National Grid's Response to Ofgem’s 'Project Discovery’ consultation

19 November 2009

Background

National Grid owns and operates the high voltage electricity transmission system in England and Wales and, as National Electricity Transmission System Operator (NETSO); we operate the Scottish high voltage transmission system. National Grid also owns and operates the gas transmission system throughout Great Britain and through our low pressure gas distribution business we distribute gas in the heart of England to approximately eleven million businesses, schools and homes. In addition National Grid owns and operates substantial electricity and gas assets in the US, operating in the states of New England and New York.

In the UK, our primary duties under the Electricity and Gas Acts are to develop and maintain efficient networks and also facilitate competition in the generation and supply of electricity and the supply of gas. Our activities include the residual balancing in close to real time of the electricity and gas markets.

Through our subsidiaries, National Grid also owns and maintains around 18 million domestic and commercial meters, the electricity Interconnector between England and France, and a Liquid Natural Gas importation terminal at the Isle of Grain.

National Grid is committed to safeguarding the global environment for future generations. As part of its strategy, National Grid is committed to:

- Reducing its own greenhouse gas (GHG) emissions - a new interim 45 % reduction in GHG emissions by 2020, as part of its target trajectory of 80 % reduction in GHG emissions by 2050.
- Working with legislators and regulators to reshape energy markets; and
- Helping and supporting its customers, employees and suppliers in changing their behaviours so as to be more considerate to the environment.

National Grid is committed to playing its part in addressing climate change. In order to reach the Governments target of 80% GHG emissions reduction by 2050, and 15% of energy to be supplied from renewable sources by 2020 we will need Government, industry and consumer collaboration to determine a route-map or Master plan for meeting targets. A joined-up approach is essential to get the right legislative and regulatory frameworks in place and ensure necessary infrastructure investment is available in a timely manner for the connection of new renewable sources of electricity generation. We also need to support the development of new technologies.

Introduction

We welcome the opportunity to respond to Ofgem's 'Project Discovery' consultation and look forward to engaging in this and future phases of the project.

Our response has focused on the questions raised within the consultation and we have not commented on the wider network or market implications, recognising that this will be considered in detail in the proceeding phases.

We believe that scenarios are an extremely important and valuable tool in understanding the challenges we face as an industry, in terms of delivering secure, low carbon energy in an affordable way.

We too have carried out a significant amount of work looking at plausible future scenarios. We have developed these scenarios over the last 18 months, resulting in a scenario called Gone Green. This scenario considered the network and operational challenges that we may face, and we have articulated these and sought feedback through the Electricity Network Strategy Group (ENSG).

At National Grid we have undertaken a significant amount of work over recent months, focusing on the action required in three areas which we believe need to be understood if the UK is to achieve its transition to a low carbon economy successfully. These areas are:

- **Network Investment** – ensuring the new low carbon and renewable generation can be connected to the networks, which we have played a significant role in through the ENSG.
- **Operational Challenge** – address what needs to change in order to be able to continue to operate the networks in the future economically and securely as explored in our consultation "Operating the Electricity Transmission Networks in 2020" as part of this we continue to engage with energy consumers and service aggregators in exploring the potential for growth in demand side Balancing Services; and
- **Markets** – market behaviour with a low carbon generation mix as explored in Poyry's "impact of intermittency" study, which we contributed to.

Our thinking on 'Network Investment' and 'The Operational Challenge' has been published in some detail in the work described above. We are pleased to see Ofgem's timely 'Project Discovery' exercise taking forward consideration of the other major piece of the jigsaw – current market arrangements and whether they "are capable of delivering secure sustainable energy supplies".

National Grid would welcome the opportunity to discuss in more detail the assumptions and modelling behind the Project Discovery scenarios and share our work to enable a more comprehensive comparison of the alternative demand, generation and gas supply scenarios.

Responses to Questions

Section 2 - Approach and Assumptions

Question 1: Please provide comments on our approach of using scenarios and stress tests to explore future uncertainty, and as a basis for evaluating policy alternatives?

We believe that scenarios are an important and valuable tool in understanding the implications of the challenges we face as an industry, in terms of delivering secure, low carbon energy in an affordable way. The four scenarios articulated cover a plausible range of outcomes going forward and encompass the main variables affecting demand, generation and gas supply sources.

At National Grid we have undertaken similar work in developing our "Business As Usual" and "Gone Green" scenarios which have been utilised in the production of our Transporting Britain's Energy[1] consultation and the Electricity Networks Strategy Group (ENSG) final report[2]. In addition to the work done to support the evaluation of anticipatory investment as detailed in the ENSG report we have also consulted on how we could operate the system under National Grid's Gone Green scenario[3].

