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Electricity Capacity Assessment 2014: decision on methodology

Final decision

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Overview:

We are required to provide the Secretary of State with an annual Electricity Capacity Assessment report. The first report was submitted in August 2012 and the next report is due by 1 September 2014.

This document summarises our final decision on the methodology for the 2014 Electricity Capacity Assessment report.

This decision follows our consultation in late November 2013 on the validity of the general approach for assessing risks to electricity security of supply for the 2014 report. We also sought feedback from stakeholders on how the report represents uncertainty in the Capacity Assessment.

Context

Ofgem's[1] principal objective is to protect the interests of existing and future energy consumers. This includes their interests in the reduction of greenhouse gases and in the security of the supply of electricity and gas.

We first highlighted concerns over security of supply in the 2010 Project Discovery. Following this, we were given a new requirement[2] to provide the Secretary of State with a report assessing different electricity capacity margins and the risk to security of supply associated with each alternative. This Electricity Capacity Assessment report has to be delivered to the Secretary of State by 1 September each year. It is intended to inform government and Ofgem decisions on electricity security of supply.

Producing these reports required development of a model to assess the risks to electricity security of supply. This model was developed in 2012 and amended in 2013. We propose to update this model to fulfil the Authority's obligation for annual reporting for 2014.

The Electricity Act 1989 allows us to delegate the modelling to a transmission licence holder. We delegated construction of the model to National Grid Electricity Transmission plc (National Grid).

Associated documents

- Electricity Capacity Assessment 2014: Consultation on methodology: https://www.ofgem.gov.uk/publications-and-updates/electricity-capacity-assessment-2014-consultation-methodology

- Previous Electricity Capacity Assessment reports, consultation and decision documents: https://www.ofgem.gov.uk/electricity/wholesale-market/electricity-security-supply

- Department of Energy and Climate Change, Statutory Security of Supply Report 2013: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/254134/HC_675.pdf

[1] In this document the Gas and Electricity Markets Authority is referred to as "the Authority" or as "Ofgem".
[2] Section 47ZA of the Electricity Act 1989, as amended by the Energy Act 2011.

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Executive Summary

In November 2013 we published a consultation to seek views on the general approach for assessing the risks to electricity security of supply for the 2014 Electricity Capacity Assessment report.

The consultation closed on 9 January 2014. We received eleven responses, four from industry participants and seven from academic institutions and others.

In our consultation we proposed maintaining the general approach used for the 2013 report for this year's report. Our view has been broadly supported by the consultation responses. This means we will continue to use the model designed by Ofgem and National Grid and used for the 2013 report. However, all input assumptions will be updated to reflect current market developments.

We also sought views from stakeholders on how the report represents the uncertainty in the Capacity Assessment. All respondents agreed with our approach to using sensitivities to represent the main uncertainties, and will retain this for the 2014 report. In addition, we are minded to make use of all four of the National Grid Future Energy Scenarios in the 2014 report.

Respondents also included some additional comments and recommendations that were not particularly related to the specific questions asked in the consultation. This included clarification of the definition of the Loss of Load Expectation (LOLE) and a number of technical questions for specific assumptions or approaches.

Overall, respondents broadly agreed that the methodology remains sound and fit for purpose for the period of analysis.

1. Introduction

1.1. The Electricity Act 1989[3] requires us to provide the Secretary of State with an Electricity Capacity Assessment report by 1 September every year. The last report was published in June 2013 and set out our assessment of the risks to security of supply over the next six winters.

1.2. The analysis in the 2012 and 2013 reports was based on the results of a probabilistic model combined with sensitivity analysis. This accounted for the uncertainty in the expected levels of supply and demand and interconnector flows. Full details of the current methodology can be found in the 2013 report.

1.3. Our Electricity Capacity Assessment report aims to set out the risks to electricity security of supply in Great Britain (GB). It is not designed to calculate how much capacity to procure to reach a particular standard of reliability. Its aim is to inform government and Ofgem decisions on electricity security of supply.

