

## 1. Introduction

The purpose of this document is to describe the general requirements within which NTS investment planning is conducted and the supply and demand assumptions used by National Grid when planning and developing the NTS. It is intended that this information forms part of the future Transmission Planning Code (TPC) and has been released ahead of the formal consultation on the TPC to give interested parties an opportunity to make informal comments on the nature of the information provided

## 2. General Requirements

National Grid is required to comply with certain legal requirements in the planning and development of the NTS. These are described below.

### 2.1. Gas Act 1986 (as Amended by the Gas Act 1995)

The Gas Act (Section 9) states a Gas Transporter has general duties in the planning and development of their system, which are:

- a) To develop and maintain an efficient and economical pipe-line system for the conveyance of gas; and
- b) Subject to paragraph (a) above, to comply, so far as it is economical to do so, with any reasonable request for him –
  - (i) To connect to that system, and convey gas by means of that system to, any premises, or
  - (ii) To connect to that system a pipe-line system operated by an authorised transporter.

### 2.2. National Grid's Gas Transporter Licence in respect of the NTS

National Grid is bound by the terms of its Gas Transporter Licence in respect of the NTS. This contains a number of Standard, Standard Special and Special Conditions that National Grid must abide by in developing and operating the network and in conducting its transportation business. The licence obligations that are relevant to the planning and development of the NTS are described below. For clarity, "National Grid NTS" is used where National Grid is undertaking its duties in respect of the NTS.

#### **Standard Special Condition A9: Pipe-Line system Security Standards**

This condition sets out the security standard for the NTS. It requires that National Grid NTS must plan the system to meet the 1 in 20 peak aggregate daily demand, including but not limited to, within day gas flow variations on that day.

It states 1 in 20 peak demand level should be calculated to include the load reduction through interruption or for contractual reasons and requires that at historic data from at least the 50 previous years should be used when identifying the 1 in 20 peak day.

#### **Special Condition C2: Long Term Development Statement**

Under this obligation, National Grid NTS must publish an annual Long Term Development Statement for the NTS that sets out the likely use of the NTS, and the likely developments of the NTS, any other facilities or pipeline systems that may affect the connection charging and transportation charging arrangements over the next ten years. National Grid NTS publishes the Ten Year Statement each year in accordance with this condition and UNC Section O (which describes the data that may be published in the statement).

### **Special Condition C8D: NTS gas entry incentives, costs and revenues**

The NTS entry condition sets out the entry capacity incentive arrangements that National Grid NTS operate under, the obligations on National Grid NTS to offer entry capacity for sale, the levels of entry capacity that must be offered for sale, and the process for increasing the levels of entry capacity that must be offered for sale.

The condition describes two incentive mechanisms that incentivise National Grid NTS to manage its lead times for additional entry capacity release around a default lead time of 42 months.

The details of the Entry Capacity release process are set out in Section B of the Uniform Network Code (UNC) and the Incremental Entry Capacity Release Methodology Statement.

### **Special Condition C8E: NTS gas exit incentives, costs and revenues**

The NTS exit condition sets out similar requirements to that for entry. Under the enduring exit arrangements there is an incentive for National Grid NTS to manage lead times for additional exit capacity release around a default lead time of 38 months.

The details of the Exit Capacity release process are set out in Section B of the Uniform Network Code and the NTS Exit Capacity Release Methodology Statement.

## **2.3. Gas Safety (Management) Regulations 1996.**

The Gas Safety (Management) Regulations (GS(M)R) require National Grid NTS to prepare and maintain a Safety Case that considers primarily those matters that relate to management of the safe flow of gas within the network and the provision of an emergency service. The Safety Case also contains requirements for planning and development of the NTS. It requires National Grid NTS to ensure arrangements are in place to maintain adequate pressure for gas leaving the NTS. This applies for both peak and off-peak demand conditions.

## **3. Transporting Britain's Energy Consultation and the Ten Year Statement**

National Grid NTS undertakes an annual Transporting Britain's Energy consultation process to gather detailed information in order to supplement the supply and demand assumptions used for investment planning and other forecasting needs. Questionnaires are circulated to a range of industry players (producers, importers, shippers, storage operators, terminal operators, transporters and consumers) requesting demand and supply forecast data and inviting views on our underlying assumptions.

