Issue	Revision
1	0

The Statement of the Ex-Ante or Ex-Post Treatment of Modelling Inputs Methodology

Effective from 1 April 2011

18th July 2011

About this Document

This document contains one of three methodologies that National Grid Electricity Transmission plc (NGET), employs to calculate the Modelled Target Costs, against which its actual balancing costs will be compared, on a month-by-month basis, under the Balancing Services Incentive Scheme (the 'Scheme').

The remaining methodologies are as follows:

- The Statement of the Constraint Cost Target Modelling Methodology; and
- The Statement of the Energy Cost Target Modelling Methodology.

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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 the SO Incentives team by email:

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1. Introduction

1. Critical to the success of the Scheme is determining the relationships between the various factors that influence costs of System Operation and then categorising the model inputs as those that can (or can not) be reasonably be forecast, as well as determining which of these inputs are (or are not) under NGET's control. Where NGET does not have any control of the inputs it may still be able to take actions that result in reduced costs.

2. It is important to strike an appropriate balance between insulating NGET from volatile parameters over which it has little or no control over (using 'Ex-Post' out-turn data in models), and incentivising it to deliver efficiencies where it does have a measure of control (using 'Ex-Ante' forecast data in models).

2. Categorisation of inputs

3. The extent to which the drivers of system operation costs can be controlled or forecast to enable effective incentivisation as part of a system operator incentive scheme is fundamental to whether they should be considered as Ex-Ante or Ex-Post inputs to BSIS models which are defined as follows:

Ex-ante inputs will be set prior to the commencement of the scheme. The same dataset for these inputs will be used whenever the models are run throughout the 24 month duration of the scheme and would not normally be updated as the scheme progresses (except under specific agreed circumstances via an Income Adjusting Event); and

Ex-post inputs will be collated on a monthly basis following the commencement of the scheme and combined with the Ex-Ante dataset, to be run through the models to determine the target level of costs that NGET should be incentivised against.

2.1 Criteria to assess the treatment of modelled parameters

4. To investigate the extent to which NGET can be appropriately incentivised, NGET's ability to forecast or control cost drivers is considered, with particular reference to the potential mechanisms it can use to influence them. The process of determining the extent to which NGET can both forecast and control existing cost drivers will also be important when determining whether a new cost driver should be treated on an Ex-Ante or Ex-Post basis in BSIS models.

2.1.1 NGET's ability to forecast inputs to BSIS models

5. NGET's ability to forecast inputs at lead times of up to 24 months (and potentially beyond) depends on a number of factors. For each input, NGET's ability to forecast will be considered as follows:

Measure	Detail
Availability of data	Inputs may be based on submitted data (which is likely to have a range of certainty associated with it) or on collected data from other sources (including out-turn data). It is assumed that data is already available to NGET – where additional data is required, the potential cost of procuring such data is not explicitly considered.
Volatility of drivers	Inputs may be based on plant parameters, and hence be reasonably stable, or they may be based on economic

Measure	Detail
	fundamentals/market behaviour (such as fuel prices), with the potential to exhibit significant volatility. Assessment of volatility is assumed to apply for 24 months unless otherwise stated.
Applicability of historic data trend analysis	Inputs may be driven by known behaviours studied over a period of time, such as demand forecasts, and hence be forecast with a good degree of certainty. Alternatively, they may be driven or influenced by one-off/exceptional events, such as significant prolonged plant failure, which might not normally be considered as part of a 'reasonable' forecast.

Table 1: Generic assessment criteria for NGET's ability to forecast inputs

6. The extent to which each measure contributes to NGET's ability to forecast an input is assessed to give an overall forecast confidence, as follows:

- **None:** NGET has no ability to forecast the input
- **Low:** NGET's ability to forecast the input is limited, for example due to lack of data, volatility of the input or lack of historic trends
- **Medium:** NGET's ability to forecast the input is reasonable, through a combination of data availability and either low volatility or the presence of usable historic trend analysis
- **High:** NGET's ability to forecast the input is good, through availability of data and known behaviours

2.1.2 NGET's ability to control inputs to BSIS models

7. NGET has a number of tools at its disposal to manage or influence the requirement for, and cost of, the actions it takes for system operation purposes. The greater the degree of control, the more suitable a tool is likely to be for incentivisation. However, not all tools are applicable to all model inputs. Depending on the model input, there may be sub-components that have varying degrees of control, and hence varying suitability for incentivisation. Key tools that NGET considers it can use are as follows:

Tool	Extent of NGET control	Areas for incentivisation
Balancing Mechanism (BM)	NGET could be seen as a price taker in the BM, although its actions as sole counter-party can influence submitted prices in subsequent settlement periods. Also, it can trade-off delivery of required volume of actions between pre- and post-gate closure to deliver value.	Trading strategy
Trades	NGET can enter into forward trades with counterparties to buy or sell energy for 'energy' or 'system' reasons.	Trading strategy; Contracting approach
Balancing Services contracts	NGET can enter into agreements with counterparties for the provision of ancillary services or to manage power station output levels.	Trading strategy; Contracting approach; Development of ancillary services; Enhancing pool of available service providers
Transmission system	NGET can keep its approach to planning and operating the national	Innovation in planning and operating the national

Tool	Extent of NGET control	Areas for incentivisation
planning/ operation	electricity transmission system under review.	electricity transmission system; Development of relationship with other Transmission Owners
Changes to operating policy	NGET can refine its approach to determining operational requirements (such as reserve holding) by changing its modelling approach or in light of experience	Development of operating policy
Changes to industry codes	NGET can propose changes to industry codes where it believes such change would better facilitate their aims.	Increased co-ordination and efficiency between code parties
Information provision	NGET can work with the industry to identify information that could be made available to participants which might deliver more effective market information.	More effective functioning of market with regard to system operator actions

Table 2: Generic assessment criteria for NGET's ability to control inputs

8. The extent to which NGET can use the tools available to influence the input is considered and given a rating, as follows:

- **None:** NGET has no ability to use the tool to influence the input
- **Low:** NGET's ability to use the tool to influence the input is restricted in timeframe and scope
- **Medium:** NGET's ability to use the tool to influence the input is good in some areas (e.g. required volume) but limited in others (e.g. small pool of available service providers impacting price)
- **High:** NGET's ability to use the tool to influence the input is good in most areas (e.g. required volume and range of available service providers)

2.2 Approach to assessment

9. The assessment of BSIS drivers against NGET's ability to control and forecast those drivers, as outlined above, is structured in the following way:

- Generation availability (whether generation is not on outage, and can be included in a 'fundamentals' model to determine how it would run in a particular period);
- Generation running (how available generation would run in light of market fundamentals);
- Demand level (factors which feed into the overall demand);
- Demand volatility (factors which drive rapid changes in the demand profile);
- Transmission availability (the extent to which transmission equipment is available to transport power – i.e. not on outage); and
- Transmission capability (the physical capability of available transmission equipment to transport power).

10. These six categories have been chosen to provide a framework within which drivers of BSIS costs can be considered based on their overall effect, rather

than considering individual BSIS cost components; the aim being to minimise duplication where cost drivers influence multiple BSIS components.

11. The six categories allow for an assessment of the drivers behind BSIS model inputs to be undertaken and a conclusion reached regarding how they should be treated. Where an input is recommended for Ex-Ante input to models, it will contribute to the target costs against which NGET is incentivised. Where an input is recommended for Ex-Post input to models, it will remove the potential for windfall gains/losses associated with the inability to accurately forecast that input.

12. The assessment is structured such that new drivers behind the six categories can be incorporated and the assessment re-done to determine appropriate treatment of those drivers.

13. NGET considers that inputs should only be treated on an Ex-Post basis where the confidence with which it may be forecast is either 'low' or 'none'. Similarly, NGET does not consider that inputs are suitable for incentivisation where it has no ability to control them.

3. Assessment of BSIS model inputs and drivers

This section presents NGET's conclusions following assessment of its ability to forecast and control the drivers behind BSIS costs. Detailed information supporting the conclusions drawn can be found in Appendix A.

