

Nodal Allocation Maximum (NAM)

25. This methodology does not utilise Nodal Allocation Maximum (NAM). The maximum capability of any ASEP is not set in advance, but is identified, through network analysis, only if the ASEP is the constraining factor.

Entry Zones

26. This methodology does not utilise Entry Zones but is undertaken on an ASEP to ASEP basis.

⁵ Examples of a “significant change in demand” would be extreme weather forecasts or commissioning of a new interconnector or consuming plant that take anticipated demand outside that otherwise derived in accordance with this methodology.

Test Scenarios

27. The latest published UK Future Energy Scenarios document (UK FES) will be used as the basis for analysis. However the UK FES considers a limited range of scenarios designed for long-term planning and are not designed to test for material costs from constraints arising from short term supply patterns (which can be very different). The future energy scenarios will therefore be adjusted (“flexed”) to test the Exchange Rate. Such flexing will reflect historic and credible future supply patterns. These scenarios are referred to as test scenarios.
28. The test scenarios are patterns of supply based on the assumed demand level such that supply and demand are in balance and within the physical capabilities of the network. Demand is assumed to be static, i.e. does not readily move from one System Exit Point to another, however, supply is known to be much more flexible. The supply scenarios will be based on National Gas Transmission’s reasonable assessment of a credible “difficult” supply situation, i.e. gas entering the NTS in quantities, and at locations, that are operationally difficult to accommodate but which are reasonably expected to occur.
29. The test scenarios will be chosen in accordance with this paragraph.
- For the demand level(s) identified National Gas Transmission will identify historic supply patterns at that level.
 - The most recent years’ data will be used.
 - Historical supply patterns with up to 10% above and below the demand level will also be identified so as to capture inherent uncertainties in supply patterns.
 - Supply patterns identified will be ranked in the order of severity in relation to the recipient ASEP(s) concerned. Where “severity” represents the operational difficulty, at that demand level, of flows at the ASEP(s) being considered and adjacent ASEPs. The supply pattern with the highest severity will be put at the top of the ranking.
 - The top 25% of the supply patterns in the ranking (or a minimum of five supply patterns) will be taken, and the resultant average flows at each ASEP will be used to form a test scenario.
 - Where supplies do not match the demand level considered as a result of these changes, the supply at all ASEPs will be adjusted pro rata. Supplies will be capped at the obligated level; this may require further adjustment at other ASEPs.
 - Additional test scenarios will be determined for each ASEP as appropriate. This will reflect different scenarios where difficult conditions can be created by supplies concentrated at different ASEPs, e.g. Theddlethorpe high or Bacton UKCS high.

Where appropriate changes will be built into the scenarios to reflect significant developments, or exceptional circumstances, that affect supply patterns, such as:

- New gas supplies coming on stream;
- Existing gas supplies declining;
- New NTS infrastructure being commissioned; or
- Other factors, such as maintenance plans, affecting supply patterns.

Example

In the example below, for simplicity three supply patterns are used (instead of five). Assume they represent the top 25% of the available data. Numbers are used to illustrate the methodology and are not intended to be representative.

| Example: Demand level 350 mcmd ⁶ – Recipient Bacton UKCS | | | | | | | |
|---|--|-----|-------|-----|-----|----------------------------------|---------------------------------------|
| | Supply mcmd | | | | | Average (A+B+L)/3 (to 1dp) | Re- balanced Supply (to 1dp) |
| | A | B | C...J | K | L | | |
| St Fergus | 100 | 90 | | 120 | 110 | 100.0 | 101.0 |
| Easington | 80 | 90 | | 90 | 75 | 81.7 | 82.5 |
| Teesside | 50 | 50 | | 60 | 40 | 46.7 | 47.1 |
| Bacton UKCS | 80 | 70 | | 70 | 95 | 81.7 | 82.5 |
| Theddlethorpe | 40 | 35 | | 20 | 35 | 36.7 | 37.0 |
| Total | 350 | 335 | | 360 | 355 | 346.7 | 350.0 |
| Ranking | 2 | 3 | | 12 | 1 | | |
| Comment | Supply pattern K is least severe. In this example severity is measured as the combined flow at Bacton UKCS, Easington and Theddlethorpe. | | | | | | |

30. Different test scenarios may be applicable for different Recipient ASEPs, e.g. high supplies on the East Coast if considering Easington ASEP as a Recipient ASEP, or high South and West supplies if considering Milford Haven ASEP as a Recipient ASEP.
31. Where more than one scenario is identified for a Recipient ASEP analysis will be undertaken for each scenario. Constraints identified under any of the test scenarios could place a limit on Exchange Rates.