The Ten Year Statement details our latest supply and demand forecasts, system reinforcement projects and investment plans. It is published at the end of the annual planning process and provides the platform on which the next annual planning process is built.

The Ten Year Statement is published in line with Special Condition C2 of our Gas Transporters' Licence and Section O of the Uniform Network Code. Further information on the TBE process and the TYS is available on our website <http://www.nationalgrid.com/uk/Gas/TYS/>

## **4. Supply assumptions for the planning and development of the NTS**

The Ten Year Statement contains detailed information on, supply and demand forecasts, current reinforcement projects and investment plans and actual flows seen on the NTS in recent years

Following the annual TBE process, National Grid NTS generally produces a Base Case long term supply forecast, and describes a range of possible supply flows around this case. The Base Case is a point of reference from which to develop other supply patterns anticipated on the NTS. Occasionally when there has been considerable uncertainty surrounding potential future supplies, scenarios of comparable weightings have been produced. All of this information is published in the Ten Year Statement.

In order to cope with increasing supply diversity and potential oversupply a range of possible supply patterns must be considered within the investment planning process. Such scenarios enable the modelling of the likely development of supply levels and supply patterns over the course of the ten-year planning horizon. The basic steps involved in developing such supply scenarios are described below

#### **4.1. TBE Base Case and supply ranges**

For each demand level and year examined, National Grid NTS has tended to develop a Base Case supply flow level for each supply point. Supplies are modelled at the level required to capture their behaviour, for example at ASEP, terminal or sub-terminal level depending on the different sources of gas that enter the system at such points.

#### **4.2. Supply scenario identification**

Generic supply scenarios are developed through plausible situations that could occur for the NTS. These scenarios are qualitative descriptions of how a supply or group of supplies may react to certain market related events, including global market drivers. Reasoning and background will be included with each case to describe how that particular flow pattern may occur.

Long term planning analysis requires that the supply levels must be matched to the total demand level. Due to the requirement to match supply to demand, some supplies may flow whilst others may not.

In order to model specific supply levels and patterns that meet demand within a particular supply scenario, information is needed on which supplies are believed to more likely flow than others (essentially a supply ranking), and which supplies may be displaced by other sources of gas (supply balancing) and the range associated with a maximum and minimum likely anticipated flows for each supply. It should be noted that these rankings may vary from one supply scenario to another, and that many specific supply levels and patterns may be examined under each generic supply scenario.

Broadly, it is the highest demand days that drive investment. On these days the supply scenarios are focussed on the potential interaction between

- LNG imports
- Pipeline imports and
- Gas sourced from storage.

The variability in potential supplies from the sources outlined above is considered to be large and the uncertainties are increased by a general lack of evidence to support assumptions about levels of gas flow. The interaction or extent to which one source of gas will displace another is also an unknown factor. Within the broad categories described above different assumptions can be made for each element (for example, it might be assumed that pipeline import facilities each have different characteristics).

Gas from the United Kingdom Continental Shelf (UKCS) is generally considered to have a greater certainty of being delivered at the beach and as a consequence the range of uncertainty is reduced when compared to LNG imports etc.

At lower demand levels, the planning assumptions will generally favour gas supplies that are, lower cost, or cannot be delivered to any other location than the United Kingdom. In this case the sensitivity analysis will focus on the potential for gas that can be delivered to interconnected markets to be delivered elsewhere.

#### **4.3. Supply ranking assumptions**

For each scenario a ranking order (or merit order) is determined for use in the balancing of supply and demand where more supply is available than that required to meet demand.

The ranking order for a particular supply or supply type includes an assumption for the likely cost of supply, as well as incorporating other more qualitative analyses. The lowest cost and least volatile gas is likely to sit at the top of the ranking order (“base load supplies” - assumed to flow) and the most expensive, fluctuating supplies are likely to sit at the bottom of the ranking order (“volatile supplies” - more price sensitive supplies likely to flow at high demand/price). In this respect, qualitative analysis is particularly important in an environment where there appears to be a marked difference between marginal costs of supply and wholesale gas prices.