3.1 Generation Availability

3.1.1 Overview

14. Generation availability is a key driver for constraint and margin costs.

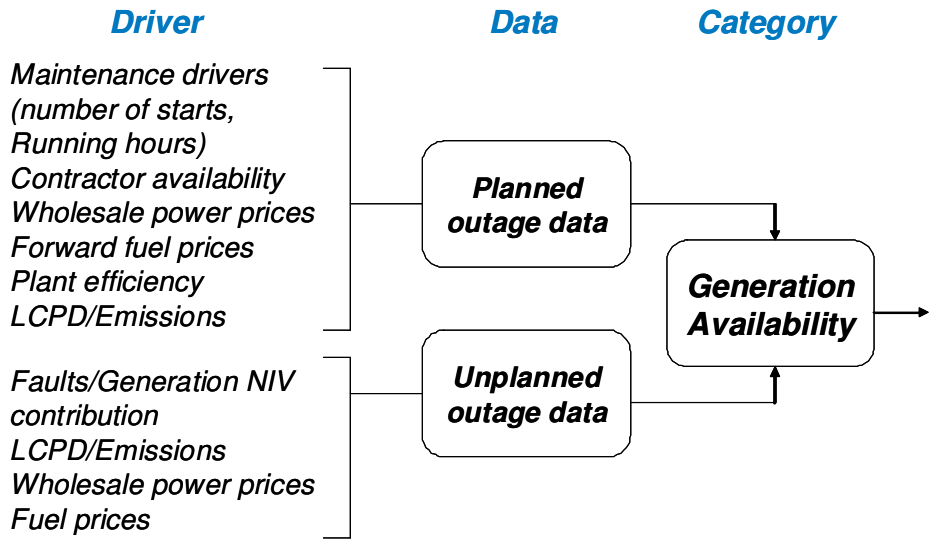

Figure 1: Cost drivers for generation availability

15. Generation availability is a binary input into the 'generation running' model input. If a generator is not on outage, it is available for its running to be modelled in accordance with market fundamentals.

16. Generation availability depends on generation outages (planned and unplanned). Long-term planned outage data is notified to NGET under the

provisions of Grid Code Operating Code 2 (OC2), and is a key input to the process of alignment of generation outages with transmission system outages.

17. An additional factor when considering generator OC2 submissions is the extent to which they interact with demand forecasts and the Short Term Operating Reserve Requirement to give an indication of plant margin, and hence the potential need for NGET to undertake additional actions to create margin. It should also be noted that the reliability of OC2 data decreases the further ahead of real-time it is for, due to the continual process for optimising outage placement.

18. Unplanned (fault) outages and delays to generator commissioning schedules have the potential to significantly impact NGET's performance against agreed scheme targets where they persist for a significant period of time. Unplanned outages will contribute to the Net Imbalance Volume (NIV) to the extent that the generator is unable to adjust its portfolio or procure replacement energy from the market.

3.1.2 NGET's ability to forecast and control drivers

19. The extent to which NGET considers the drivers of generation availability can be forecast and controlled; and hence the extent to which it can be incentivised to have an impact on those drivers, is set out in Appendix A, tables 4 and 5.

20. Generator availability tends to be driven by the need to take, and logistics surrounding, maintenance outages. Additionally, long-term adverse movements in spark/dark spreads[1] can influence generators' decisions to mothball or 'regime' the running of certain power stations (for example by running only on weekday peaks).

21. In the first instance, the processes set out under OC2 should facilitate the efficient co-ordination of outages between generation outages and outages on the National Electricity Transmission System. However there remains the potential for either generation outages or transmission outages to move (for example due to unavailability of contractors or for economic reasons), which creates the possibility of outage misalignment and the potential for constraints to arise.

22. There is also the possibility that fault outages can influence other system operation costs, for example:

- benefiting export constraints/exacerbating import constraints; and
- reducing the requirement to take 'footroom' actions (for example where a baseload nuclear generator suffers a persistent fault.

23. It should be noted that the impact of such faults depends on the generator's position in the merit order and the duration of the persistent fault.

3.1.3 Conclusions for Generation Availability

24. In the context of determining generator availability, it is the extent to which drivers behind OC2 and MEL data can be influenced by NGET that is important, as this determines whether or not they are suitable for incentivisation. If they are, they will be treated on an Ex-Ante basis, whereas if they aren't, they will be treated on an Ex-Post basis.

[1] The spark spread (dark spread) is the theoretical gross margin of a gas-fired (coal fired) power plant from selling a unit of electricity, having bought the fuel required to produce this unit of electricity. All other costs (operation and maintenance, capital and other financial costs) must be covered from the spark (dark) spread.

OC2 data:

25. NGET uses generator OC2 data within its outage planning processes and has a reasonable confidence in the accuracy of that data in the near-term. NGET can use mechanisms such as Balancing Services contracts to try to influence the timing of planned generation outages, for example by making a payment to cover costs incurred through movement of outage dates (for example contractor costs or 'lost opportunity' costs). Any subsequent changes to outage dates should then be reflected in revised OC2 submissions. Hence NGET can be incentivised to have an impact on planned outages and considers it appropriate that the OC2 data that describes them forms an Ex-Ante input to BSIS models. However, it should also be noted that the reliability of OC2 data decreases the further ahead of real-time it is for, as the drivers behind the timing of such outages become more fluid. Hence to maintain an appropriate basis for incentivisation, NGET considers it necessary to update the OC2 dataset for generation outages on a rolling annual basis.

MEL data:

26. NGET is unable to forecast when short-term generation faults will occur (and hence their impact on a party's imbalance position, which contributes to NIV). However, they have the potential to impact NGET's scheme performance, so they are an important consideration from a BSIS modelling perspective. Whilst such faults will be modelled Ex-Ante using stochastic techniques, NGET considers that there are situations which may have an impact on scheme performance, such as:

- Where short-term faults persist and have a material impact on a transmission constraint (for example exacerbating an import constraint or ameliorating an export constraint); and
- Where they remove the need to take actions to manage footroom or have an impact on the need to reschedule generation to increase high frequency response holding.

27. Despite these potential impacts of short-term generator faults, the ability to define the point at which an unplanned outage becomes a planned outage (for instance, defining the length of time that would constitute a 'short-term fault' and at what point, and via what mechanism, it becomes a 'planned outage') is not clear cut. In addition, the impact short-term generation faults might have on export or import constraints volumes in particular will, to an extent, offset each other over the course of the 2 year incentive period thus reducing the possibility of windfall profit or loss.

28. NGET therefore considers that, whilst short-term faults are not forecastable or controllable, for the reasons set out above and for consistency with planned outages, unplanned outages should be treated on an Ex-ante basis using stochastic modelling techniques, with the exception of faults on nuclear plant which, due to the potential magnitude of their impact on footroom costs, should be input to that model on an ex-post basis.

3.2 Generation Running

3.2.1 Overview

29. Generation running is a key driver for constraint and margin costs. It is a modelled parameter that forms an input into other BSIS models, such as constraints and margin.

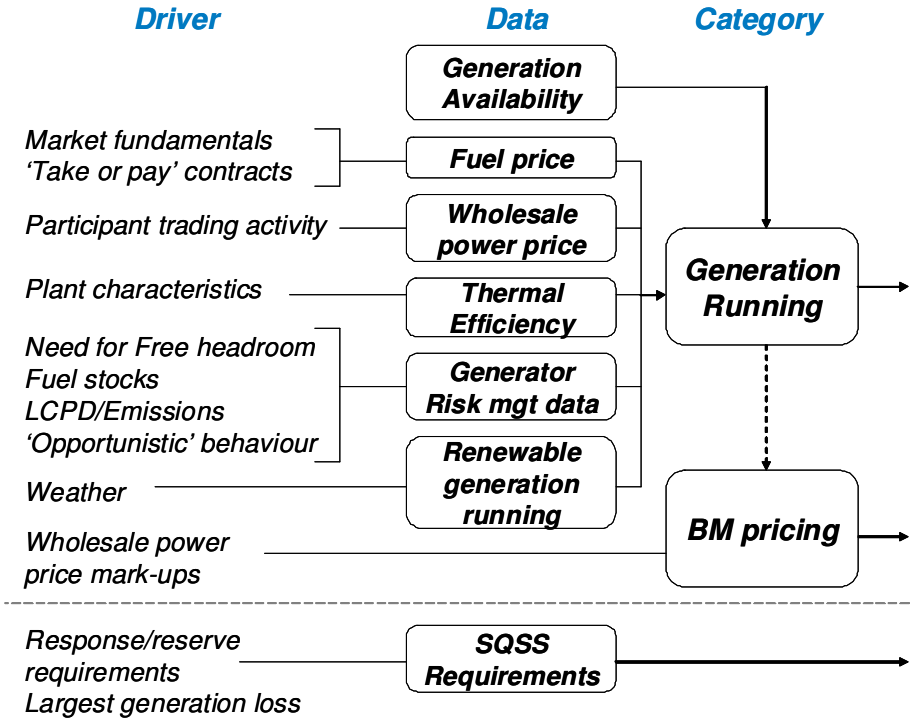

Figure 2: Cost drivers for Generation Running

30. For a generator to be able to run, it needs to not be on outage. For available generation, whether or not it will run depends primarily on the interaction between fuel prices, wholesale power prices and generator efficiency factors. However, there are additional considerations, such as generators' approach to portfolio risk management (which, for example, will influence the amount of 'free headroom' available on their plant); and from a wider system operator perspective (shown in parallel to the 'generation running' drivers above), the need to consider the requirements of the Security and Quality of Supply Standards.

31. Generation running is notified to NGET via physical notification submissions through the timescales, becoming fixed at gate-closure (one and a half hours ahead of real-time). Generators submit prices at which NGET may instruct them to deviate from physical notification levels – these tend to be at a 'mark-up' from general wholesale price levels.