Modelling and Analysis

32. The analysis and modelling is primarily based on steady state conditions. National Gas Transmission will assume that a balance exists between supply and demand throughout the day.
33. It will be assumed that flow variation within and across days continues as per historical patterns. Where National Gas Transmission identifies that within or across day imbalances present a realistic risk of a material increase in costs then National Gas Transmission may supplement steady state analysis with transient state analysis.
34. Transfer and Trade shall be assessed against:
- existing commitments (and new commitments expected to be effective from the relevant Period), including capacities, and pressures on the network; and
 - existing infrastructure, including that expected to come on stream before the relevant Period.
35. Transfer and Trades shall not be accepted if:
- this leads to existing (and committed) commitments not being maintained. These commitments will be taken from regulatory and commercial agreements and statutory instruments; or
 - this is anticipated to lead to a material increase in costs, including but not limited to;
 - entry capacity buy-back costs;

⁶ mcmd means million cubic metres per day.

- other constraint management costs.

ASEP to ASEP Exchange Rate Calculation (see Diagram 1)

36. An Exchange Rate will be determined for the movement of capacity across ASEPs where there is a beneficial relationship between them i.e. reduction in obligations at one ASEP would allow more capacity to be released at another ASEP without causing system constraints or breaching existing commitments. For example Easington, Theddlethorpe, Bacton UKCS and Isle of Grain ASEPs currently have a beneficial relationship to each other.
37. The UNC may set limits on certain parameters that restrict the scope for Transfer and Trade, e.g. an upper limit on Exchange Rates. These limits will be observed; however, this Methodology Statement only details how Exchange Rates will be calculated. Where a limit is reached the Transfer or Trade will be undertaken as allowed for by rules defined in the UNC. Whether capacity is allocated in such circumstances is outside the scope of this Methodology Statement.
38. The Exchange Rate between ASEPs will be calculated on a frequency specified in UNC and will be determined as follows.
39. In accordance with UNC processes National Gas Transmission will identify:
 - Recipient ASEPs;
 - any grouping of Transfer and Trade bids and the ranking of these groups (as may be defined by the UNC); and
 - the Available Capacity for Allocation (“ACfA”) at each potential Donor ASEP. In simple terms, this is the quantity of capacity at an ASEP that can be allocated through Transfer and Trades.
40. The analysis will be performed for the expected demand level(s) for the Period in question as determined in accordance with paragraphs 23 and 24.
41. National Gas Transmission will identify appropriate test scenarios in accordance with paragraphs 28 to 31.
42. For the selected Recipient ASEP, and the relevant demand level, the appropriate test scenario will be identified. This process may be repeated for additional scenarios identified in accordance with paragraph 30.
 - a) If the gas flow, in the test scenario, at the Recipient ASEP is below the obligated level then it shall be increased to the obligated level and the gas supply shall be rebalanced as described in sub-paragraph f below; then
 - b) Gas flow at the Recipient ASEP will be increased to the level required to satisfy the Transfer and Trade bid(s) being considered; and
 - c) The Donor ASEP will be determined;
 - This will be on the basis of which potential Donor ASEP provides the most favourable Exchange Rate to the Recipient ASEP. Hence this may require calculation of the Exchange Rate (in accordance with the procedure below) for all potential Donor ASEPs in order to identify the most favourable. However, National Gas Transmission may limit such analysis only to those potential Donor ASEPs where experience suggests the most favourable Exchange Rate is likely to occur.
 - The Donor ASEP providing the most favourable Exchange Rate will be selected even if the ACfA is less than is required at the Recipient ASEP

in step b. In this case the bid(s) can only be partially satisfied and the increase in gas flow at the Recipient ASEP identified in step b will be limited to equal the ACfA. To completely satisfy the bids at the Recipient ASEP subsequent Donor ASEPs (if any) will need to be considered.