Supply ranking will also be developed by incorporating information gathered through the TBE process and discussions with developers/shippers, for example for new supplies for which detailed cost information is unavailable or untested. Supply ranking may also incorporate observed behaviour from historic flow patterns.

#### **4.4. Supply balancing assumptions**

National Grid NTS will determine the supply balancing assumptions in line with the qualitative requirements of each generic supply scenario. These balancing assumptions will allow some supplies to increase above the base case forecast; some to decrease below the base case forecast in order to balance the increases and the remaining supplies will be fixed at the Base Case forecast.

Supply flow increases above the Base Case level generally start with supplies at the top of the ranking order and work down. Supply flow decreases below the Base Case level generally start at the bottom of the ranking order and work up.

#### **4.5. Supply range assumptions**

National Grid NTS will identify the plausible volatility for each existing supply. In determining the ranges, National Grid NTS will consider historic information on actual flows observed on the NTS. The maximum and minimum flow range for well established supply flows is predicted by adding the observed volatility to the base case forecasts. This analysis is generally supplemented by consideration of the trends at each entry point. For example, UKCS supplies are well established but the trend towards greater levels of depletion needs to be taken into account when forecasting future levels of gas supply.

Supply ranges will also be based on TBE information and discussions with developers/shippers where flow behaviour is anticipated to change from historical patterns, for example for new supplies or gas sources, or for supplies that are in decline.

#### **4.6. Supply scenario updates**

Supply scenarios will be reviewed and updated annually as an input to the investment planning process, and will reflect National Grid NTS’s views on the range of flow patterns that may occur on the NTS over the ten-year planning horizon.

National Grid NTS may review supply scenarios or develop additional supply scenarios during the planning year, as a result of new information being made available that influences its view on the likely level and flow behaviour of a particular supply. For example, new information may result from discussions with developers and shippers, or on the planning consent status of third party developments associated with gas supplies to the NTS or as a result of information received through entry capacity auctions.

## **5. Demand assumptions for the planning and development of the NTS**

There are primarily two sources of demand information available to National Grid NTS when considering investment planning needs: the gas demand forecasts and information collected through the UNC Section B and Offtake Arrangements Document Section H processes. These are described further below.

### **5.1. Demand Forecasts**

National Grid's gas demand forecasts are developed using detailed analysis of demand drivers including (but not limited to) fuel prices and economic forecasts. Demands are forecast by different market sectors, with forecasts produced for both annual gas demand and peak day gas demand.

Peak day forecasts are required under Special Condition A9 Pipe-Line System Security Standards of National Grid NTS's Licence to ensure that the network meets the security of supply standard. A 1-in-20 peak day forecast is produced from statistical analysis of historic weather patterns that determines the demand level that is expected to be reached or exceeded on average once in every 20 years. Such a peak day demand level could be experienced on more than one day in a winter.

Load duration curves of annual gas demand are produced from statistical analysis of historic data to determine the number of days each year on average that a demand level is reached or exceeded. Two curves are produced for investment planning needs: a 1-in-50 load duration curve to reflect severe conditions that may be expected on each day of the gas year, and an average load duration curve to reflect average conditions that may be expected on each day of the gas year. National Grid NTS would normally use the average load duration curve to generate demand patterns for off-peak analysis.

Sensitivities around the central demand forecast assumptions are also considered in order to produce ranges of potential demand over the longer term.

The Ten Year Statement contains detailed analysis of the assumptions driving the gas demand forecast and the forecast data.

National Grid NTS's Demand Forecasting Methodology is published on National Grid's website and contains a detailed description of how statistical models are used to produce peak day forecasts and load duration curves.

### **5.2. UNC Offtake Capacity Statements and Long Term Planning information**

The UNC requires National Grid NTS and the Distribution Network Operators (DNOs) to share information to ensure their systems are planned in a coordinated manner.

UNC Section B describes the annual Offtake Capacity Statement (OCS) process, which National Grid NTS and DNOs use to agree peak day requirements for DNOs for Offtake (Flat) Capacity, Offtake (Flex) Capacity and Assured Offtake Pressures. The OCS process results in annual capacity bookings and pressure commitments that National Grid NTS is required to meet from the start of the next gas year, for four years

into the future. DNOs also provide indicative bookings for a fifth year to signal possible future capacity and pressure requests.