Consequently, we are pleased to see that Project Discovery is taking forward, based on a set of plausible scenarios, consideration of the next phase of the work i.e. the suitability of market arrangements.

We believe that while the stress tests carried out are not exhaustive they cover the main issues that could plausibly affect the UK. Other stress tests that may be worth considering involve combinations of these tests, such as longer duration outages at gas terminals, offshore gas hubs or offshore wind caused by extreme but not necessarily uncommon weather e.g. severe storms. Low wind availability does not represent an extreme event as it is likely to occur on many occasions, as has already been seen, and as such describing it as a stress test may imply it is a more rare event than anticipated. We comment further on this in section 4 question 2.

Question 2: Are there other techniques for analysing uncertainty that we should consider?

The deterministic approach adopted in developing these scenarios appears, in our view, to be the best methodology. Other approaches based around a more probabilistic method can rely too heavily on speculative judgements of the probabilities of certain events/developments taking place. Given the uncertain nature of these developments, many of which are new, such an approach would seem unlikely to deliver any additional insight.

Question 3: Do you agree with how we measure the impacts of our scenarios and stress tests?

We would agree that the measures adopted for analysing the energy scenarios i.e. emissions, renewable energy, plant margins, gas import levels, investment and consumer bills with the stress tests concentrating on demand curtailment, are a plausible set of measures.

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[1] http://www.nationalgrid.com/NR/rdonlyres/3FCF87F1-6CB4-4B42-A185-AED337453821/35677/TBE2009DevelopmentofEnergyScenarios.pdf

[2] http://www.ensg.gov.uk/assets/ensg_transmission_pwg_full_report_final_issue_1.pdf

[3] http://www.nationalgrid.com/uk/Electricity/Operating+in+2020/

Security of supply is a key element in determining the risks to the GB market. As we are moving towards greater import dependency in gas and more intermittent generation sources in electricity, in our view it is correct to concentrate on it in particular. Diversity of supply in terms of both gas and the generation fleet fuel source could also inform the overall view of security of supply. In addition to the measures already identified, we feel value/insight could be gained from analysing a number of other areas e.g.

- European gas storage availability across the European interconnectors during a cold winter;
- The likelihood of such high levels of demand curtailment being delivered in both gas and electricity markets.

Question 4: Do you agree with our key scenario drivers and choice of scenarios?

The key drivers of the economy and environment are appropriate, particularly, as we are looking at what is required to enable the dual renewable and emissions targets to be met and how this could be affected by the pace of economic recovery.

The pace of recovery will directly affect the availability of the necessary funds to support the required investments. In this respect it is important to recognise that these scenarios, particularly the 'green' ones, will require significant investment to support the technologies and infrastructure required to bring renewable/low carbon output to market. In the absence of such support the GB market is more likely to follow the existing pathway of the Dash for Energy and Slow Growth scenarios by default. There are a number of alternative scenarios that endeavour to achieve the targets but fail; however, these scenarios would fall within the range provided by the scenarios developed and hence can be considered to be covered.

Question 5: Do you believe our scenarios sufficiently cover the range of uncertainty facing the market, and hence cover the areas where future policy responses may be required?

We believe the scenario range is wide enough to encompass a plausible range of alternative scenarios albeit many of which would fail to achieve the targets. However, given the size of the challenge and level of uncertainty, a wide range of possible outcomes is expected. The scenarios therefore provide a useful framework to analyse the changes likely to be required to both market arrangements and potentially to future government policies to achieve the targets not only to 2020 but beyond as emissions targets tighten even further.

Question 6: Do you have any specific comments on scenario assumptions, and their internal consistency?

In general the scenario assumptions as set out in Table 2.2 appear to be self consistent and cover the main variables without being exhaustive. We believe this is an important approach to provide clarity of understanding and to give a plausible vehicle by which to test various assumptions and policy initiatives. However, while the scenarios show a wide range in fuel prices over the next decade their range is somewhat narrow by 2020 with the exception being the carbon price which diverges across the scenario timeframe.

Question 7: Do you agree with our methodology for modelling gas and electricity supply / demand balances?

Based on the electricity supply / demand information and the descriptions detailed in the consultation document we would agree that the methodology looks sound and is similar to our own approach in this area. However, we do have concerns relating to the likelihood of such high levels of demand curtailment being delivered in both gas and electricity markets particularly as gas exit reform appears to be reducing the availability of gas interruption.

