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ELECTRICITY CAPACITY REPORT: PROCESS, RESPONSIBILITIES AND MODELLING METHODOLOGY

Introduction

This note sets out the process that will be followed in setting out the amount of capacity to contract. It considers the roles of National Grid, DECC, and the Panel of Technical Experts. The note also contains more detail on the methodology to be employed by National Grid in determining the amount of capacity to contract.

Key Principles

Ministers will take the final annual decision on the amount of capacity to contract in order to meet the Reliability Standard. This will be based on a recommendation from National Grid based on its assessment of electricity supply and demand over the period.

There were several reasons for giving this role to National Grid as part of their role as EMR delivery partner:

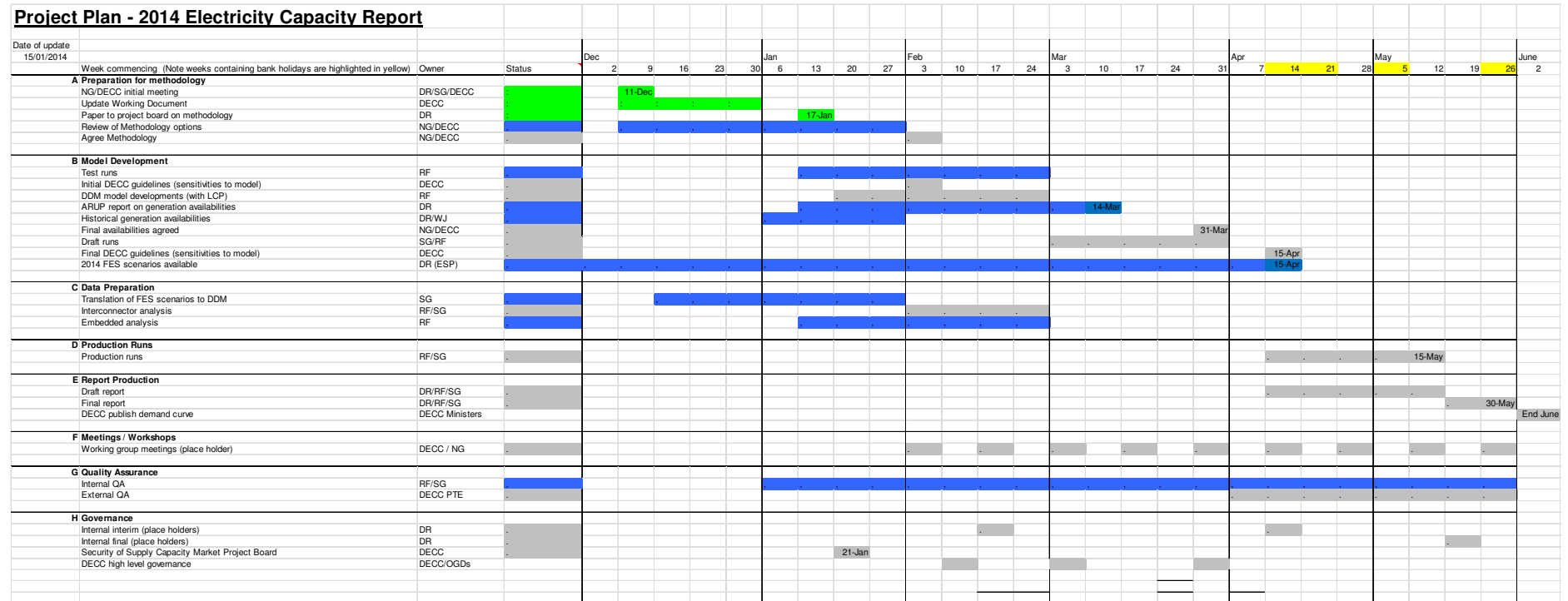
- National Grid have considerable expertise in this area given their analysis for Ofgem's Capacity Assessment.
- To try to remove as far as possible political risk from the analysis of the amount of capacity to contract.
- To increase the level of transparency to stakeholders by making use of the work that National Grid does with industry in developing its Future Energy Scenarios work.