UNC OAD Section H describes the long term forecast data that is shared between National Grid NTS and the DNOs. Both parties are required to provide the other with their forecast of gas demand, although there is no obligation on either party to use the projections provided.

The information provided under the UNC OCS process only covers 5 years of the ten year planning period. For plan years 6 to 10, National Grid NTS will pro-rate the OCS bookings using the forecast growth factor developed through the demand forecast process (and published in the Ten Year Statement). This assumption of demand growth is needed to ensure that any projects identified in early years of the plan can be assessed against potential demand through the ten-year period.

## **6. Long term system entry capacity auctions**

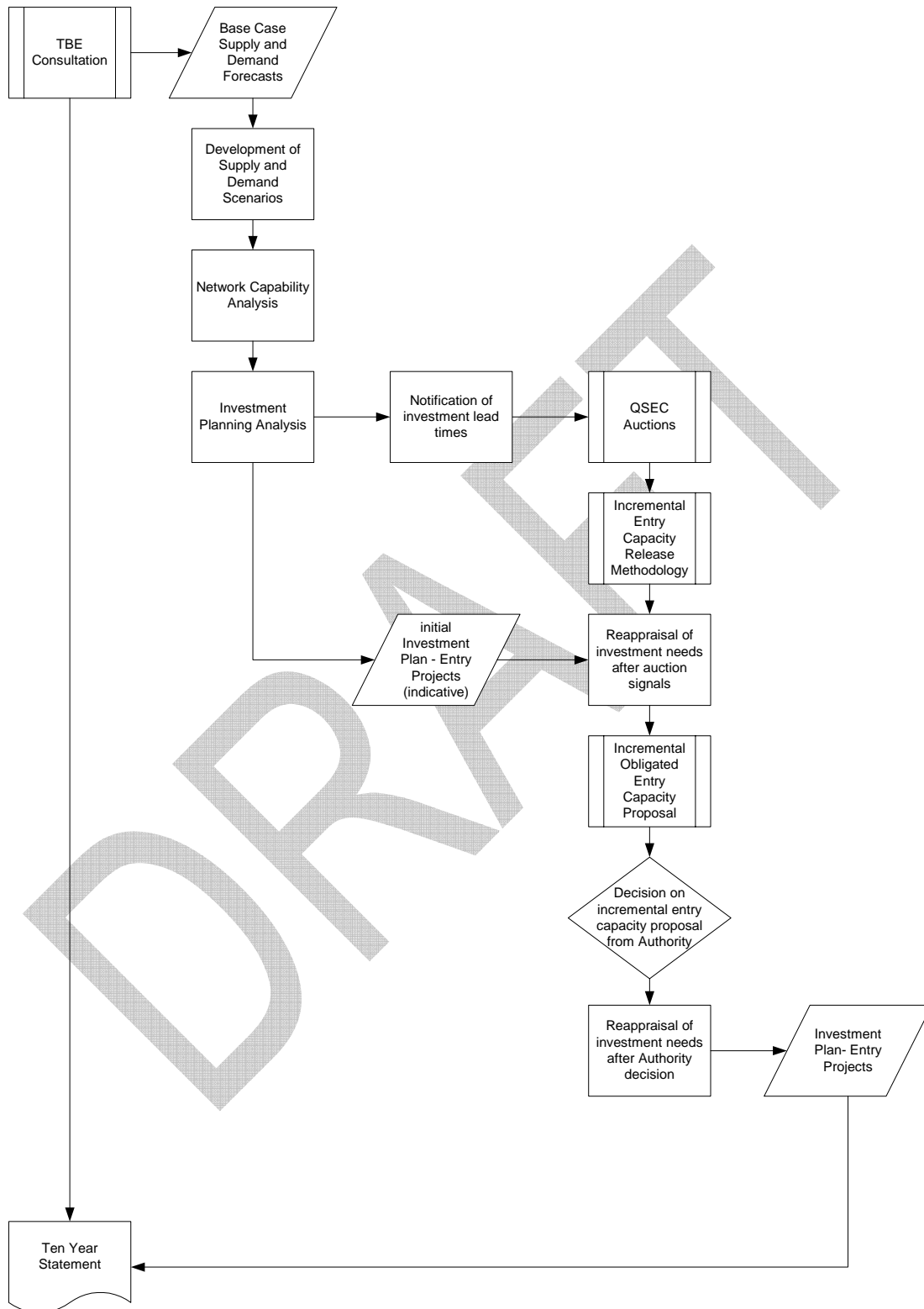
National Grid NTS makes NTS entry capacity available in a series of auctions. Signals (bids) received from long term system entry capacity auctions (QSEC auctions) are used within the planning process to confirm the need for investment.