At a high level the key gas supply / demand considerations that go into the modelling appear appropriate. However there is a lack of detail as to how the analysis fits together. As the paper details, there is considerable uncertainty regarding commodity prices. Whilst the paper details commodity price assumptions, it is difficult to see where these are used in the modelling for gas and electricity. The application of seasonal pricing (notably for gas) is important. More detail on the project viability would be useful, particularly for future storage. We agree that LNG and interconnections are critical to future flow analyses (as is storage for winter / peak). As described in this chapter LNG is subject to the vagaries of global demand, it is also sourced from distant (from the UK) production locations. These factors create heightened uncertainty that increased LNG supplies will be readily available without first understanding demand and prices elsewhere. The length of the LNG supply chain raises particular concerns about the ability of incremental LNG supplies to be delivered in a timely fashion in order to meet short term supply deficits.

Consequently, we would welcome the opportunity to discuss in more detail the assumptions and modelling behind the Project Discovery scenarios and share our work to enable a more comprehensive comparison of the alternative demand, generation and gas supply scenarios. We believe that it is important to avoid confusion amongst the industry by ensuring that measures of security of supply, such as the 1 in 20 peak day, are calculated on a consistent basis by both the licence holders and the regulator. A detailed discussion on the ‘mechanics’ of all such calculations would, in our opinion, be worthwhile.

Question 8: Do you agree that LNG is the likely medium-long term source of "swing gas" for the European market?

National Grid’s scenario broadly aligns with all four of Ofgem’s scenarios assumptions regarding UKCS and Norwegian volumes going forward (the four scenarios show little variation in UKCS and Norwegian). The greatest variation in the four scenarios is for LNG imports followed by Continental imports, which is similar to our own work where LNG is effectively the marginal supply, providing flexibility for significantly greater imports in the Dash for Energy scenario. Similarly, LNG imports are squeezed in the Green Transition scenario, as are LNG imports in our Gone Green work. Hence we agree that LNG will be the main “swing gas” for the UK and Europe markets.

There are many facets to “swing”, including a seasonal basis and a short term response. Swing also needs to be assessed with respect to contracted supplies and fundamental supply / demand balances. For instance we would not make the assumption that LNG terminals will be operating at close to maximum capacity all winter, but on occasion they would.

Section 3 (Scenario Analysis)

Question 1: Do you have any observations or comments on the scenario results

In general the scenarios look to be self consistent and compare closely to our own scenarios developed to support our planning processes and the ENSG work. The

following table and text give a high level comparison between Ofgem's Project Discovery's scenarios and National Grid's for generation capacity, electricity demand, gas demand and gas supply:

Generation Capacity:

2020 GW	NG 2009 Gone Green	Ofgem Green Transition	Ofgem Green Stimulus	Ofgem Dash for Energy	Ofgem Slow Growth	NG BAU Apr '09
CCGT	30.3	27.5	27.5	44.7	35.6	34.8
Coal	17.7	24.2	17.0	20.6	20.2	20.0
Nuclear	11.2	9.3	9.3	3.7	3.7	6.9
CHP*	4.4	4.9	4.9	4.9	4.9	3.8
Wind	27.8	28.6	27.2	14.2	12.9	20.4
Other Renew	9.2	6.3	6.2	4.7	4.5	4.9
Other	3.5	2.7	2.7	2.7	2.7	4.0
Interconnectors	2.0	3.5	3.5	2.5	2.5	2.0
Total	106.1	107.0	98.3	98.0	87.0	96.8
Inters Floating	1.7	0.0	0.0	0.0	0.0	1.7

- Green Transition & Stimulus result in 30% renewable electricity compared to National Grid's Gone Green 32%, hence more renewable capacity and backup CCGTs in Gone Green.

- National Grid's Business As Usual (BAU) reaches around 18% renewable generation.

- Interconnectors exclude Irish links as they are assumed to export at peak. Also we assume importing interconnectors aren't fully utilised with 1.7GWs of the 3.5GW capacity at float i.e. flow could be in either direction.

Electricity Demand:

Broadly speaking the Green Transition and National Grid's Gone Green annual demand scenarios are consistent with similar growth rates between 2010 and 2020 although direct comparisons are difficult due to definitional differences and lack of detail breakdowns. Our Business As Usual forecast is similar to the Slow Growth scenario.

Gas Demand:

The gas demand scenarios show a far greater range than for electricity due to the varying assumptions for CCGT use and the displacement of gas heating by other sources. Our Gone Green scenario is closest to the Green Stimulus but clearly not far from Green Transition. Our Business As Usual forecast sits roughly in the middle of the demand scenario range.