This decision has been reinforced by the recent consultation exercise where all parties emphasised that this analysis should be open and transparent and that Government discretion in setting the amount of capacity to contract should be minimal. The consultation also suggested that industry would like to have a full understanding of the inputs to the Capacity Report and to be consulted on it each year. This ought to be possible with the proposed approach through National Grid's Future Energy Scenarios work. The case for adopting this approach is also further strengthened by the fact that National Grid need to carry out a similar exercise of determining how much capacity to contract as part of the mid-decade demand side balancing reserve (DSBR) and supplemental balancing reserve (SBR) that may be required.

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Project Plan for Analysis

[Please note: actual dates are indicative]



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Project Plan Narrative

Work Package A: National Grid and DECC to work on the methodology for the amount of capacity to contract. Later, this document sets out at a high level how we expect this to work although there will need to be additional work to bottom this out. The intention is that the high level methodology is agreed by Feb 7th.

Work Packages B, C, D and E: National Grid carry out the analysis using the Dynamic Despatch Model. This analysis will need to include any scenarios that DECC explicitly ask it to model although these scenarios need not feed into National Grid's recommendation on the amount of capacity to contract. The scenarios and sensitivities to be included will be agreed no later than 22 April. ARUP will deliver the PTE recommended power plant availability work in the middle of March to compare against the historical GB based analysis. National Grid will then need to determine the appropriate de-rating factors to use by 31 March.

Work Package E: National Grid to provide a report to DECC with a recommendation on the amount of capacity to contract. DECC Ministers will use that advice to set out a demand curve for the Capacity Market auction by the end of June 2014.

Work Package F: Working Level Meetings between DECC and National Grid so that DECC understands the advice that it will receive.

Work Package G: Quality Assurance takes place within DECC and from the Panel of Technical Experts. It is important that as part of Work Package A, DECC are satisfied with the QA plan for Grid's analysis.

Work Package H: Governance meetings including National Grid meetings as well as DECC meetings which give more senior Government officials sight of the analysis as it develops.

High Level Roles and Responsibilities

National Grid

- Responsible for developing a methodology to undertake the analysis and agree it with DECC in work package A.
- Responsible for carrying out the analysis as part of work packages B, C and D.
- Responsible for providing a recommendation on the amount of capacity to contract based on a range of scenarios which it will set out in a report as part of work package E.
- Responsible for demonstrating that the models and analysis that are used in the assessment have been appropriately quality assured.

DECC

- Provides the Dynamic Despatch Model which will be used by National Grid in carrying out its analysis of the amount of capacity to contract as part of Work package C.
- Is responsible for providing certain inputs to National Grid to allow it to run the Dynamic Despatch Model including around the levelised costs of different technologies. These will be the same as those used in the EMR final delivery plan and so this has already been carried out.
- Involved in working level meetings to discuss progress.
- This group would among other things manage the Risk that the analysis from National Grid is inconsistent with the analysis from DECC's EMR Delivery Plan.

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Ministers

- Provide final sign off on the amount of capacity to contract based on the recommendation from National Grid.

Panel of Technical Experts

- Responsible for scrutinising the assumptions, models and methodology that feeds into National Grid's analysis.

Industry

- As part of the Future Energy Scenarios process the industry has been extensively consulted via workshops and individual meetings. A summary of the feedback from this consultation will be published in early February. The resulting axioms and scenarios are currently being developed and will be published on 10th July at the FES summer conference but will be available to use from 15 April for the ECR, Capacity Assessment report for Ofgem and the Mid-Decade SBR work.
- Will see the National Grid publication on the amount of capacity to contract as well as any reports from the PTE scrutinising the analysis.

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Work Package A: Modelling Methodology

In order to understand the roles and responsibilities and to agree to the project plan it is important to have an understanding of how we expect the modelling to work and some of the issues that we expect to arise. At a high level, the proposal is that National Grid use DECC's Dynamic Dispatch Model to calculate the capacity requirement for a range of scenarios and sensitivities. Most of the important assumptions which drive the amount of capacity to contract will be based on National Grid's Future Energy Scenarios (FES). These assumptions will be supplemented by a range of credible sensitivities. In addition, in order to be able to run the Dynamic Dispatch Model, it will be necessary for DECC to provide a number of input assumptions e.g. levelised generation costs.