- d) The obligated level at the Donor ASEP will be reduced by the same quantity⁷ as the Recipient ASEP has been increased in sub-paragraph b; and
- e) Where the reduction in obligated entry capacity at the Donor ASEP does not result in an equivalent reduction in gas flow at the Donor ASEP (under the test scenario) then it will be necessary to rebalance the gas supply.
- f) Gas supply will, where required, be rebalanced by reducing (for the purposes of the analysis) gas flows at a third (and potentially additional) ASEP(s). This ASEP shall be selected on the basis of
 - Low interactivity with the Recipient ASEP, i.e. the reduction has little or no impact on the capability of the Recipient ASEP; and
 - Sufficient level of flow to accommodate such rebalancing.

Although, for the purposes of further analysis, the gas flow at the ASEP where rebalancing occurs is reduced, there will be no requirement, or restriction, on Users to reduce actual flows at that ASEP. There is a risk that actual flows could be higher than those modelled resulting in the need for constraint management actions (e.g. capacity buy-backs). National Gas Transmission has concluded that such a risk does not constitute a material increase in costs.

- 43. The network will now be checked to assess whether it can accommodate the supply / demand position. If it can be accommodated then the Exchange Rate will be calculated. If it cannot be accommodated then further adjustments shall be made as follows.
- 44. The network will be deemed to have failed to accommodate the supply / demand position if:
 - Network analysis failed⁸; or
 - a material increase in costs, including constraint management costs has been identified.

In the case of a network failure there is significant risk that an increase, over the current position, in constraint management actions will be required. National Gas Transmission has concluded that such a risk constitutes a material increase in costs.
- 45. Where further adjustments are required this will commence with a further reduction in the obligated level at the Donor ASEP and, if necessary, additional rebalancing. The obligated level at the Donor ASEP will be reduced by no more than the ACfA. Analysis will be repeated. The level at which the network does not fail shall be recorded. Where the network continues to fail even with the Donor ASEP at the lowest permissible level then the gas flow at the Recipient ASEP shall be reduced, i.e. Transfer and Trade bids cannot be fully satisfied by this Donor ASEP.
- 46. Where Transfer and Trade bids at the Recipient ASEP are not satisfied by Transfer and Trade from the Donor ASEP then Transfer and Trades shall be assessed for an additional Donor ASEP.

⁷ Where there is insufficient ACfA at the Donor ASEP (paragraphs 42 d and 45) then the Donor ASEP will only partially satisfy the Transfer or Trade. In this case, more than one Donor ASEP will be required.

⁸ Network failure would normally be identified by an over- or under- pressure alarm within the network analysis. The alarm pressures are set to ensure that safety and / or contractual limits are not compromised. Failure could be caused by other parameters.

47. Where Transfer and Trade bids at the Recipient ASEP cannot be satisfied by reducing the obligated level at all potential Donor ASEPs by the ACfA then it will be necessary to re-consider the quantity to be assigned to the Recipient ASEP (in step 42b).
48. The Exchange Rate shall be calculated as:
 - Exchange Rate = $\frac{\text{Reduction in Obligated Entry Capacity at Donor ASEP}}{\text{Increase in Obligated Entry Capacity at Recipient ASEP}}$
 - Where capacity required to satisfy one Recipient ASEP bid (or group of bids) requires capacity to be allocated from more than one Donor ASEP multiple Exchange Rates shall be determined.
49. Analysis will then move to the next Recipient ASEP.
50. When considering the second or later Recipient ASEP(s), or the second or later Donor ASEP(s) in respect of a specific Recipient ASEP, analysis will take account of the revised supply scenario where the previous Transfer and Trade has been allocated.
51. A detailed worked example is provided in Appendix 2

Appendix 1: Indicative Demand Levels.