Gas Supply:

All four scenarios show broad agreement with our assumptions re UKCS and Norwegian volumes going forward (the four scenarios show little variation in UKCS and Norwegian). The greatest variation in the four scenarios is for LNG imports followed by Continental imports, which is similar to our own work where LNG is effectively the marginal supply, providing flexibility for significantly greater imports in the Dash for Energy scenario. Similarly, LNG imports are squeezed in the Green Transition scenario, as are LNG imports in our Gone Green work.

Question 2: Do you agree with our assessment of what the key messages of the scenario analysis are?

The key messages do identify the main issues resulting from the four scenarios and the risks to security of supply that could materialise as well as the challenge of financing the investment required, particularly, when compared to current levels of investment which are below the requirement in all four scenarios. Hence it would not be unreasonable to assume current market arrangements will need to change to deliver these large increases in investments required to meet in particular the "Green" scenarios.

Question 3: Are there other issues relating to secure and sustainable energy supplies that our scenarios are not showing?

National Grid welcomes the acknowledgement in footnotes 30 and 31 on page 31 that grid-injected biomethane is expected to displace some demand for natural gas over time, particularly in the Green scenarios. We noted in our January 2009 paper[4] on the potential for renewable gas that, even in our baseline scenario biomethane could contribute 5.6 bcm per year by 2020 (around 7% of gas demand by 2020 in the Green scenarios). We agree with Ofgem that a reduction in demand for fossil gas would have the dual benefits of assisting Britain to meet its targets for contribution of renewable energy and improving security of supply.

Question 4: To what extent do you believe that innovations on the demand side could increase the scope for voluntary demand side response in the future?

Innovations on the demand side will increase the scope for voluntary demand side response in the future. This demand side response will take the form of greater demand side participation in wholesale market as well as services to system or network operators for the purposes of residual balancing and network control.

We have almost two decades of experience at National Grid in using demand side services and are very keen to get more demand side parties involved in the provision of Balancing Services[5] to meet our growing requirement over the next decades. We also believe that market arrangements should incentivise wholesale market participants to seek out demand side solutions when these are more economic than generation led solutions.

However our experience, backed up by the responses we received to our "Operating…in 2020" consultation, highlights that hard evidence of the total demand side potential across Great Britain is yet to be gathered, and there is little consensus over how demand side services will fit into the energy markets. In order to deliver a step change in demand side participation, a significant initiative is needed, such as the role out of high specification smart meters, accompanied by a good understanding of the market framework.

Traditionally the majority of demand turndown has been contracted from the Industrial & Commercial sectors; this may not necessarily be the future situation. Already the smallest demand reduction site under contract is less than a quarter of a MW. This trend towards the aggregation of ever smaller demand sites will continue

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[4] http://www.nationalgrid.com/NR/rdonlyres/9122AEBA-5E50-43CA-81E5-8FD98C2CA4EC/32182/renewablegasWPfinal1.pdf

[5] National Grid procures Balancing Services in order to balance demand and supply and to ensure the security and quality of electricity supply across the GB Transmission System. https://www.nationalgrid.com/uk/Electricity/Balancing/

as smart metering overcomes the existing economic constraints of installing applicable metering and communication solutions.

We therefore see the scope for voluntary demand side response growing steadily over the next few years although more work is needed to establish the true, time-bound potential. Significant step changes are feasible in the long term but are likely to be dependant on concerted action backed up by Government policy on metering, appliance standards and, in the case of electric vehicles, charging behaviour.

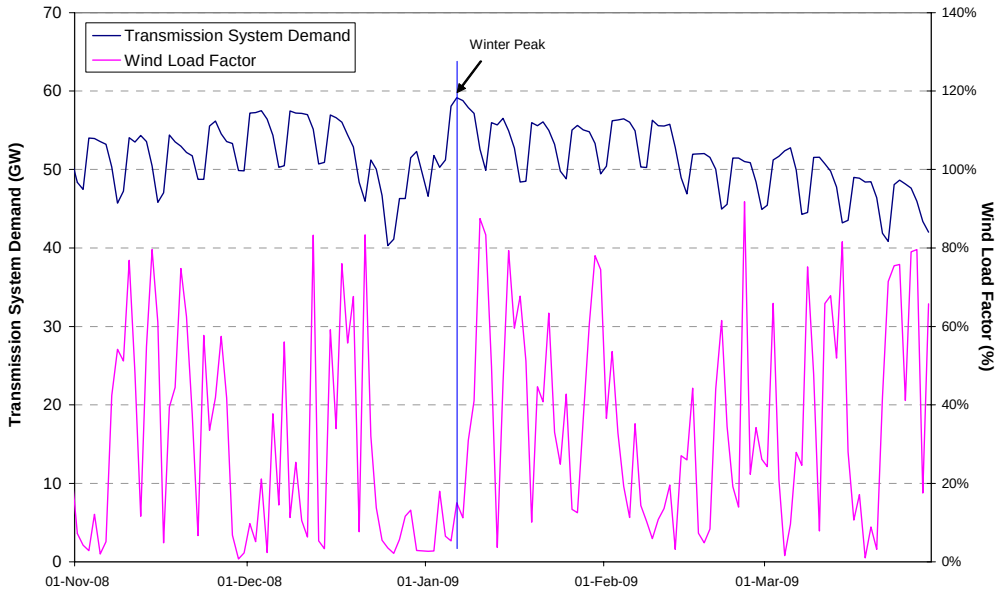
Section 4 (Stress Tests)