1.4. We consider that the methodology used in the 2013 report remains fit for purpose and valid for the period of analysis of the 2014 report (five winters from 2014/15 to 2018/19). This is separate to the assumptions applied to the methodology, which are re-examined each year to ensure they represent the most recent information.

1.5. We are therefore not proposing any methodological changes for the 2014 report.

1.6. The consultation closed on 9 January 2014. We received eleven responses, four from industry participants and seven from academic institutions and others. This document sets out respondents' views and highlights how these have been taken into consideration for the 2014 report. These decisions take into account the responses to the consultation.

1.7. We would like to take this opportunity to thank those who responded to the consultation.

1.8. Chapter 2 of this document briefly describes our decisions on the general methodology; Chapter 3 examines how we represent uncertainty; while Chapter 4 discusses additional issues identified in responses. All responses are published at the following address:

https://www.ofgem.gov.uk/publications-and-updates/electricity-capacity-assessment-2014-consultation-methodology

[3] Section 47ZA as inserted by the Energy Act 2011 can be found in Appendix 2 of the consultation document for the Electricity Capacity Assessment 2013.

2. General methodology

Chapter summary

This chapter provides a summary of the responses we received to the questions contained in the question box below and sets out our responses to these views.

In our consultation, we explained why we think the general approach used in 2013 remains appropriate for assessing capacity in the GB market for the period of analysis in the 2014 report (five winters from 2014/15 to 2018/19).

Nine out of eleven respondents agreed that the overall methodology remains sound and fit for purpose, though several raised possible alternative methodologies for future use. Reflecting these views, we will be using the same general methodology in the 2014 report. A detailed technical description of the model can be found in the 2013 report[4].

Questions

Question 1: Do you agree that the general methodology used for the 2013 report is still valid to analyse GB's generation adequacy in the next five winters from 2014/15 to 2018/19? If not, please explain why and make some specific suggestions for the methodology and their comparative advantages.

Question 2: Do you agree with using a qualitative approach to assess the impact of interconnector flows on LOLE and EEU in our Reference Scenario and sensitivities? If you disagree, please provide justification and suggestions for alternative approaches.

Question 3: Do you agree with our proposed approach to capture the uncertainties of a potential relationship between wind availability and high-demand on the level of risk? Please justify and provide suggestions for alternative options and their comparative advantages.

2.1. In this section of the consultation we sought to ask stakeholders whether they agreed that the general methodology used last year is still fit for purpose and valid for the period of analysis of the 2014 Electricity Capacity Assessment report.

2.2. Our view has been broadly supported by the consultation responses. This means we will continue to use the model designed by Ofgem and National Grid and used for the 2013 report. All input assumptions however will be updated to reflect current market developments.

[4] https://www.ofgem.gov.uk/ofgem-publications/75232/electricity-capacity-assessment-report-2013.pdf

2.3. We agree with two of the respondents that the general methodology may become less valid over time. This will happen as the penetration of intermittent generation increases, and as demand side initiatives grow. Alternatives, such as a chronological[5] model, were suggested for future consideration. We will continue to examine the approach over the coming years to ensure it remains fit for purpose.

2.4. The majority of respondents agreed with a qualitative approach to assess the impact of interconnector flows on Loss of Load Expectation (LOLE) and Expected Energy Unserved (EEU). Two respondents suggested possible quantitative methods, but did not provide suggestions on how to overcome some of the difficulties this approach would face, such as the lack of key data. We are therefore, at this stage, minded to maintain a qualitative approach to interconnectors in the 2014 report. This remains separate to the actual interconnector assumption that will be used which, as noted previously, will be re-examined to include current market information.

2.5. Respondents broadly agreed with our approach to capture the uncertainty in the potential relationship between wind availability and high demand, although several highlighted that the approach could be improved as more data becomes available over time. We will continue to refine our approach as more data and academic research becomes available (see Chapter 4).

[5] A chronological model can be defined as one that takes into account the ordering of the half-hourly time periods of the analysis period under study.

3. Representing uncertainty

Chapter summary

This chapter provides a summary of the responses we received to the questions contained in the question box below and sets out our responses to these views.