It is important to note that this methodology is subject to change as it is put into practice. This is a substantially new approach and will require further work to evaluate and develop the methodology.

Demand and Generation

To provide the recommendation, the following approach is being recommended:

- A set of alternative scenarios and sensitivities will be modelled to give a range of capacity figures to procure thus addressing the impact of uncertainty in security of supply.
- One approach would be to select a Reference Case (similar approach to that used for the Delivery Plan) and base the recommendation on the capacity requirement from that run.
- However, our proposed approach is to utilise the set of credible alternative scenarios and sensitivities and aim to cover the capacity required from a reasonable proportion of them (yet to be determined).

Taken together these scenarios and sensitivities would allow National Grid to provide a robust recommendation on the amount of capacity to procure in the electricity capacity report required by Reg 7. Further sensitivities will be modelled to include:

- Demand.
- Generation availability de-rating factors.
- Interconnector flows.
- Embedded generation.

Key drivers of how much capacity to procure in an auction.

The key drivers of how much capacity to procure in a Capacity Auction are:

- Peak Electricity Demand
- Contribution of plant not participating in the Capacity Market (low carbon plant)
- Contribution of our interconnectors to capacity adequacy
- Amount of capacity that we expect from embedded generation
- Amount of capacity from DSR
- Expected Plant Availabilities

Peak Electricity Demand

The Future Energy Scenarios contain National Grid's views of how the electricity system is expected to develop in the future. Stakeholder engagement is at the centre of the process for developing the different scenarios and National Grid consults widely on them. For 2014 there will be four scenarios, each representing a different set of assumptions or axioms. These scenarios will form the basis of the demand forecast.

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Electricity demand is driven by a range of factors including economic factors, technology changes (heat pumps, electric vehicles, LED light bulbs) and energy efficiency. The Future Energy Scenarios take a view on the development of these drivers.

Contribution of plant not participating in the Capacity Market

The estimated capacity contribution of low carbon plant will be based on the amount of this capacity that is expected to come forward in National Grid's Future Energy Scenarios together. The availability of these plants will be based on de-rating factors described below.

Interconnectors

National Grid will provide an assessment of how much capacity it thinks that interconnectors are likely to provide at times of stress. This will be based on a qualitative assessment of interconnection flows, and is likely to be similar to the analysis provided to Ofgem as part of Ofgem's Capacity Assessment. It will be updated to include any further analysis from Ofgem, DECC and ENTSOe. The uncertainty around interconnection will be modelled with different sensitivities.

Embedded generation

The FES scenarios include embedded generation. Some embedded generation is eligible for the CM and all embedded generation affects demand on the transmission system. Embedded generation will be split into that which is eligible for the CM and that which is not. The numbers from the relevant FES scenario will be used for non-CM embedded generation. Where site closures and new projects under construction are known these will also be taken from the FES scenarios. Closures for economic reasons and new build to meet the LOLE targets will be left to DDM to model. The uncertainty around embedded generation will be modelled with different sensitivities.

DSR Capacity

National Grid will assess the amount of DSR that currently exists through TRIAD avoidance and through STOR. In addition, the FES analysis will make estimate of the technical potential that could come forward over the period. In addition a plan must be developed in order that DECC has the necessary advice to assess the costs of potential DSR in order that Ministers can take a decision on the amount of cost effective DSR that can be held back. However, this is outside the scope of this methodology and will be developed as soon as possible.

Expected Plant Availabilities

National Grid will provide de-rating factors based on their expertise and historic data. National Grid has just awarded a contract to ARUP to review the current de-rating assumptions, as recommended by the PTE. Any additional learning from this project will be incorporated in the de-rating factors used to assess the amount of capacity to procure.

Other data required in order to run the DDM model

The rest of the information required by DDM will initially be obtained from the EMR CfD strike price modelling scenario 1. This will include

- i) Levelised cost data
- ii) Strike prices
- iii) Build rates
- iv) Fuel prices
- v) Demand profiles

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Modelling

The DDM will be used to make an assessment of the amount of capacity to contract in the auction in order to meet the Reliability Standard.

The non-CM elements of generation will be kept the same as the FES scenarios by hard coding the build of these technologies into the DDM and setting build rates to zero for non-CM generation (Renewables, nuclear).