Question 1: Do you agree that our stress tests are representative of the types of risks facing the GB energy sector over the next decade?

Question 2: Are there further stress tests that you think should be considered?

There are potentially a wide range of factors/risks that could affect the UK energy market over the next decade. However, many of these risks can be covered by generic stress test such as outages (e.g. generation, networks, interconnectors and offshore infrastructure) but these may well have different implications depending on the length of the outages and the magnitude of the outage e.g. Norwegian offshore gas hub failure versus a sub terminal failure at St Fergus. Consequently, we believe the stress tests are representative of the types of risks facing the UK market but that there may well be scope for more specific tests around key infrastructure outages and for a longer period than a day e.g. technical failure of one of the three Norwegian gas hubs or ice storms rendering offshore wind inoperable for many weeks.

In itself the 'no wind output' stress test is not an uncommon event , as can be seen in the following chart taken from our 2009/10 Winter Outlook Consultation report which highlights that close to zero output from wind generation occurred on numerous occasions over winter 2008/09. Hence no wind on a peak day, in our view, is not the type of extreme event to be assessed with a stress test, whereas no wind output for a sustained period, as described in the situation above, could be considered as a more appropriate stress test.



Question 3: Do you agree with the assumptions behind our stress tests?

Generally the assumptions behind the stress test look reasonable, not withstanding the answer to the previous question. An assumption which may be worth considering would be flexing the LNG stress test so that interconnectors to Europe change their flow profiles rather than remain constant before and after the stress test. Ofgem may also like to consider extending the duration of an outage at Bacton.

Question 4: Do you have any views on the probabilities of these stress tests occurring?

Ascribing specific probabilities, other than very high level categories i.e. greater than 50%, to any stress test or for that matter any scenario would be problematic and spurious because of the high degree of uncertainty associated with many of the various factors involved and consequently in our view should be avoided.

Question 5: Do you agree with how we have modelled demand curtailment in response to constrained supply?

The adopted approach, of assigning a value of lost load to different demand categories seems reasonable to us for the purposes of this modelling exercise. The values quoted in Figure A1 of appendix 2 seem reasonable, but it is important to recognise the uncertainty around these if assigning a value of actions based on these parameters.

It is also important to avoid double counting in this area - how much demand sensitivity to price is already factored into peak demand forecasts for example?

The practical requirements and consequences of demand curtailment will need to be considered at an appropriate point in this exercise. Currently National Grid has a combined total of ~ 500MW of pure demand side contracts, which when combined with observed demand response within the wholesale markets yields a 'voluntary' demand curtailment volume of less than the 3.8% used in this analysis. We believe however that investment in demand side services will, over time, increase the volume of voluntary demand curtailment options through Balancing Services and the wider wholesale market and it may be worth using time varying parameters in this area.

We also note Footnote 43 indicates that over time, with the depletion of fields within the Southern North Sea, the impact of the Bacton Outage test will diminish. National Grid considers that whilst the indigenous gas fields within this area will diminish, the recent implementation on 1st November 2009 of the DECC Offshore Gas Storage and Unloading Licensing regime now affords the market with an opportunity to convert depleted fields into offshore gas storage facilities. Therefore, it should not be assumed that depletion of gas fields will necessarily lead to a reduction in the volume of flows. National Grid is aware of several potential offshore storage developments where gas might be landed at Bacton. One such offshore gas storage development has the potential to be larger than the Rough offshore facility with deliverability in the order of 50+ mcm/day.

National Grid believes that it may be prudent for Project Discovery to consider the effects of the new DECC Offshore Gas Storage and Unloading regime and, those potential offshore developments which might become operational within the next 10 years.

Question 6: Do you have any other comments on our stress tests?

The interaction between overall power generation and therefore gas demand for CCGTs and the intermittency of wind needs to be brought together more explicitly.