The analysis presented in the 2013 report gave a Reference Scenario as well as a range of sensitivities around interconnector flows, generation capacity, and demand. These sensitivities are used to represent the uncertainty of the future outlook and should be analysed alongside the Reference Scenario.

We sought views on how the uncertainty of the future outlook can be represented. Respondents broadly agreed with our approach, and suggested some additional scenarios and sensitivities.

Question box

Question 4: Do you agree with the use of sensitivities to represent the main uncertainties facing the electricity security of supply outlook at the moment? If not, please provide specific reasons and alternatives.

Question 5: Do you agree that our proposed sensitivities around interconnector flows, generation capacity, and peak demand capture the uncertainties that have the most significant impact on the level of risk? If not, what other sensitivities should we consider and why?

Question 6: Do you agree that the Reference Scenario and associated sensitivities provide a sufficient range of possibilities for the electricity security of supply outlook? Please provide suggestions for alternative options and their comparative advantages.

Question 7: Do you agree that the different demand projections presented in the report provide a sufficient range of possible demand outcomes? If not, please suggest alternatives and their comparative advantages.

Question 8: What sensitivities do you think would be most appropriate to include in our main summary graphs (e.g. Executive Summary), and why?

3.1. As noted in the consultation document, the uncertainties around the outlook for security of supply, even over the short term, are significant. In this section of the consultation we sought views from stakeholders as to how this uncertainty could best be represented.

3.2. The 2013 Reference Scenario was based on the 'Gone Green 2013' scenario (part of National Grid's Future Energy Scenarios). Alongside this, the report also presented specific sensitivity analyses to investigate the impact of uncertainty in key input assumptions on the risk to security of supply. By moving only one variable at a

time, the use of sensitivities isolates the impact of each variable on the risk measures.

3.3. All respondents agreed with our approach to using sensitivities to represent the main uncertainties, although two also suggested the use of additional scenarios alongside our current Reference Scenario. They were not clear however, on what variables these scenarios should contain. Scenarios represent an aggregate view of a number of variables, including assumptions on political, economic, social and technological trends and developments. The 2013 report made use of the National Grid Future Energy Scenarios (FES). National Grid has now expanded the number of scenarios they will make available to four[6]. We are minded to make use of all four of the National Grid Future Energy Scenarios in the 2014 report

3.4. Respondents broadly agreed with our suggested sensitivities around key variables, namely interconnector flows, generation capacity, and peak demand. Some views differed on how some of these sensitivities should be treated however; a respondent suggested an additional sensitivity of a higher peak demand, one suggested that interconnectors should always be considered to be importing, while another suggested that a sensitivity for interconnectors was not necessarily required.

3.5. We are therefore minded to use similar sensitivities to the 2013 report. How each sensitivity is treated, or if additional sensitivities would be useful, will be assessed and updated to include current market information.

3.6. Future demand levels are subject to significant uncertainty, even over the short and medium term. In light of this uncertainty and to highlight the risk, we are considering an additional sensitivity. This will project demand at its current levels if a higher demand level is not covered by National Grid's 2014 FES. Respondents who commented agreed that such a sensitivity would be useful if higher demand was not considered by the FES. One respondent also suggested that we provide a more detailed description of the impact of potential demand side response and efficiency. We will continue to liase with National Grid to ensure we have data that is as up to date as is feasible.

[6] http://www.nationalgridconnecting.com/uk-future-energy-scenarios-stakeholder-feedback-document-published/

4. Additional issues identified in responses

Chapter summary

Respondents have included additional comments and recommendations that are not particularly related to the specific questions asked in the consultation. We appreciate all comments and will examine all suggestions to try and improve our analysis. We comment on some of the additional issues in this chapter.

Definition of LOLE

4.1. Respondents highlighted that confusion persists over the definition of LOLE. The definition used in the Capacity Assessment report is consistent with the Electricity Capacity Regulations published by the Government[7] and will therefore continue to be used. We will try to explain further the concept of LOLE to avoid any confusion in the future.