National Grid NTS must, under the terms of its Licence, prepare a proposal for releasing incremental entry capacity and submit this proposal to the Authority for approval. In addition, the UNC requires that notification of entry capacity allocations to shippers who have bid in the QSEC auction occurs within 2 months of the end of the auction invitation period.

National Grid NTS must therefore submit its proposal for incremental entry capacity to the Authority within one month of the end of the auctions, in order that allocation may occur in line with the UNC requirements and decision period allowed under the Licence for the incremental obligated entry capacity proposal.

In order to fulfil its obligations under both the Licence and the UNC within the required notice periods, National Grid NTS will need to undertake some network analysis before the annual QSEC auctions. The basic steps that will be undertaken before and after the QSEC auctions are shown in Figure 1 and described below:

Figure 1: Entry capacity investment planning process



### **6.1. Development of supply and demand scenarios to assess entry capacity release**

Supply scenarios will be determined using latest TBE forecast data as described above. Demand scenarios for entry capacity assessment have tended to be centred on a Base Case with demand sensitivities. Demand is also assessed at peak (1 in 20 conditions), and at average and severe conditions through the load duration curve. Analysis will be undertaken for each relevant year of the ten-year planning horizon.

### **6.2. Investment planning analysis for entry capacity**

Investment planning analysis will be undertaken where a shortfall, or bottle neck, is observed in the capability of the NTS to support the required flow patterns under the supply and demand patterns tested. Each supply and demand scenario may generate a number of investment projects for consideration as the supply patterns are varied away from the Base Case supply pattern.

An initial Investment Plan will be determined by considering the investment projects required across the range of supply scenarios and for a range of demand scenarios, to develop a range of projects that best meets the anticipated flow patterns of the system, whilst paying due regard to National Grid NTS's wider obligations. These include, but are not limited to, its obligations to develop the NTS in an economic and efficient manner and to maintain a safe and secure system. At this stage the 'investment projects' should be viewed as indicative and may be modified in the light of further detailed analysis. The supplementary analysis might also consider routing or siting difficulties arising from environmental, safety and wider societal impacts.

The initial Investment Plan will be updated when the bids placed in the QSEC auction are available. If required the Base Case is adjusted accordingly.

### **6.3. Analysis of long term system entry capacity auction signals**

The QSEC auctions provide an important source of planning information on the levels of user commitment for baseline and incremental entry capacity. The initial Investment Plan must be developed ahead of the QSEC auction, due to the amount of analysis required. The final Investment Plan will be determined after auction signals have been analysed and potential projects have been reviewed.

Users of the system will place entry capacity auction bids in accordance with the rules set out in the UNC. Once the auction information is received, National Grid NTS will apply the Incremental Entry Capacity Release Methodology in line with its duties under the Licence to determine whether additional entry capacity should be made available at any ASEP and the amount of incremental entry capacity that should be made available.

Fixed lead times are available to National Grid NTS both for determination of how much capacity to allocate (including project identification) and for design and build of the identified projects. The lead times are such that National Grid NTS will where possible carry out a certain amount of speculative analysis ahead of an auction to identify what investment could be required if an anticipated pattern of bids is subsequently received. This analysis may need to be modified if an unanticipated pattern of bids are received in an auction.

National Grid NTS is required to submit an incremental obligated entry capacity proposal to the Authority that describes how much incremental obligated entry capacity has been released as a result of applying its Incremental Entry Capacity Release Methodology and how much entry capacity may be substituted to meet the incremental obligated entry capacity requirement as a result of applying its Entry Capacity Substitution Methodology.