The demand level used in the network analysis to determine Exchange Rates will be determined prior to each set of Transfer and Trades according to paragraphs 23 and 24. Indicative values are provided in the table below (forecast demand will be updated as new data becomes available) and are provided for guidance only. National Gas Transmission shall determine the demand level(s) at the time of the analysis using information available at the time.

| Year | Month | Average minimum daily demand over 5 years | Average maximum daily demand over 5 years | Forecast demand (cold season) |
|------|-------|---|---|-------------------------------|
| 2021 | Apr | 190.7 | 301.7 | 281.6 |
| 2021 | May | 162.0 | 248.5 | 233.6 |
| 2021 | Jun | 134.1 | 195.5 | 195.7 |
| 2021 | Jul | 146.7 | 189.6 | 170.5 |
| 2021 | Aug | 133.6 | 179.6 | 167.4 |
| 2021 | Sep | 135.7 | 211.8 | 195.7 |
| 2021 | Oct | 187.5 | 277.7 | 271.3 |
| 2021 | Nov | 216.2 | 346.5 | 323.9 |
| 2021 | Dec | 243.9 | 360.2 | 364.3 |
| 2022 | Jan | 263.8 | 382.5 | 395.0 |
| 2022 | Feb | 240.6 | 369.3 | 385.1 |
| 2022 | Mar | 230.2 | 344.3 | 334.8 |
| 2022 | Apr | 194.1 | 309.7 | 273.0 |
| 2022 | May | 168.8 | 254.7 | 233.1 |
| 2022 | Jun | 141.2 | 207.0 | 197.3 |
| 2022 | Jul | 149.7 | 192.4 | 173.7 |
| 2022 | Aug | 138.3 | 183.6 | 172.0 |
| 2022 | Sep | 144.9 | 222.2 | 198.1 |
| 2022 | Oct | 191.9 | 277.1 | 329.9 |
| 2022 | Nov | 212.8 | 344.3 | 368.2 |
| 2022 | Dec | 237.3 | 366.9 | 362.0 |

Appendix 2: Worked Example of Exchange Rate Calculation

1. Identify Demand Levels.

National Gas Transmission tests at 275, 350 and 400 mcmd. For this example, a demand level of 350mcm is considered.

Assume first Recipient ASEP to be considered is Teesside ASEP. Use historic supply patterns for demand 350 mcmd +/-10% (a range of between 315 and 385 mcmd).

Take the top five supply patterns (paragraph 29). Assume they represent the top 25% of the available data. The resultant average flows at each ASEP will be used to form a test scenario. Supply is “re-balanced”, which in this example is setting the supply level to 350 mcmd, using the average flows proportion at each ASEP.

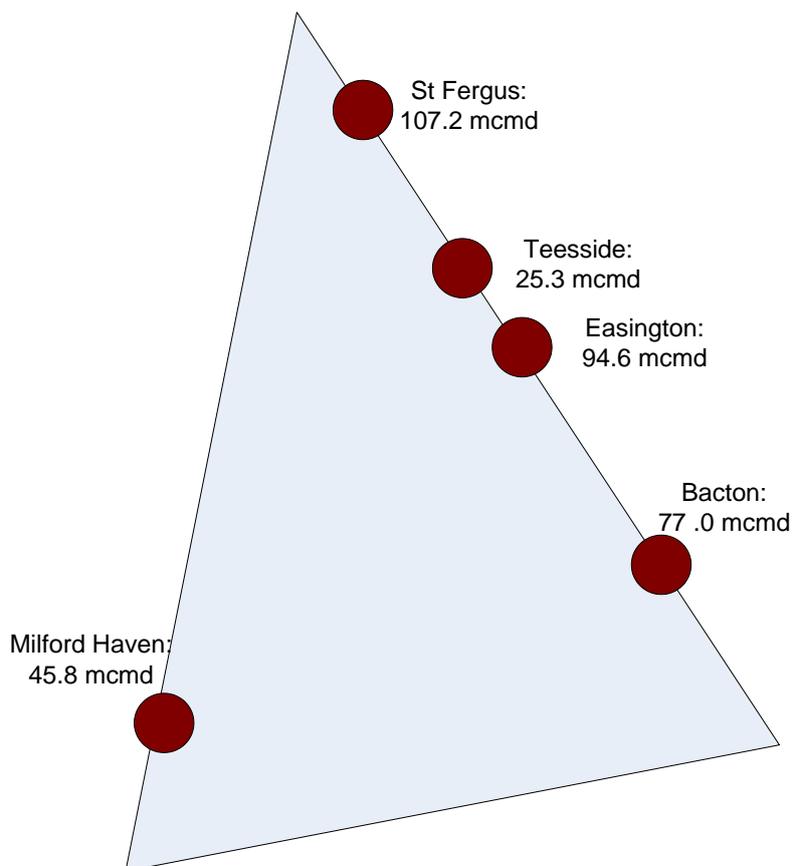
Example⁹: Demand level 350 mcmd – Recipient Teesside