4.2. Several respondents highlighted the difficulty the report faces in communicating technical subject matter to both specialist and non-technical audiences. One suggestion to assist in this was to contextualise the security of supply measures of LOLE or margins for consumers in a meaningful way. This is a very challenging topic, but we will continue to engage with stakeholders on how this may be best achieved.

Largest In-feed Loss should not be considered in our assessment

4.3. The inclusion of an allowance for the largest infeed loss is important, as it reflects the way National Grid, as the System Operator (SO), operates the network. The SO reserves this capacity to ensure the integrity of the network and therefore cannot be available to meet demand[8]. As this requirement can be met through a number of sources, we incorporate it by adding it to the demand side, ensuring it is allowed for in the risk calculation. We do not propose a change to this approach in the 2014 report.

Reconsider our approach to the wind-demand relationship

4.4. There is not enough data to quantify the wind-demand relationship at times of high demand, where it is more relevant from a capacity adequacy perspective. In our Electricity Capacity Assessment 2013 report, we carried out sensitivity analysis about

[7] Electricity Capacity Regulations 2014, available in (page 9): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249564/electricity_capacity_regulations_2014_si.pdf

[8] National Grid would curtail demand before using this reserve.

the wind-demand relationship; in our Reference Scenario we made the assumption that there is no relationship between these variables at times of high demand. We also developed a wind generation availability sensitivity, in which wind availability is halved at times of very high demand. These provide credible upper and lower bounds on the supply-demand balance.

4.5. For the wind generation availability sensitivity, we looked at wind load factors and daily peak demand at the time of high demand for electricity. There is limited data about times of very high demand (because they are very rare) and as a result this trend cannot be found to be statistically significant. The small amount of data that exists is taken from a limited time period, mainly in the three winters from 2008-11.

4.6. It was also suggested that we use the relationship between temperature (as a substitute for demand) and wind to quantify the wind-demand relationship at times of high demand. The experience of National Grid, and some early academic research, suggests that an appropriate temperature variable (combined with sunset time and day of week) predicts daily demand peak given underlying demand patterns with reasonable accuracy. However, we consider that using this approach in the capacity assessment requires further research to verify the quality of the results.

4.7. We agree that the wind-demand relationship is an area of significant uncertainty. We will continue to work with National Grid in this area as more data and academic research become available for future reports.

Clarify how a qualitative approach to assess the role of interconnection would influence the level of capacity procured in capacity mechanism auctions.

4.8. Our Electricity Capacity Assessment report aims to set out the risks to electricity security of supply in GB. It is not designed to calculate how much capacity to procure to reach a particular standard of reliability. Its aim is to inform government and Ofgem decisions on electricity security of supply. DECC and National Grid have developed their own modelling to estimate the volume for procurement in the Capacity Market[9].

Further explanation about the sensitivities used in our analysis

4.9. It was suggested that stakeholders would benefit from more explanation around the sensitivities presented in our assessment; in particular the drivers that could make them possible and the type of future they represent. We will continue working on the presentation of the results and assumptions of the Capacity Assessment report. We will continue working with National Grid to improve the

[9] For more information please see the Electricity Market Reform (EMR) Final Delivery Plan, available here: https://www.gov.uk/government/publications/electricity-market-reform-delivery-plan.

explanation for the scenarios and sensitivities considered in our assessment. We will endeavour to use a narrative to explain why a sensitivity might occur and the type of future it represents.

Impact of weather on Combined Cycle Gas Turbine (CCGT) output

4.10. The output from CCGT plants increases as temperature falls and their operation becomes more efficient. This is still the case in extremely cold conditions[10]. Any unavailability of power plant, including in extremely cold conditions, is reflected in our generation availabilities methodology. We do not propose a change to the approach for estimating generation availabilities in the 2014 report. However, we will use the latest market data available.

[10] However, the station output could be affected by factors not related to generation adequacy (like restricted station access for staff due to road closures).

Appendix 1 - Glossary

A

ACS

Average Cold Spell. Defined as a particular combination of weather elements which give rise to a level of peak demand within a financial year (1 April to 31 March) which has a 50% chance of being exceeded as a result of weather variation alone.