National Grid NTS will not proceed with projects identified to deliver incremental obligated entry capacity if any of the following cases apply:

1. Sufficient user commitment is not signalled through the QSEC auction to justify the economic case for these projects.
2. The Authority determines that National Grid NTS should not implement the incremental obligated entry capacity proposal made by National Grid NTS under Special Condition C8D of its Licence.

National Grid NTS will re-evaluate projects identified to deliver incremental obligated entry capacity where the incremental entry obligated capacity proposal is modified in line with Special Condition C8D of its Licence.

National Grid NTS believes that such actions are consistent with its wider obligations to develop the NTS in an economic and efficient manner.

## **7. Long term exit capacity bookings**

The processes used to book exit capacity differ from those used to book entry capacity. Two routes to booking long term exit capacity are currently in force<sup>1</sup>. DNOs book their capacity and pressure requirements long term through the OCS process describe in UNC Section B, and are required to provide financial user commitment for additional capacity bookings that would require specific reinforcement on the NTS over a given size.

Shippers may only secure additional exit capacity in the longer term if specific reinforcement is required on the NTS in order to release that capacity and the capacity booking is over a given threshold; they must provide some financial user commitment to trigger such reinforcement. Shippers requiring capacity levels that do not meet these criteria must register capacity in the shorter term.

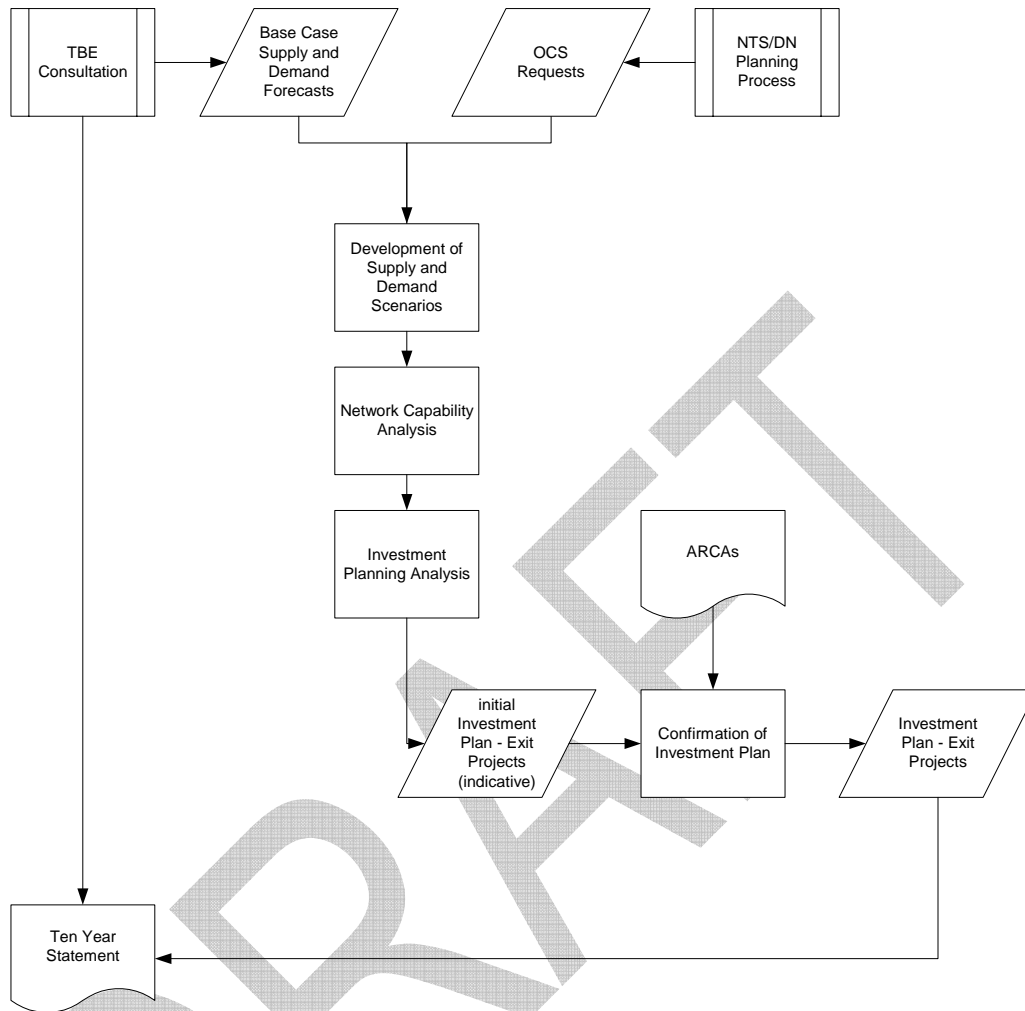
Further detail of the release of exit capacity on the NTS is given in National Grid NTS's Exit Capacity Release Methodology Statement, available on the National Grid website.