| | Supply mcmd | | | | | Average | Re-balanced Supply |
|---------------|-------------|-----|-----|-----|-----|---------|--------------------|
| | | | | | | | |
| St Fergus | 110 | 120 | 95 | 130 | 95 | 110 | 107.2 |
| Easington | 100 | 95 | 95 | 100 | 95 | 97 | 94.6 |
| Teesside | 30 | 30 | 25 | 25 | 20 | 26 | 25.3 |
| Bacton UKCS | 80 | 80 | 70 | 70 | 95 | 79 | 77 |
| Milford Haven | 55 | 40 | 45 | 60 | 35 | 47 | 45.8 |
| Total | 375 | 365 | 330 | 385 | 340 | 359 | 350 |

2. Identify Recipient ASEP and Quantity

⁹ Data used in this example is for illustrative purposes only and has no relation to the actual figures.

Schematic Network diagram – Test Scenario



For this example assume obligated levels and sold levels as:

| ASEP | Obligated level mcmd | Sold capacity mcmd |
|---------------|----------------------|--------------------|
| St Fergus | 117 | 100 |
| Easington | 100 | 100 |
| Teesside | 30 | 30 |
| Bacton UKCS | 150 | 70 |
| Milford Haven | 60 | 30 |

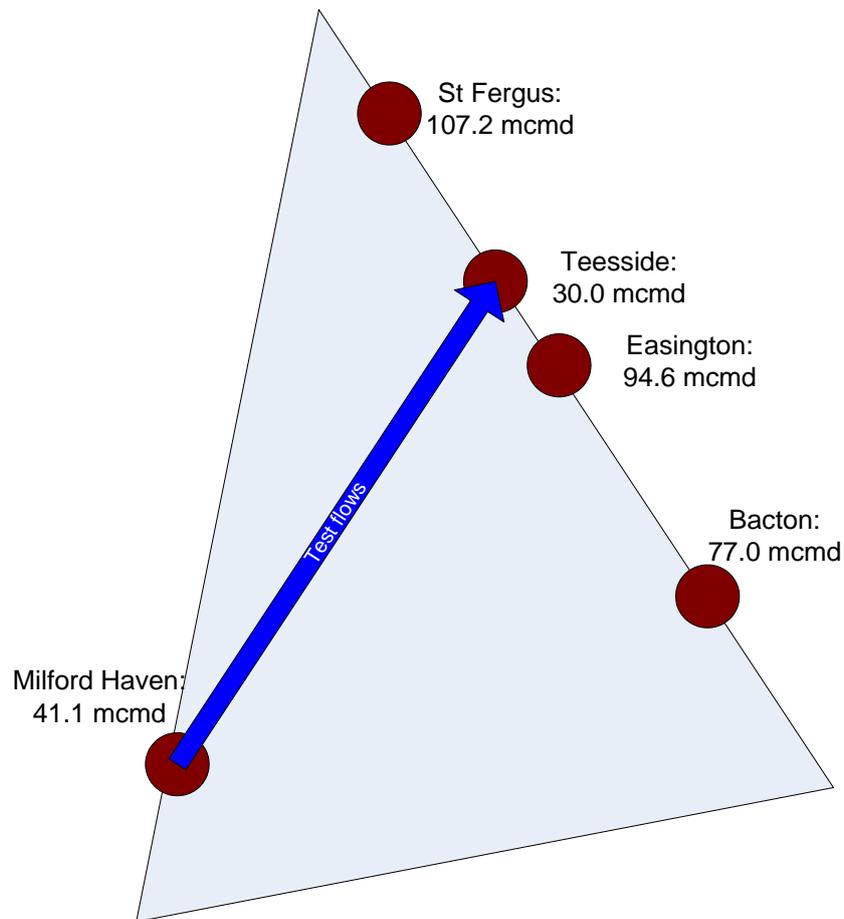
Assume that Teesside receives bids for 10 mcmd which would take the obligated level to 40 mcmd. Increase flows at Teesside ASEP in the test scenario to the obligated level, not including any Transfer and Trade bids (paragraph 42 a): i.e. increase the current rebalanced supply level of 25.3 mcmd by 4.7 mcmd to 30 mcmd.