3.2.2 NGET's ability to forecast and control drivers

32. The extent to which NGET considers the drivers of generation running can be forecast and controlled; and hence the extent to which it can be incentivised to have an impact on those drivers, is set out in Appendix A, tables 6 and 7.

33. Whether or not a generator will be running depends primarily on the differential between its fuel prices and the wholesale power price, taking into account the efficiency of the generator. NGET has a number of tools at its disposal which it can try to use to manage generation running. The price NGET pays for the various tools will generally be based on a view of what would be paid for alternatives (e.g. whether to enter into a contract or use the BM). Hence from an incentive viewpoint it is important that a 'fundamentals' model for determining generation running paints a reasonable picture of what will actually happen, as this forms the basis upon which NGET's use of the various tools is incentivised.

3.2.3 Conclusions for Generation Running

34. In the context of determining generator running, the drivers behind generator running are direct inputs to BSIS models; hence it is necessary to consider whether or not they are explicitly treated on an Ex-Ante or Ex-Post basis:

Generation Availability:

35. For the reasons set out in section 3.1, Generation Availability data, with the exception of faults on nuclear power stations should be an Ex-Ante input to the Generation Running model.

Fuel Price, Wholesale Power Price:

36. Whilst data for fuel prices and wholesale power prices are available, their associated volatility and NGET's inability to influence them results in NGET considering that Ex-Post treatment in BSIS models is appropriate.

Generator Efficiency Factors:

37. Once known, generator efficiency factors vary little. Hence they should be treated as an Ex-Ante input.

Generator Risk Management Data:

38. Generator risk management data feeds into BSIS models primarily in the form of 'free headroom', although other elements, such as the need to manage fuel stocks, can be an influence on balancing services contracts. The inability to derive suitable data relating to how generator risk management activities manifest themselves, in the form of 'free headroom' presented to NGET at gate closure, results in NGET considering that it should be fed into BSIS models as an Ex-Post input.

Renewable Generation Running:

39. The volatility associated with wind generation in particular, the difficulty in forecasting wind speed accurately as lead-time increases and the ability of wind generation to have a significant impact on SO costs such as constraints, results in NGET considering that it should form an Ex-Post input to BSIS models.

Frequency Response/Reserve Requirements/Largest generation loss:

40. Frequency response/reserve requirements and the largest generation loss are known and vary little. Hence they should be treated as an Ex-Ante input.

BM Pricing:

41. Bid-offer prices are a key driver behind the costs NGET faces and its contracting and risk management strategies focus on trying to deliver value against expectations of submitted bid-offer price levels. NGET should be

incentivised to deliver value in this area; however the nature of this incentivisation depends on the context within which the BM prices are used. Where BM price levels are taken in aggregate, for example when determining wholesale power price mark-ups within the Energy models, NGET considers an ex-ante treatment to be appropriate. However when they are considered at BM Unit level, such as in the modelling of constraint costs, NGET considers ex-post treatment to be appropriate, along with measures to retain the incentive on NGET to pursue efficiencies.

3.3 Demand Level

3.3.1 Overview

42. The level of demand on the transmission system is a key driver for frequency response, footroom and constraint costs, and is a direct input to BSIS models.

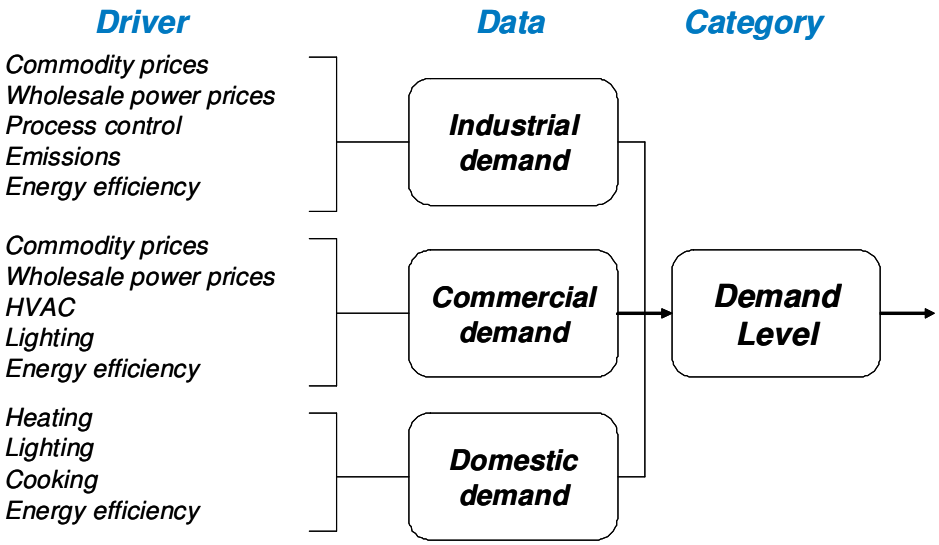

Figure 3: Cost drivers for Demand Level

43. The demand level depends on a range of factors linked to the behaviour of industrial, commercial and domestic consumers. Whilst in the context of current BSIS the demand level is generally accepted as an Ex-Ante forecast input, there are few things that NGET can do to influence the demand level. The need for the SO to be able to influence demand is likely to become increasingly important into the future, for example as the need to charge electric vehicles increases and following the introduction of smart meters.

3.3.2 NGET's ability to forecast drivers

44. NGET's ability to forecast demand is well established, and it is appropriate to treat demand as an Ex-Ante input to BSIS models.

45. Currently, NGET seeks to identify suitable industrial, commercial and domestic load types that can provide demand deferral services to assist with provision of frequency response/reserve services. In the future, changes in the volume and type of demand, for example through increased penetration of electric vehicle use or the introduction of smart meters, might have a short-term impact on NGET's ability to forecast demand whilst new behaviours are understood. However they may also provide additional scope for system operator service provision.

3.4 Demand Volatility

3.4.1 Overview

46. The level of demand volatility on the transmission system is a key driver for frequency response, footroom and constraint costs.

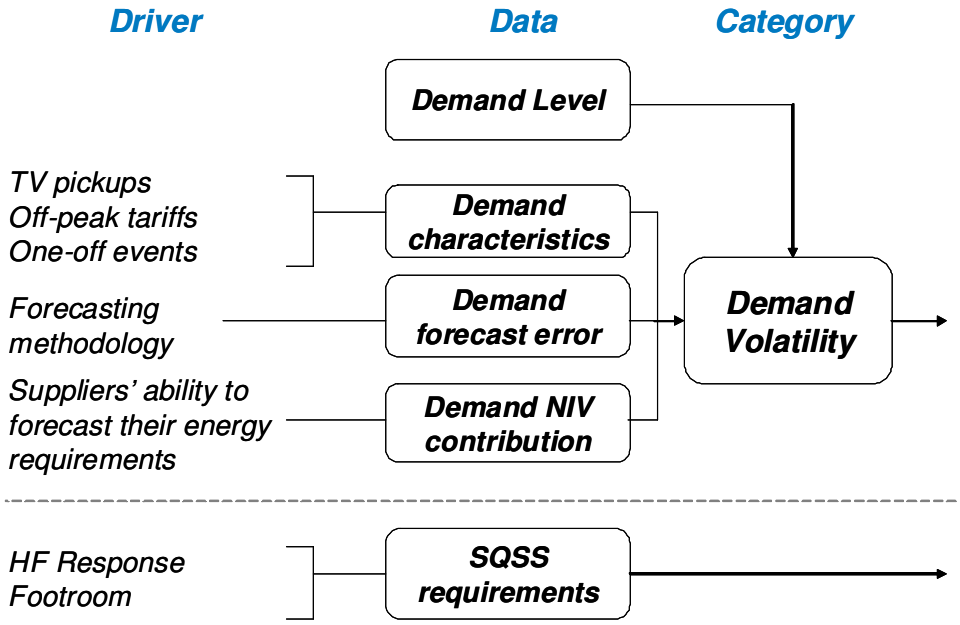

Figure 4: Cost drivers for Demand Volatility

47. Demand volatility depends on a range of factors linked to the behaviour of industrial, commercial and domestic consumers. Rapid demand changes, such as those caused by TV pickups and the incidence of off-peak heating tariffs, are of particular interest when considering the effective management of the demand profile.

48. The accuracy of individual supplier's estimates of their energy requirements, and their appetite for risk, will dictate their contracting strategy and, to the extent that they are over- or under-contracted, drive the demand NIV contribution.

3.4.2 NGET's ability to forecast and control drivers

49. The extent to which NGET considers the drivers of demand volatility can be forecast and controlled; and hence the extent to which it can be incentivised to have an impact on those drivers, is set out in Appendix A, tables 8 and 9.

50. NGET forecasts demand using established techniques and a wealth of historic data; and has a number of mechanisms which it can try to use to respond to rapid changes in demand. Most are enacted close to real time, although there exists the possibility to re-schedule or defer demand ahead of time.