The exit process is described in Figure 2 and discussed in more detail below.

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<sup>1</sup> Exit arrangements are currently under review, and therefore new processes may be introduced in the near future to allow users to book exit capacity. The regime described above is National Grid NTS's understanding of the current arrangements for exit capacity booking.

**Figure 2: Exit capacity investment planning process**



### 7.1. Development of supply and demand scenarios to assess exit capacity release

National Grid NTS will develop supply scenarios for assessing changes to exit capacity bookings that focus on local sensitivities to supply conditions that are known to exist on the NTS. For example, supply scenarios are developed to explore the conditions on a part of the network when LNG importation or storage withdrawal is assumed, compared to the situation where LNG importation is not present and/or storage injection is required. Such scenarios will identify issues with supporting the pre-existing capacity and pressure commitments at NTS exit points.

Demand scenarios assessed may include a number of possible demand sensitivities at each level of demand analysed, for example:

1. Demand flows that occur in line with TBE Base Case for all users of the NTS
2. Demand flows that occur in line with DNO OCS bookings (and TBE Base Case flows for directly connected NTS loads)
3. Demand flows associated with storage sites and interconnector pipelines
4. Demand flows associated with large loads or loads located in sensitive areas of the network
5. Demand flows associated with interruptible loads directly connected to the NTS

The demand sensitivities will be developed according to the location of the exit capacity being assessed. It is assumed that DNO OCS requests will include the latest assessment of interruptible load in their respective networks.

Demand is assessed at peak (1 in 20 conditions), and at average and severe conditions through the load duration curve. Analysis will be undertaken for each relevant year of the ten-year planning horizon.

## **7.2. Investment planning analysis**

Network analysis is undertaken as part of the OCS process to identify the existing capability of the NTS to accommodate changes in the Offtake (Flat) Capacity requests made by DNOs. Investment will be undertaken for increases in the Offtake (Flat) Capacity bookings under the terms of the Exit Capacity Release Methodology Statement. Such increases may require a feasibility study to be initiated in order that the appropriate investment planning analysis may be undertaken. Investment is not undertaken on the NTS for increases in Offtake (Flex) Capacity or Assured Offtake Pressures.

National Grid NTS will assess requests for changes to Offtake (Flat) Capacity first, followed by requests for changes to Offtake (Flex) Capacity, followed by requests for changes in Assured Offtake Pressures. Off-peak data provided by DNOs under the UNC OAD Section H process is not treated as long-term booking of Offtake (Flat) Capacity or Offtake (Flex) Capacity.

Parties that are directly connected to the NTS are required to register capacity in the short term under the process defined by UNC Section B. Increases in exit capacity can be requested in line with the Exit Capacity Release Methodology Statement. Enquiries may be made at any time about potential increases in load, or new loads connecting to the NTS, although there may be a lead time before additional capacity can be made available. Information on new and existing loads is also collected through the TBE process, so the annual planning cycle will include the best known information to National Grid NTS on directly connected NTS loads, including any previous enquiries made by shippers or developers. Any investment required as a result of load enquiries received by National Grid NTS will therefore be consolidated into the next or future planning cycles.

## **8. Publication of investment proposals**

National Grid NTS will publish the projects that are determined to be part of its final Investment Plan in the Ten Year Statement, after consideration of the information received from the QSEC auction and incremental entry capacity release process.