National Grid Energy Forecasting Team

Action Plan to Improve Forecast Accuracy

February 2017

**Introduction**

In line with our commitment to transparency, we are sharing a summary of our action plan to improve our forecast accuracy. While we will be specific where we can, in some areas we are still negotiating contracts and so can only share plans at very high level.

Please provide any feedback on these plans to Jeremy.caplin@nationalgrid.com

**Source of Error**

Our analysis, together with customer feedback, indicates that PV should be our main focus. Our daytime demand forecast errors have grown over the last few years in line with the growth in embedded PV generation. (We forecast National Demand as defined by the Grid Code, which is loosely the demand needed to be met by generation connected to National Electricity Transmission System. This means that embedded generation appears as negative demand and so reduces the demand from the NETS. Hence in order to forecast National Demand correctly we have to forecast embedded generation and subtract this from our demand forecasts). Embedded wind generation is also a significant source of demand forecast error, with our errors increasing on windy days.

**Projects in Flight**

We have a number of projects funded under the Network Innovation Allowance (NIA):

* In August 2015 a collaborative project was started with Sheffield University under Ofgem’s Network Innovation Allowance scheme. The aims of this project were to deliver a method of extrapolating the output from a relatively small number of PV sites in order to estimate an hourly total PV generation, first at a national level and then at an individual Grid Supply Point level. This project delivered estimated national totals in 2016, which allowed National Grid to further improve the power curves used to forecast PV generation, based on estimated national outturn. The estimated national PV output is now published by Sheffield University, and they have API interfaces installed to allow the data to be freely downloaded.
* A second NIA project was initiated in April 2016 in collaboration with the Met Office in order to improve the solar radiation forecasts received by National Grid. The first phase of this project has already delivered changes to the models used for the National Grid specific forecasts, which has significantly improved the accuracy of the solar radiation forecasts. The second deliverable, of statistical post processing of the forecasts in order to further improve accuracy, is currently being tested by National Grid prior to implementation. A third phase due to deliver in summer 2017 will provide hourly updates to the short term solar radiation forecasts based on latest weather observations. A longer term piece of work is being conducted in parallel as part of this project aimed at improving the representation of cloud and solar radiation in the Met Office’s fundamental weather forecasting models.
* A NIA project with Reading University was recently started aimed at providing ways of assessing the probability of different weather scenarios and how they will impact on combined PV and wind generation. This will allow assessment of risk of high or low generation events, and aid with determining the maximum amount of generation that can be connected in a region without risking overloading the network, as well as helping security of supply assessments. Another output from this project will be improved power curves for conversion of solar radiation into MW.

Our key focus over the last two years has been to obtain data that will allow us to improve our models. These projects are complete, or nearing completion, meaning that we can now move on to using the data to improve our models:

* We have obtained a near live data feed from over 1000 domestic PV installations, together with Day + 1 output for over 20,000 installations. This is the first large scale PV dataset that we have been able to obtain
* We have obtained a significant amount of aggregated historic data from embedded generation, broken down by fuel type.
* We are setting up a project to analyse the PV data to determine the range of PV models that we require, as well as to develop these models
* We are setting up a project to use the historic embedded wind generation data to optimise our embedded wind models, particularly in the area of high wind speed shutdown.
* We are setting up a project to use the historic embedded generation data to develop models for different non weather variable embedded generation technologies. These would be subtracted from our national total in the same way as embedded wind and PV.
* We are developing internally a now-cast system that will take hourly updated solar radiation forecasts and combine them with the live PV output data in order to provide a short term forecasts of PV, primarily for use by our control engineers in short term (1-4 hours) balancing of the system.

Another key area of concern is estimating capacity of embedded generation, particularly PV. Domestic PV presents difficulties in that the primary source of information as to the capacity and location of PV installations is the FIT register published by Ofgem. It can take some months for people to register new installations, so the register tends to lag behind, requiring us to estimate the rate of growth of PV. Going forward, if there were no FIT or equivalent, then there would be no central register of installed PV capacity. We are looking at a number of projects aimed at improving our knowledge of installed PV capacity, both now and in the future.

We are also looking at how we will model the impact of energy storage on demand, and the potential impact of the capacity mechanism.

We will continue in our usual forecast optimisation activities – regularly reviewing demand, wind and PV models and updating as necessary, as well as developing a number of improvements to our IS systems, particularly in the area of further developing our modelling demand down to Grid Supply Point level for optimal constraint management.

Our top priorities at the moment are the hourly solar radiation forecasts, linking to the PV now-cast, and the projects to improve our understanding of installed PV capacity.