3.4.3 Conclusions for Demand Volatility

51. In the context of determining demand volatility, the drivers behind demand characteristics, demand forecast error and SQSS requirements are direct inputs into BSIS models.

52. As NGET has a high degree of control over the drivers behind those inputs, due to its demand forecasting ability and Balancing Services contracting capability, it is clear that the management of demand volatility should be incentivised; and associated data required by BSIS models should be treated on an Ex-Ante basis.

53. However, as NGET is unable to forecast or influence the demand contribution to NIV, NGET considers (as with generation contribution to NIV) that it be treated on an Ex-Post basis when determining the NIV to be used in models.

3.5 Transmission Availability

3.5.1 Overview

54. Transmission availability is a key driver for constraint costs and is a direct input to the power system studies that feed into BSIS models.

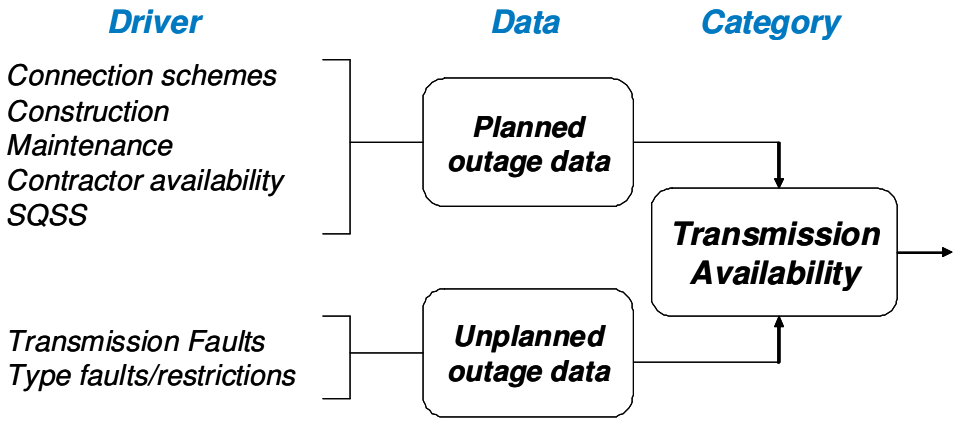

Figure 5: Cost drivers for Transmission Availability

55. Transmission availability is a function of the number of outages required to be taken on transmission equipment, and is linked to construction (new generation and load) and maintenance (non-load) activities.

3.5.2 NGET's ability to forecast and control drivers

56. The extent to which NGET considers the drivers of transmission availability can be forecast and controlled; and hence the extent to which it can be incentivised to have an impact on those drivers, is set out in Appendix A, tables 10 and 11.

57. NGET builds outage plans based on information from its own transmission owner function and the other transmission owners under the provisions of OC2 and the System Operator – Transmission Owner (SO-TO) Code. The processes set out in OC2 are dynamic in nature and allow for outages to be changed and notified accordingly, which means that taking a view ahead of time is always going to be subject to an element of risk.

58. The system operator has to balance the release of transmission equipment for outage with the need to maintain pre- and post-fault system security in accordance with standards prescribed in the SQSS.

3.5.3 Conclusions for transmission availability

59. In the context of determining transmission availability, the drivers behind planned and unplanned outages are direct inputs into BSIS models. Hence it is necessary to consider whether or not they are explicitly treated on an Ex-Ante or Ex-Post basis:

Connection scheme outages, Construction/maintenance outages and Contractor Availability:

60. NGET has a high degree of control over the outage planning processes and should be incentivised to deliver efficiencies in the planning and execution of outages.

61. NGET has a reasonable degree of control over the planning of contractor availability for its own outages. Whilst it has little control over the availability of contractors for other TOs' outages it should be incentivised to deliver efficiencies in the overall planning and execution of transmission system outages. Hence NGET can be incentivised to have an impact on it and considers it appropriate that OC2 data forms an Ex-Ante input to BSIS models. As with generation outage data, it should also be noted that the reliability of OC2 data decreases the further ahead of real-time it is for, however due to the greater degree of control NGET has over transmission outages, taking a single two-year snapshot of OC2 data for transmission outage is likely to still form a reasonable basis for incentivisation.

SQSS:

62. Transmission planning/operational requirements as specified in the SQSS are known and vary little. Hence factors such as the largest credible generation loss to be catered for should be treated as an Ex-Ante input. It should be noted however that there exists the potential for an SQSS change to introduce a material change in the way the system is operated, which could bring with it a step-change in SO costs unforeseen at the time an incentive is set. Under such circumstances it may be appropriate to consider a mechanism to allow the parameters of such scheme to be revisited.

Transmission equipment faults and Type faults/restrictions:

63. Whilst NGET is unable to forecast the incidence of transmission faults, it is incentivised to minimise the likelihood and impact of such faults under its Transmission Network Reliability Incentive. Hence it would not be appropriate to afford them Ex-Post treatment under BSIS.

3.6 Transmission Capability

3.6.1 Overview

64. Transmission capability is a key driver for constraint costs and is a direct input to the power system studies that feed into BSIS models.

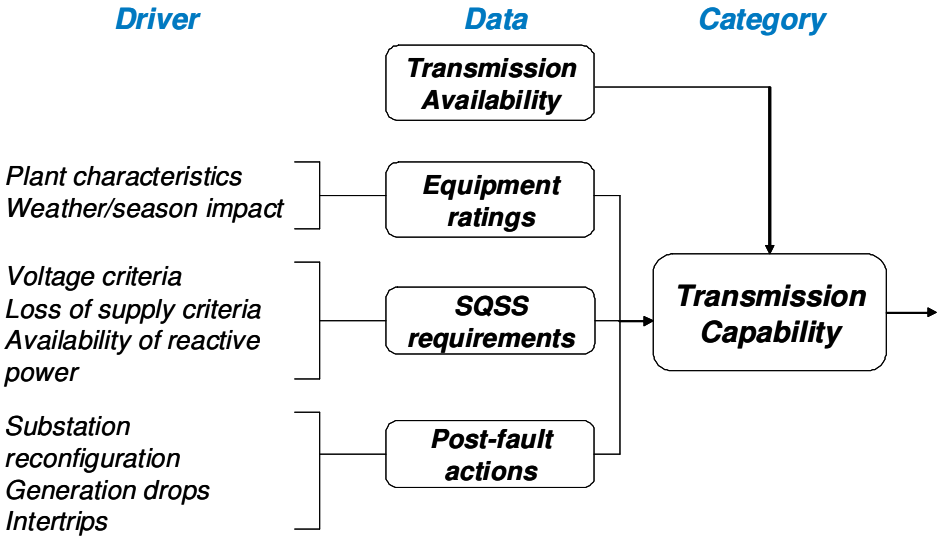

Figure 6: Cost drivers for Transmission Capability

65. Transmission capacity is a function of the initially identified requirement for capacity when the transmission equipment was installed and the ability of that equipment to be able to cope with short-term overloads (for example following faults on other transmission equipment).

3.6.2 NGET's ability to forecast and control drivers

66. The extent to which NGET considers the drivers of transmission capability can be forecast and controlled; and hence the extent to which it can be incentivised to have an impact on those drivers, is set out in Appendix A, tables 12 and 13.

67. Operation of the transmission system is one of NGET's key roles and it has a range of tools available to assist it in the management of transmission capability.

3.6.3 Conclusions for transmission capability

68. In the context of determining transmission capability, the drivers behind equipment ratings, SQSS requirements and Post-fault actions are direct inputs into BSIS models.

69. However, as NGET has a high degree of control over the drivers behind those inputs, either because it owns the equipment, has the ability to use SO tools to manage them or can influence them using policy/code routes, it is clear that the maximisation of transmission capability should be incentivised. Where associated data is required by BSIS models, it should be treated on an Ex-Ante basis.

Treatment of the retail price index (RPI)

70. A range of inputs to BSIS models are specifically impacted by changes in the RPI, for example:

- Reactive power default payment arrangements are indexed by RPI in accordance with the provisions set out in CUSC Schedule 3 Part 1;
- Black start agreements can include indexation of payment rates year-on-year;
- Operational intertrip payments are indexed by RPI in accordance with the provisions set out in CUSC Section 4 Schedule 4; and
- Other multi-year balancing services contracts may include indexation using RPI.

71. The prices associated with these services are based on a range of factors and RPI. NGET should be incentivised to develop and procure services that deliver value against what currently exists; hence their expected cost should be considered as an Ex-Ante input to models. However NGET notes that RPI is beyond its sphere of influence and difficult to accurately forecast; and so should be treated as an Ex-Post input to BSIS models.