3. Identify and Adjust Test Scenarios

The gas supply will be rebalanced by reducing the flows (4.7 mcmd in this case) at an additional ASEP, selected on the basis of low interactivity with the recipient ASEP, and that there is sufficient flow to accommodate. In this scenario, Milford Haven.

Rebalance at Milford Haven: $45.8 - 4.7 = 41.1$ mcmd (paragraph 42f).

Schematic Network diagram – Teesside Increased to Obligated Level



Increase flows in test scenario to bid quantity at Teesside (paragraph 42 b): i.e. by 10 mcmd to 40 mcmd.

4. Identify Donor ASAP

Identify most **favourable donor ASEP** (i.e. most interaction with Teesside (paragraph 42 c)) and reduce obligated level (paragraph 42 d).

Most favourable is Easington ASEP.

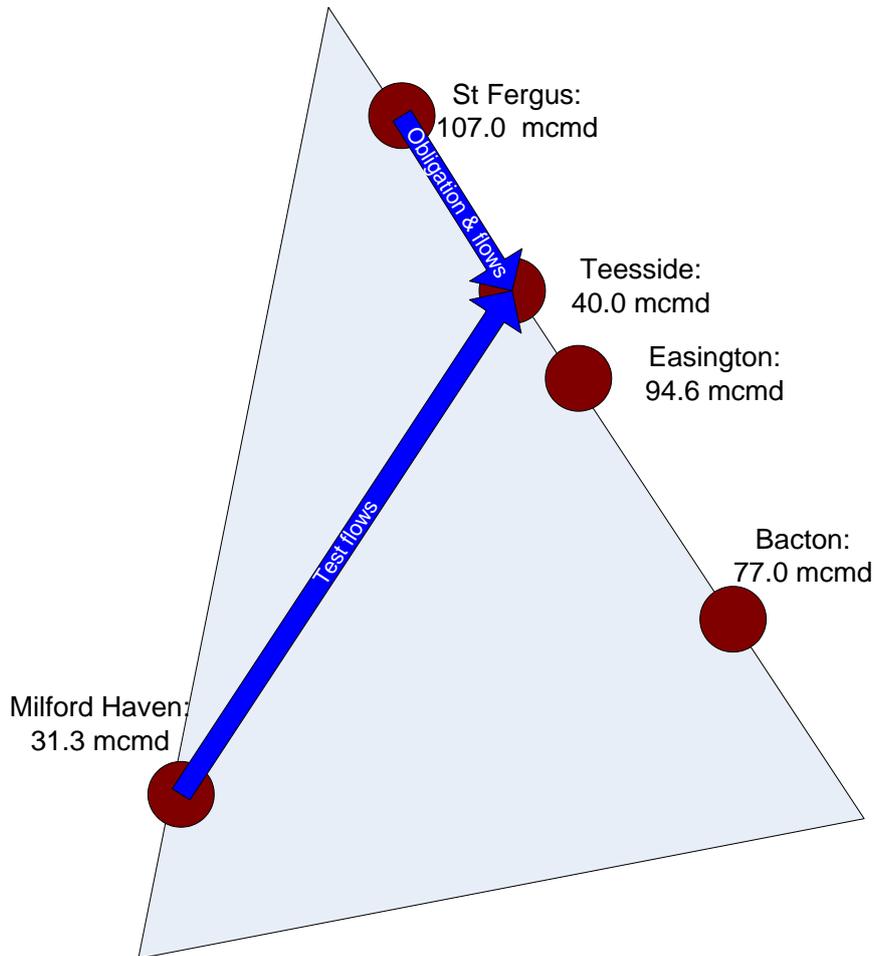
Obligated level cannot be reduced below sold level; as there is no spare capacity (sold level = obligated level) no adjustment can be made at Easington. Hence identify next most favourable:

St Fergus: reduce obligated level: $117 - 10 = 107$ mcmd.