Although the DDM model does produce an estimate of the costs of a capacity auction, they will be an unused element here. This analysis is purely focused on the amount of capacity that is required to meet the reliability standard. The auction itself will determine the cost of that capacity. Although the DDM will assess the likely plant mix, through an assessment of the likely new build or retirements of existing plant, this will not be used here.

The DDM will decide the closure dates and new build for generation that influences CM payments (CCGT, OCGT and coal) in order to meet the LOLE target of 3 hours per year.

The auction price cap will be set at a high level to ensure that it does not prevent DDM from reaching the reliability standard. Tolerances may also be adjusted if necessary to prevent them influencing the capacity.

Reporting

National Grid will provide a statement recommending an amount of capacity to procure. An example of the sort of high level recommendation that Grid will provide is below:

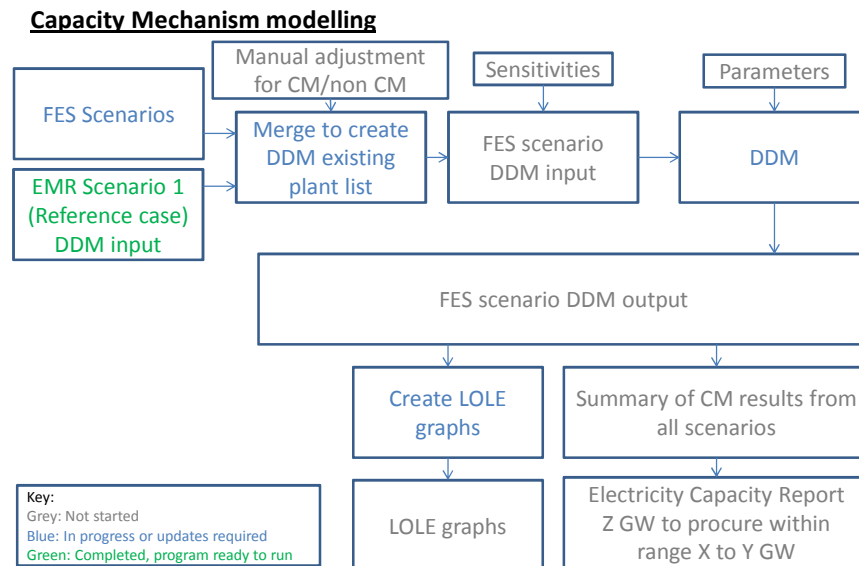
National Grid recommends procuring ZGW of capacity. This is based on an analysis of different scenarios which suggest that the amount of required capacity to meet the Reliability Standard is in the range between XGW and YGW. This range is based on National Grid's Future Energy Scenarios and agreed sensitivities. This range takes into account, among other things, uncertainty in the level of demand in 2018/19. This analysis includes assumptions from DECC on strike prices etc.

This recommendation will be for 2018/19 although the analysis will cover 15 year horizon and will be based on the outputs from the DDM. The report will include:

- 1) A justification for the recommended capacity.
- 2) Nameplate capacity for each year, scenario and sensitivity.
- 3) De-rated capacity for each year, scenario and sensitivity.
- 4) Shortfall in capacity for each scenario and sensitivity in 2018/19 if recommended capacity is procured.
- 5) Variation in capacity from FES scenario.
- 6) Modelled LOLE (The target is 3 but the lumpy nature of the demand curve means the result may be slightly different).
- 7) De-rating assumptions by technology.
- 8) A brief description of each scenario/sensitivity.
- 9) A brief description of the modelling process.
- 10) LOLE v Capacity graphs

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High level diagram of modelling process



Issues

- 1) The strike prices were generated from a model using DECC UEP demand forecasts. They may not be enough to produce the same level of low carbon generation in the FES scenarios.
- 2) Some DDM inputs such as fuel prices are also inputs to FES and may be different to the values used in FES.
- 3) The generation categories in DDM do not exactly match those in FES. For example there are many more bioenergy categories in DDM than FES.
- 4) DDM needs to be updated to correct known issues with the start date of new generation that affects the LOLE output.
- 5) Nameplate capacity will depend on the market mix. De-rated capacity should remove this variability.