4. Summary of treatment of inputs

72. Table 3 summarises the conclusions drawn in the sections above.

Generation:	**Forecast Confidence:**	**Treatment in models:**	**Degree of Control:**	**Suitable for incentivisation?**
Long Term Generation Availability (OC2)	Low - medium	Ex-Ante[2]	Low - medium	Yes
Short Term Generation Availability (MEL)	None	Ex-Ante	None	Yes[3]
Generation Contribution to NIV	Low	Ex-Post	None	No
Generator Fuel Prices	Low	Ex-Post	None	No
Wholesale Power Prices	Low	Ex-Post	None	No
Generator Efficiency Factors	Medium	Ex-Ante	None	No
Free headroom	Low	Ex-Post	None	No
Renewable generation running	Low	Ex-Post	None	No
Nuclear generation running (for footroom model)	Low	Ex-Post	None	No
Frequency response/reserve requirements	High	Ex-Ante	Low	Yes
Largest generation loss	High	Ex-Ante	Low	Yes
BM Pricing/wholesale power price mark-ups (for energy models)	Low - medium	Ex-Ante	Low	Yes
BM Pricing for constraints modelling	Low	Ex-Post	None - Low	No
Demand:				
Demand Level	High	Ex-Ante	None - Low	Yes
Demand volatility	Medium	Ex-Ante	Low - medium	Yes
Demand contribution to NIV	Low	Ex-Post	None	No
Largest demand loss	High	Ex-Ante	Low	Yes
Transmission:				
Transmission availability (OC2)	Medium	Ex-Ante	Medium	Yes
Transmission capability	Medium - high	Ex-Ante	Medium	Yes
Other:				
RPI	Low	Ex-Post	None	No

Table 3: Summary of proposed treatment of cost drivers.

[2] Ex-ante, but updated on an annual basis.
[3] On the basis that, using constraints as an example, there exists the potential for the impact of such faults on import and export constraints, when considered in the round, to cancel each other out.

5. APPENDIX A: Assessment of NGET's ability to forecast and control drivers

Forecasting drivers of Generation Availability	
Measure	**Detail**
Is data readily available?	**Planned outage data: YES** Generator availability is notified to NGET under the provisions of OC2. Hence the data itself, once submitted, is readily available. Data quantity/quality decreases as the lead-time of the data increases. **Unplanned outage data: YES (though at short notice)** Unplanned outages are notified to NGET through re-declarations of the 'Maximum Export Limit' (MEL) parameter in the BM, and represent generators' contribution to NIV until the lost output is replaced. If they persist, they would become visible through OC2 data submissions. **Drivers behind data:** **Maintenance Drivers and Contractor Availability: NO** NGET has no knowledge of the maintenance policies applicable to generation plant except to the extent that they depend upon factors such as running hours, number of starts, etc. **Wholesale Power Prices and Fuel Prices: YES** Data relating to historic fuel prices and wholesale power prices are readily available. Forward price curves also exist for fuel prices and wholesale power prices, although such forward curves may not be reflective of the prices at the time of planned outages. **Plant efficiency: NO** High-level information regarding generic plant efficiency factors is available; however specific information relating to individual generators and their various operating configurations tends to be known only by the owners of the plant. **Faults: YES** NGET can estimate data regarding faults on generating plant from MEL submissions, based on assumptions.

Forecasting drivers of Generation Availability	
Measure	**Detail**
	LCPD/Emissions: YES Data relating to the Large Combustion Plant Directive/emissions are available on the Environment Agency website.
Volatility of drivers	**Maintenance Drivers and Contractor Availability: Varies with lead time** **Low (up to e.g. 4 weeks) – increasing to HIGH (beyond 6 months)** Maintenance drivers tend to be based on policy, hence should be stable. Contractor availability can change, however, and NGET has no sight of this. **Wholesale Power Prices and Fuel Prices: HIGH** Whilst NGET is able to monitor movements in market fundamentals such as fuel price and wholesale price, any decision by a generator to mothball or regime plant is largely unforecastable. **Plant efficiency: LOW** Plant efficiency would only change if plant characteristics change. **Faults: HIGH** Faults are random in nature, hence they, and their contribution to NIV, are highly volatile and cannot be forecast in a meaningful sense. **LCPD/Emissions: MEDIUM** Restrictions on running hours lead generators to target high-reward periods in which to generate. Hence these periods are linked to fuel prices and wholesale power prices, but could reasonably be expected to coincide with winter periods.
Applicability of historic data trend analysis	**OC2 data: NO** Because of its drivers, OC2 data is unique to a particular time period and, other than the fact that outages tend to be taken over the lower-demand summer period, show no real trend. **MEL data: NO**

Forecasting drivers of Generation Availability	
Measure	**Detail**
	The random nature of faults makes it difficult to use past history as an indication of when faults might occur.
Conclusion:	Forecast confidence for drivers behind OC2 data = **Low to medium** Forecast confidence for drivers behind short-term faults = **None**

Table 4: Forecasting drivers of Generation Availability

Ability to control drivers of Generation Availability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
Balancing Mechanism (BM)	The BM can only be used to change output levels of generators that are already running or can be made to run in BM timescales. The BM is not a means by which NGET can make generation available. Ability to influence generator availability via the BM: **None**	N/A
Trades	NGET has limited ability to use trades to influence generator availability. NGET tends to trade within-day/day-ahead for general energy balancing; and may trade up to two weeks ahead for constraint management purposes (having taken a view on generator running and outage certainty), whereas generator outages will generally be finalised before then. Where trading is possible, NGET would require the ability to enter into BM Unit-specific trades under its standard Grid Trade Master Agreement (GTMA) provisions. Also, the less competition exists in service provision, the more difficult it is for NGET to be able to influence the price it would have to pay. Ability to influence generator availability via trades: **Low**	Develop/enhance trading strategies; Extend the availability of GTMA Schedule 7A to enable BM Unit-specific trades from a wider pool of counter-parties
Balancing Services	Balancing Services contracts are perhaps the main tool by which NGET is able to influence generation availability, as they provide a means by which we can	Develop existing/new ancillary service mechanisms to influence generator

Ability to control drivers of Generation Availability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
contracts	discuss and agree our requirements with generators ahead of time, at which point it may be possible to influence generation outage dates before details such as contractor availability have been finalised, or by funding changes to contractor availability. As with trades, a lack of competition in service provision can make it difficult for NGET to influence the price it would have to pay, although the longer lead-times may allow a wider range of options to be explored. Ability to influence generator availability via contracts: **Medium**	availability; Facilitate provision of such services by potential service providers; Increase pool of available service providers
Transmission system planning/ operation	N/A	
Changes to operating policy	N/A	
Changes to industry codes	The code change route could be used to propose changes to outage co-ordination processes with the aim of ensuring their continued efficiency. However it is important to note the context within which the code processes are set and it is unlikely that, for example, firm obligations to co-ordinate generation and transmission outages; and the imposition incentives on generators in the form of penalties where co-ordination is not maintained; could be introduced via this route. Rather, they might take the more general form of enhanced licence obligations to minimise constraint costs through efficient co-ordination. Ability to influence generator availability via code changes: **Low**	Investigate how increased co-ordination and efficiency between code parties might be possible and what the benefit for the outage planning process might be
Information provision	NGET publishes a range of information to the industry through its Seven Year Statement, its own website and via submission to the Balancing Mechanism Reporting Agent (BMRA). Some of this information may influence generator	Investigate how increased availability of information might lead to more effective functioning of the market with

Ability to control drivers of Generation Availability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	availability, for example demand forecasts and Short Term Operating Reserve requirements. Ability to influence generator availability via information provision: **Low**	regard to system operator actions
Conclusion:	Degree of control by system operator =	Long term generator availability: **Low to medium**; Short-term availability (including generation contribution to NIV): **None**

Table 5: Ability to control drivers of Generation Availability

Forecasting drivers of Generation Running	
Measure	**Detail**
Is data readily available?	**Generation Availability: YES** Generator availability data is available via OC2 and MEL submissions, subject to increasing uncertainty as lead time increases (as described earlier). **Wholesale Power Prices and Fuel Prices: YES** Data relating to historic fuel prices and wholesale power prices are readily available. Forward price curves also exist for fuel prices and wholesale power prices, although such forward curves may not be reflective of the prices at the time of planned outages. **Plant efficiency: NO** Specific information relating to individual generators and their various operating configurations tends to be known only by the owners of the plant. However, it may be possible to collate generic plant efficiency factors based on age, technology and fuel type. **Generator Risk Management Data: NO** Information relating to generators' approach to managing portfolio risk is not readily available. Attempts can be made to derive behaviours from available data sources; however it is difficult to derive robust data. **Renewable Generation Running: YES** Renewable generation can be monitored by NGET where suitable metering is in place. **SQSS Requirements: YES** The SQSS specifies criteria within which the transmission system must be operated. These criteria drive the need to procure frequency response and energy reserves to manage the risks associated with generation running (for example keeping system frequency within prescribed limits following the largest credible/ allowed generation loss). **BM Pricing: YES** Data regarding generator bid-offer prices is readily available.