The St Fergus reduction only reduces flows by 0.2 mcmd (as the rebalanced supply was 107.2 mcmd) in the test scenario (paragraph 42 e).

Complete the rebalance (paragraph 42 f) at Milford Haven: $41.1 - 10 + 0.2 = 31.3$ mcmd.

Schematic Network diagram – Teesside Increased to Bid Quantity



5. Test Network

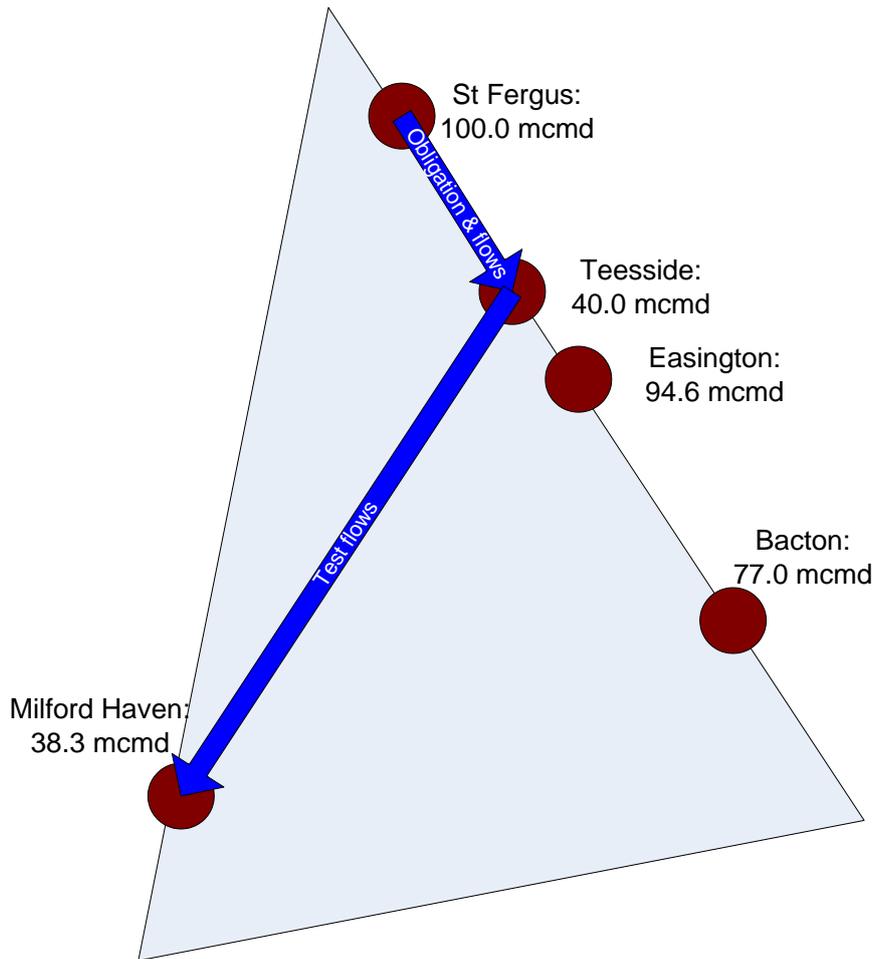
If this network passes (paragraph 43) then a 1:1 exchange rate will apply for St Fergus to Teesside for these quantities provided that other constraint management costs have not been identified.

If this network fails then decrease obligation at St Fergus (no further than sold level) and rebalance at Milford Haven until analysis passes (paragraph 45).

St Fergus obligated level: $107 - 7 = 100$ mcmd

Rebalance at Milford Haven: $31.3 + 7 = 38.3$ mcmd.

Schematic Network diagram – 1:1 exchange fails:
St Fergus Reduced



6. Calculate Exchange Rate

Provided that other constraint management costs have not been identified, the point at which the network passes will determine the Exchange Rate (paragraph 43).

$$\text{Exchange rate} = \text{Decrease in obligation at St Fergus} : \text{Increase in obligation at Teesside}$$

$$(117 - 100) : (40 - 30) =$$

$$\mathbf{1.7:1}$$

Diagram 1: High Level Procedure for Determination of Transfer and Trade Exchange Rate and Donor ASEP.