C

Capacity margin

The excess of installed generation over demand. It is sometimes referred to as 'reserve margin'.

Capacity market (capacity mechanism)

Policy instrument designed to help ensure security of supply by providing a more secure capacity margin than that which would be determined by the market without intervention.

Consumer

Users of network services (for example generators, shippers) as well as domestic and business end consumers, and their representatives.

D

DECC

Department of Energy and Climate Change.

Demand Side Response (DSR)

Actions by customers to change the amount of electricity they take off the grid at particular times in response to a signal. These signals could include prices, incentives, information or contracts.

De-rated capacity margin

The average excess of available generation capacity over peak demand, expressed as a percentage. Available generation capacity is the part of the installed capacity that can, in principle, be accessible in reasonable operational timelines, i.e. it is not decommissioned or offline due to maintenance or forced outage.

E

EMR

Electricity Market Reform.

Energy efficiency

A change in the use of energy to reduce waste and lower energy use. For example, insulation in buildings, reducing demand from heat, or increasing the efficiency of appliances so they use less energy.

Expected energy unserved (EEU)

A probabilistic measure defined as the mean amount of electricity demand that is not met in a year. This combines both the likelihood and the potential size of any supply shortfall.

I

Interconnector

Electricity interconnectors are electric lines or other electrical plants based in the jurisdiction of Great Britain, which convey electricity (whether in both directions or in only one) between Great Britain and another country or territory.

Intermittent generation

Electricity generation technology that produces electricity at irregular and, to an extent, unpredictable intervals, eg wind turbines.

L

Loss of Load Expectation (LOLE)

A probabilistic measure defined as the mean number of hours per year in which supply does not meet demand in the absence of intervention from the System Operator. In other words, it reflects the probability that the System Operator should intervene due to insufficiency of available generation to meet demand. A number of different interventions are generally available, but only the last of these involves disconnection of demand.

M

Mothballed

Often used for long-term storage of Generating Units. Such plant is sometimes also referred to as 'decommissioned'.

N

National Electricity Transmission System (NETS) System Operator (SO)

The entity responsible for operating the GB electricity transmission system and for entering into contracts with those who want to connect to and/or use the electricity transmission system. National Grid is the GB electricity transmission system operator.

National Grid Electricity Transmission plc (NGET)

Transmission System Operator for Great Britain. As part of this role it is responsible for procuring balancing services to balance demand and supply and to ensure the security and quality of electricity supply across the Great Britain Transmission System.

P

Peak demand, peak load

These two terms are used interchangeably to denote the maximum power requirement of a system at a given time, or the amount of power required to supply customers at times when need is greatest. They can refer either to the load at a given moment (eg a specific time of day) or to averaged load over a given period of time (eg a specific day or hour of the day).

Pumped storage

Process, also known as hydroelectric storage, for converting large quantities of electrical energy to potential energy by pumping water to a higher elevation, where it can be stored indefinitely and then released to pass through hydraulic turbines and generate electrical energy.

S

Sensitivity

This is a test where a single factor is changed (eg interconnector flows) keeping all other factors fixed to their Reference Scenario value to see the effect the single factor produces on the model output (eg LOLE).

T

Transmission System

The system of high voltage electric lines providing for the bulk transfer of electricity across GB.

The Authority/Ofgem

Ofgem is the Office of Gas and Electricity Markets, which supports the Gas and Electricity Markets Authority ("the Authority"), the regulator of the gas and electricity industries in Great Britain.

Appendix 2 - Feedback questionnaire

1.1. We believe that consultation is at the heart of good policy development, and we are constantly striving to improve our approach wherever possible. We would therefore be grateful if you could take a few minutes to answer the following questions:

1. Do you have any comments about the overall process, which was adopted for this consultation?
2. Do you have any comments about the overall tone and content of the report?
3. Was the report easy to read and understand, could it have been better written?
4. To what extent did the report's conclusions provide a balanced view?
5. To what extent did the report make reasoned recommendations for improvement?
6. Do you have any further comments?

1.2. Please send your comments to:

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