Forecasting drivers of Generation Running	
Measure	**Detail**
	Drivers behind data: **Fuel Market Fundamentals/'Take or Pay' Contracts: NO** Whilst it may be possible to form a view, detailed information regarding the drivers behind fuel prices is not available to NGET. **Participant Trading Activity: NO** Detailed information regarding the drivers behind participant trading activity is not available to NGET. **Plant characteristics: NO** Whilst it may be possible to form a view, detailed information regarding the characteristics of generating plant that drive fuel efficiency is not available to NGET. **Need for Free Headroom: NO** Portfolio risk management methods are not visible to NGET, hence it is not possible to obtain data regarding the level of free headroom that generators are likely to hold. **Fuel Stocks: NO** Detailed information regarding participants' fuel stocks is not available to NGET. **LCPD/Emissions: YES** Data relating to the Large Combustion Plant Directive/emissions are available on the Environment Agency website. **'Opportunistic' behaviour: NO** Whilst it may be possible to identify behaviour that might look as though it represents opportunistic behaviour on the part of generators (for example the exploitation of transmission constraints) it is extremely difficult to be certain about such behaviours. Certainly, no data exists to allow it to be modelled.

Forecasting drivers of Generation Running	
Measure	**Detail**
	Weather: YES (developing for wind speed data) The weather is a key factor in determining renewable generation running – particularly for wind and run-of-river hydro. NGET has a range of weather data at its disposal, and is working to develop its capture of wind speed data at wind farm sites. **Response/Reserve Requirements/largest generation loss: YES** Data for frequency response/reserve requirements and the largest generation loss (as derived from SQSS criteria) are readily available to NGET. **Wholesale power price mark-ups: YES** Bid-offer data can be compared against wholesale electricity prices to determine the level of mark-up.
Volatility of drivers	**Fuel Market Fundamentals/'Take or Pay' Contracts: HIGH** Fuel markets can exhibit significant volatility through the interaction between supply and demand. **Participant Trading Activity: MEDIUM** Volatility associated with individuals' trading activity depends to an extent on whether they have contract cover through vertical integration. **Plant characteristics: LOW** Plant characteristics would only tend to change through replacement of equipment. **Need for Free Headroom: HIGH** The need for generators to hold free headroom depends on the physical ability of their plant to robustly meet their contract obligations and their desire to avoid imbalance cash-out if their plant fails to deliver. Accordingly, it is linked to the risk that generating plant might develop a fault and the perceived risk of incurring imbalance cash-out charges, both of which can be highly volatile). **Fuel Stocks: MEDIUM**

Forecasting drivers of Generation Running	
Measure	**Detail**
	The requirement and ability to hold fuel stocks depends on expected generation running, which is a function of market fundamentals. **LCPD/Emissions: MEDIUM** Restrictions on running hours lead generators to target high-reward periods in which to generate. Hence these periods are linked to fuel prices and wholesale power prices, but could reasonably be expected to coincide with winter periods. **'Opportunistic' behaviour: MEDIUM** 'Opportunistic' behaviour may be linked to a particular transmission outage; and may become visible to market participants. This in turn may temper its impact. **Weather: Varies with lead time** **Low (within day) – HIGH (beyond 1 day)** Weather conditions can be highly variable. Wind speed in particular is difficult to forecast beyond a few hours. **Response/Reserve Requirements and largest generation loss: LOW** Requirements for frequency response/reserve and the largest generation loss, being based on SQSS criteria, tend to change infrequently. **Wholesale power price mark-ups: HIGH** The drivers behind the extent to which generators apply a mark-up to wholesale power prices when setting bid-offer prices (for example changing fuel prices, locational price exploration) and the fact that bid-offer prices can change half hourly contribute to the potential for them to exhibit significant volatility.
Applicability of historic data trend analysis	**Generation Availability: NO** As discussed in the previous section, generator availability is a function of the need to take outages which, other than the fact that planned outages tend to be taken over the lower-demand summer period, show no real trend. **Wholesale Power Prices and Fuel Prices: NO**

Forecasting drivers of Generation Running	
Measure	**Detail**
	Wholesale power prices and fuel prices are a function of the interactions between market participants in relation to bulk energy trading. Whilst trends may be observable in past behaviour it is not often the case that they provide a robust indicator of future pricing. **Plant efficiency: YES** In the absence of equipment changes, plant efficiency should remain reasonably constant. **Generator Risk Management Data: NO** Whilst generators may adopt reasonably consistent policies for risk management, the way they manifest themselves and the difficulties in obtaining data on generator risk management make trend analysis difficult. **Renewable Generation Running: NO** At the moment, insufficient data/evidence exists for trend analysis to help with forecasting renewable generation running. The situation may change as more data becomes available and forecasting techniques develop. **SQSS Requirements: YES** SQSS criteria tend to change infrequently. **Wholesale power price mark-ups: YES** Whilst trends in wholesale power prices might not be a reliable indicator of future price levels, the extent to which bid-offer prices are set relative to the wholesale price, absent any locational/opportunistic behaviour, is more likely to be suitable for trend analysis.
Conclusion:	Forecast confidence = **Low to medium**

Table 6: Forecasting drivers of Generation Running

Ability to control drivers of Generator Running		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
Balancing Mechanism (BM)	The BM can only be used in the short-term to change output levels of generators that are already running or can be made to run in BM timescales. This makes it useful for dealing with short-term plant loss or transmission issues which a large pool of potential providers can alleviate. It is not possible to influence longer-term generation running via the BM. Ability to influence generator running via the BM: **Low**	Ensure efficient trade-off between expected prices/volumes available in the BM with options for trading/contracting pre-gate closure
Trades	NGET has a limited ability to use trades to influence generator running. NGET is generally able to trade up to two weeks ahead, which gives some scope to manage running profiles at a BM Unit level, subject to suitable GTMA terms (Schedule 7A) being in place. However they do not allow for additional flexibility (e.g. management of offer/bid volumes/prices in the BM). Low levels of competition in service provision make it difficult for NGET to influence the price it would have to pay. NGET can also seek to obtain additional energy via Pre-Gate Closure BM Unit Transactions (PGBTs). These are based on a more open procurement process (offers are invited from participants for energy provision and the most suitable price/volume combination chosen) but are restricted to use in prompt timescales. Ability to influence generator running via trades: **Medium**	Develop/enhance trading strategies; Attain prices better than those forecast to be available in the BM (and manage associated half-hourly price risk); Extend the availability of GTMA Schedule 7A to enable BM Unit-specific trades from a wider pool of counter-parties
Balancing Services contracts	Balancing Services contracts provide NGET with the ability to specify and procure a range of Balancing Services through the timescales. NGET consults widely with the industry when developing and enhancing the design and operation of Balancing Services but has a high degree of control over service	Develop/enhance strategies for determining required constraint contract volumes; Develop existing/new ancillary service mechanisms to influence generator

Ability to control drivers of Generator Running		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	design. NGET uses Balancing Services contracts to satisfy its frequency response requirement and that level of reserve over and above what is provided through market operation. Where there is a wide pool of available providers, services are procured via open tender – the more competition NGET can generate, the more likely the pricing will be competitive. Ability to manage volume of generator running provision via contracts: **Medium - high** Ability to influence price of such contracts: **Low – medium** (depending on procurement method)	running; Facilitate provision of such services by potential service providers; Attain prices better than those forecast to be available in the BM or via trades (and manage associated price risk); Increase pool of available service providers
Transmission system planning/ operation	N/A	
Changes to operating policy	NGET's Short-Term Operating Reserve Requirement (STORR) is set to ensure compliance with relevant policy. Changes in operating conditions may trigger the need to revise policy, which may vary the requirement for certain Balancing Services (and vice versa). Ability to manage volume of generator running via changes to operating policy: **Medium** (relies on driver for change) Ability to influence price of generator running via changes to operating policy: **None - low**	Ensure continued optimal requirement for response and reserve holding/provision; Develop NETS SQSS so that policies accommodate/ are consistent with the latest industry developments

Ability to control drivers of Generator Running		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	The National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) sets out a co-ordinated set of criteria and methodologies that apply to the planning of the national electricity transmission system. NGET can work with the industry to develop the NETS SQSS to ensure response/reserve requirements remain appropriate to cater for the largest generation loss, although the ease with which the SQSS can be changed, and the associated timeframe, tends to depend on the magnitude of that change. However, NGET could also incur a step-change in SO costs if changes to the SQSS impose different ways of working on it. Ability to influence transmission availability via changes to operating policy: **Low**	
Changes to industry codes	The code change route could be used to propose changes to the imbalance regime such that incentives to manage portfolio risk were sharper. This may deliver more part-loaded BM Units and hence contribute towards margin provision. However it is important to note that certain code changes (such as those relating to imbalance as referenced above) would attract industry-wide interest and no doubt be contentious. The code change route could be used to propose changes to the arrangements for provision of mandatory ancillary services to NGET (both in terms of quantity and cost). It is important to note that there may be considerable uncertainty regarding the success and timing of such proposed changes.	Investigate how code provisions might influence generator running to better meet system operation needs

Ability to control drivers of Generator Running		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	Ability to influence generator running via code changes: **Low**	
Information provision	NGET publishes a range of information to the industry through its Seven Year Statement, its own website and via submission to the Balancing Mechanism Reporting Agent (BMRA). Some of this information may influence generator running, for example demand forecasts and Short Term Operating Reserve requirements. Ability to influence generator running via information provision: **Low**	Investigate how increased availability of information might lead to more effective functioning of the market with regard to system operator actions
Conclusion:	Degree of control by system operator =	**Low to medium**

Table 7: Ability to control drivers of Generator Running

Forecasting drivers of Demand Volatility	
Measure	**Detail**
Is data readily available?	**Demand characteristics: YES** NGET has a wide range of historic demand data. **Demand forecast error: YES** NGET is able to compare forecast demand with out-turn values. **Demand NIV contribution: YES** NGET is able to obtain NIV from settlement data. **SQSS Requirements: YES** Data regarding required levels of high frequency response and 'footroom' to allow generation to be reduced following a loss of demand are readily available. **Drivers behind data**: **TV pickups: YES** Historic TV pickup data is readily available. **Off-peak tariffs: YES** The incidence of off-peak tariffs can be determined from out-turn demand data, from Distribution Network Operators or via interrogation of the radio teleswitch off-peak tariff management system. **One-off events: YES (for historic events)** Data from past one-off events is readily available. **Forecasting methodology: YES** NGET's forecasting methodology is well understood.

Forecasting drivers of Demand Volatility	
Measure	**Detail**
	Suppliers' ability to forecast their energy requirements: NO Whilst NGET can obtain NIV data, NGET has no view of individual suppliers' forecasting or risk management processes. **HF response requirement: YES** The HF response requirement is well understood **Footroom: YES** The need to hold sufficient downward reserve capability to cope with the largest credible demand loss at times of minimum demand is known.
Volatility of drivers	**TV pickups: HIGH** TV pickups depend on the size of TV audiences and the timing of commercial breaks. For established programmes on TV at regular times, they can exhibit stable behaviour. However they have the potential to exhibit significant volatility, particularly when associated with large sporting events. **Off-peak tariffs: LOW** Switching times of off-peak tariffs tend to be well established. **One-off events: HIGH** By their nature, the influence of one-off events on demand is highly uncertain. **Forecasting methodology: LOW** NGET's forecasting methodology is well understood. **Suppliers' ability to forecast their energy requirements: HIGH** Each supplier needs to forecast and risk-manage its energy requirements against a varying customer base and imbalance cash-out risk. **HF response requirement: LOW**

Forecasting drivers of Demand Volatility	
Measure	**Detail**
	The HF response requirement is set by policy, which tends to be stable. **Footroom: LOW** The need to hold sufficient downward reserve capability to cope with the largest credible demand loss at times of minimum demand is set by policy, which tends to be stable.
Applicability of historic data trend analysis	Other than for one-off events, historic demand data tends to provide useful data for trend analysis.
Conclusion:	Forecast confidence = **Medium - high**

Table 8: Forecasting drivers of Demand Volatility

Ability to control drivers of Demand Volatility		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
Balancing Mechanism (BM)	The BM can only be used in the short-term to change output levels of generators that are already running or can be made to run in BM timescales. As long as the dynamic parameters of generation running in the BM allow, it can be used to track the demand profile. Rapid changes in demand tend to require specialist services to deliver energy in short timescales. Ability to influence demand volatility via the BM: **Low**	Ensure efficient trade-off between expected prices/volumes available in the BM with options for trading/contracting pre-gate closure
Trades	Trading tends to be for the delivery of defined blocks of energy. Hence it tends not to be used as a tool to manage demand volatility. Ability to influence demand volatility via trades: **None**	N/A
Balancing Services contracts	Balancing Services contracts provide NGET with the ability to specify and procure a range of Balancing Services through the timescales. NGET uses a range of Balancing Services contracts to manage demand volatility, from frequency response through fast reserve and other reserve products. NGET looks to procure these services from a range of industrial and commercial load sources (either directly or via aggregators). NGET has also in the past investigated the potential for staggering the start-time of domestic off-peak tariffs. Ability to manage demand volatility via contracts: **Low - Medium** Ability to influence price of such contracts: **Low – medium** (depending on procurement method)	Develop existing/new ancillary service mechanisms to manage demand volatility; Facilitate provision of such services by potential service providers; Attain prices better than those forecast to be available in the BM (and manage associated price risk); Increase pool of available service providers
Transmission system planning/	N/A	

Ability to control drivers of Demand Volatility		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
operation		
Changes to operating policy	NGET's Short-Term Operating Reserve Requirement (STORR) is set to ensure compliance with relevant policy. Changes in operating conditions may trigger the need to revise policy, which may vary the requirement for certain Balancing Services (and vice versa). Ability to manage demand volatility via changes to operating policy: **Medium** Ability to influence price via changes to operating policy: **None – low** NGET can work with the industry to develop the NETS SQSS to ensure response/reserve requirements remain appropriate to cater for the largest demand loss, although the ease with which the SQSS can be changed, and the associated timeframe, tends to depend on the magnitude of that change. However, NGET could also incur a step-change in SO costs if changes to the SQSS impose different ways of working on it. Ability to influence transmission availability via changes to operating policy: **Low**	Ensure continued optimal requirement for response and reserve holding/provision; Develop NETS SQSS so that policies accommodate/ are consistent with the latest industry developments;
Changes to industry codes	The code change route could be used to investigate whether there was the opportunity for drivers for demand volatility could be managed prior to the system operation phase. Ability to influence demand volatility via code changes: **Low**	Investigate how code provisions might influence demand management to better meet system operation needs
Information provision	NGET publishes a range of information to the industry through its Seven Year Statement, its own website and via submission to the Balancing Mechanism Reporting Agent (BMRA). Some of this information may be useful in influencing the timing of demand take.	Investigate how increased availability of information might lead to more effective functioning of the market with regard to system operator actions

Ability to control drivers of Demand Volatility		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	Ability to influence demand volatility via information provision: **Low**	
Conclusion:	Degree of control by system operator =	**Low - medium (except demand contribution to NIV – None)**

Table 9: Ability to control drivers of Demand Volatility

Forecasting drivers of Transmission Availability	
Measure	**Detail**
Is data readily available?	**Planned outage data: YES** Transmission availability is notified to NGET by TOs under the provisions of OC2 and is combined with NGET's transmission availability information derived from its outage plans. Hence the data itself, once submitted, is readily available. Data quantity/quality decreases as the lead-time of the data increases. **Unplanned outage data: YES** NGET becomes aware of faults with transmission equipment through its system operator function. If faults persist, they would become visible through OC2 data submissions. **Drivers behind data:** **Connection scheme outages: YES** Data relating to connection scheme outages is readily available, subject to lead time. **Construction/maintenance outages: YES** Data relating to construction and maintenance outages is readily available, subject to lead time. **Contractor Availability: YES (NGET), NO (Other TOs)** NGET's outage planners are able to determine contractor availability through the outage planning process. Whilst other TOs do the same, NGET does not have access to information on their contractor availability. **SQSS: YES** The SQSS specifies criteria for the design and operation of the transmission system. **Transmission equipment faults: YES** Data relating to transmission system faults is readily available.

Forecasting drivers of Transmission Availability	
Measure	**Detail**
	Type faults/restrictions: YES Data relating to type faults/restrictions (once known) is readily available.
Volatility of drivers	**Connection scheme outages: Varies with lead time** **Low (up to e.g. 4 weeks) – increasing to HIGH (beyond 6 months)** Connection scheme outages are subject to variation associated with those schemes, hence dates can be subject to change and can be extremely difficult to forecast. **Construction/maintenance outages: Varies with lead time** **Low (up to e.g. 4 weeks) – increasing to HIGH (beyond 6 months)** Maintenance outages tend to be periodic in nature. However, construction/maintenance outages are subject to iterative planning processes and continuous assessment of system security. Hence, even once an outage plan has been finalised (currently at year-ahead) there is still the potential for significant change prior to real-time as stakeholders/third parties revise their plans, other equipment faults, delivery of equipment is delayed, etc. **Contractor Availability: Varies with lead time** **Low (up to e.g. 4 weeks) – increasing to HIGH (beyond 6 months)** Contractor availability can change, which for England and Wales transmission equipment NGET has some control over. However, for equipment owned by other transmission owners, NGET has no sight of/influence over contractor availability. **SQSS: LOW** System planning and operation requirements, being based on SQSS criteria, tend to change infrequently. **Transmission equipment faults: HIGH** Faults are random in nature, hence are highly volatile and cannot be forecast in a meaningful sense. **Type faults/restrictions:** Like faults, type faults/restrictions are random in nature, hence are highly volatile and cannot be forecast in a meaningful sense.

Forecasting drivers of Transmission Availability	
Measure	**Detail**
Applicability of historic data trend analysis	**Planned outage data: NO** Because of its drivers, planned outage data is unique to a particular time period and, other than the fact that outages tend to be taken over the lower-demand summer period, show no real trend in time. **Unplanned outage data: NO** The random nature of faults makes it difficult to use past history as an indication of when faults might occur, although a longer-term view of history may provide an indication of frequency.
Conclusion:	Forecast confidence = **Medium**

Table 10: Forecasting drivers of Transmission Availability

Ability to control drivers of Transmission Availability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
Balancing Mechanism (BM)	N/A	N/A
Trades	N/A	N/A
Balancing Services contracts	N/A	N/A
Transmission system planning/ operation	NGET's investment planning activity is a key driver behind the efficient development of the transmission system. NGET's outage planning activity is a key driver behind the management of transmission system availability through the planning timescales. NGET's planning roles enable it to work to co-ordinate transmission availability and investigate how to ensure the ongoing efficiency of planning processes. Ability to influence transmission availability via system planning/operation: **Medium to high** in the short-term, reducing in the medium – long term	Develop outage planning processes; Innovate with regard to running arrangements and development of post-fault system management tools; Investigate technical solutions to maximise transmission system capability
Changes to operating policy	The National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) sets out a co-ordinated set of criteria and methodologies that apply to the planning of the national electricity transmission system. NGET can work with the industry to develop the NETS SQSS to ensure its planning criteria remain appropriate, although the ease with which the SQSS can be changed, and the associated timeframe, tends to depend on the magnitude of that change.	Develop NETS SQSS so that policies accommodate/ are consistent with the latest industry developments; Ensure appropriate levels of transmission system security through network planning

Ability to control drivers of Transmission Availability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	However, NGET could also incur a step-change in SO costs if changes to the SQSS impose different ways of working on it. Ability to influence transmission availability via changes to operating policy: **Low**	
Changes to industry codes	The code change route could be used to propose changes to outage co-ordination processes with the aim of ensuring their continued efficiency. In the context of transmission system availability/capability, code changes might be a route to enhancing the collective aim of transmission owners to maximise availability, although as with generator availability it might be that enhanced licence obligations to minimise constraint costs through efficient co-ordination could be more appropriate. Ability to influence transmission availability via code changes: **Low**	Investigate how increased co-ordination and efficiency between code parties might be possible and what the benefit for the outage planning process might be
Information provision	NGET publishes information on transmission system capability to the industry through its Seven Year Statement. NGET consults with the industry regarding the quantity and type of information it provides, some of which (in conjunction with locational use of system charging, may influence generator/demand decisions on where to site, with a corresponding impact on the requirement for transmission capacity. Ability to influence transmission availability/ capacity via information provision: **Low**	Investigate how increased availability of information might lead to more effective functioning of the market with regard to system operator actions
Conclusion:	Degree of control by system operator =	**Medium**

Table 11: Ability to control drivers of Transmission Availability

Forecasting drivers of Transmission Capability	
Measure	**Detail**
Is data readily available?	**Equipment ratings: YES** Detailed ratings information for NGET's transmission equipment is readily available. Rating information for other TOs' equipment is provided to NGET under the provisions of the SO-TO Code. **SQSS Requirements: YES** Criteria for pre- and post-fault operational voltage, thermal and stability standards arising from SQSS requirements are readily available. **Post-fault actions: YES** Post-fault actions include (but are not limited to) switching of transmission equipment, agreeing of Special Actions under the terms of the Grid Code, and agreeing Balancing Services contracts. Data for agreed post-fault actions are readily available. **Drivers behind data:** **Plant characteristics: YES (NGET), NO (Other TOs)** Data relating to NGET's plant characteristics is readily available. Data relating to other TOs' plant characteristics may be available under the provisions of the SO-TO Code. **Weather/season impact: YES** Data relating to the impact of seasons NGET's plant characteristics is readily available. Data relating to the impact of seasons on other TOs' plant characteristics may be available under the provisions of the SO-TO Code. Certain of NGET's equipment have monitoring equipment that allows for more dynamic assessment of characteristics, depending on local weather conditions. **Voltage criteria, Loss of supply criteria: YES** The SQSS specifies criteria for maintaining system voltage and when loss of supply is acceptable.

Forecasting drivers of Transmission Capability	
Measure	**Detail**
	Availability of reactive power: YES Data relating to the reactive power absorption/generation of NGET's transmission assets, including reactive compensation equipment, is readily available. Data relating to the reactive power absorption/generation of other TOs' plant characteristics is available under the provisions of the SO-TO Code. Data relating to the reactive power capability if generators (as required by the Grid Code) are contained within CUSC-governed mandatory ancillary service agreements (and other Balancing Services agreements). **Substation reconfiguration: YES** Information relating to potential substation reconfigurations are retained within NGET's knowledge base. **Generation output 'drops': YES** Generators' ability top provide rapid de-loads post-fault are agreed as part of the Grid Code 'Special Actions' process. **Intertrips: YES** Data relating to installed intertrip schemes are readily available to NGET.
Volatility of drivers	As the drivers above relate either to plant characteristics or operating policy, their volatility can be considered to be **LOW**.
Applicability of historic data trend analysis	As the drivers above relate either to plant characteristics or operating policy, it is reasonable to assume they will be stable looking forward.
Conclusion:	Forecast confidence = **Medium - high**

Table 12: Forecasting drivers of Transmission Capability

Ability to control drivers of Transmission Capability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
Balancing Mechanism (BM)	The BM does not allow NGET to directly control transmission capability, although it is a tool by which generation/demand may be rescheduled to resolve any transmission constraints (thermal, voltage or stability) that may arise post-transmission equipment fault, therefore influencing the transmission capability of the remaining system. Ability to influence transmission capability via the BM: **Low**	Ensure efficient trade-off between expected prices/volumes available in the BM with options for trading/contracting pre-gate closure
Trades	As for the BM, NGET's ability to trade ahead of gate closure does not allow it to directly control transmission capability, though it does provides a further tool by which expected generation/demand may be rescheduled pre-fault to resolve any transmission constraints. Ability to influence transmission capability via trades: **Low**	Develop/enhance trading strategies; Extend the availability of GTMA Schedule 7A to enable BM Unit-specific trades from a wider pool of counter-parties
Balancing Services contracts	As for the BM and trades, do not allow NGET to influence transmission capability, although they provide a number of potential means by which available capability can be influenced: • Intertrip/fast de-load agreements allow for overloads to be resolved in the event of a fault, rather than restricting generation pre-fault; • Reactive power agreements/market arrangements can be used to enhance the value of services offered The available pool of service providers and consequential impact for procurement mechanisms influences the extent to which NGET can influence the price of such services. Ability to influence transmission capability via contracts: **Medium to high**	Develop existing/new ancillary service mechanisms to enhance post-fault generator action capability (e.g. intertrips); Facilitate provision of such services by potential service providers; Increase pool of available service providers
Transmission	The outage planning and system control functions are instrumental in developing the	Develop outage planning processes;

Ability to control drivers of Transmission Capability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
system planning/ operation	tools and techniques available to support efficient system operation against a background of changing system availability and capability: • Substation re-switches • Identification of transmission and generation post-fault actions Ability to influence transmission capability via system planning/operation: **Medium to high**	Innovate with regard to running arrangements and development of post-fault system management tools; Investigate technical solutions to maximise transmission system capability
Changes to operating policy	The National Electricity Transmission System Security and Quality of Supply Standards (NETS SQSS) sets out a co-ordinated set of criteria and methodologies that apply to the operation of the national electricity transmission system. NGET can work with the industry to develop the NETS SQSS to ensure its operational criteria remain appropriate. However, NGET could also incur a step-change in SO costs if changes to the SQSS impose different ways of working on it. Ability to influence transmission capability via changes to operating policy: **Low**	Develop NETS SQSS so that policies accommodate/ are consistent with the latest industry developments; Ensure appropriate levels of transmission system security during both intact and outage conditions
Changes to industry codes	The code change route could be used to propose changes to the requirement to make available post-fault actions. In the context of transmission system capability, code changes might be a route to enhancing the collective aim of transmission owners to maximise capability. Ability to influence transmission capability via code changes: **Low**	Investigate how increased co-ordination and efficiency between code parties might be possible and what the benefit for the managing transmission capability might be
Information provision	NGET publishes information on transmission system capability to the industry through its Seven Year Statement. NGET consults with the industry regarding the quantity and type of information it provides, some of which (in conjunction with locational use of	Investigate how increased availability of information might lead to more effective functioning of the market with

Ability to control drivers of Transmission Capability		
Tool	**Extent of NGET control**	**What does an incentive drive us to do?**
	system charging, may influence generator/demand decisions on where to site, with a corresponding impact on the requirement for transmission capacity. Ability to influence transmission capability via information provision: **Low**	regard to system operator actions
Conclusion:	Degree of control by system operator =	**Medium**

Table 13: Ability to control drivers of Transmission Capability

6. Revisions

Issue 1	Modifications	Changes to Pages
Revision 0	First Issue	