Energy Forecasting Strategic Project Roadmap

June 2019

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Introduction

ESO's energy forecasting is under strategic transformation phase aiming to create new forecasting capabilities to support our system operations and market participants to make informed decisions by providing user friendly, comprehensive and accurate information

To deliver this transformation, ESO has initiated energy forecasting strategic project to replace its existing forecasting capabilities and energy forecasting system (EFS) with a new advanced platform for energy forecasting (PEF) to redesign current processes and apply advanced machine and deep learning modelling techniques & automation to drive efficiency

This pack contains the information regarding energy forecasting strategic project roadmap and high-level information regarding energy forecasting in ESO

Energy Forecasting Strategic Project

Key objective of this project is to improve accuracy, granularity and frequency of our forecasts for our customers.

"Striving to Provide Most Accurate Possible Forecasts"

The project aims to improve ESO's forecasting capabilities to support electricity system operations and market participants to make efficient system balancing decisions ahead of real time.

Project aims to focus on 4 key areas to drive tangible benefits – **Data** ,**Innovation /Technological Adaptation**, **Automation** & **Upcoming Market/System changes**.

Initial Core phase of the project is to focus on exploring and employing innovative technologies to develop and implement our new core forecasting capabilities by March 2020 (Demand, Wind, Solar & GSP forecasts). Subsequent Enhanced phase is to focus on additional fuel type forecasts and continuously driving forecasting efficiency through innovation while keeping up with market and system changes.

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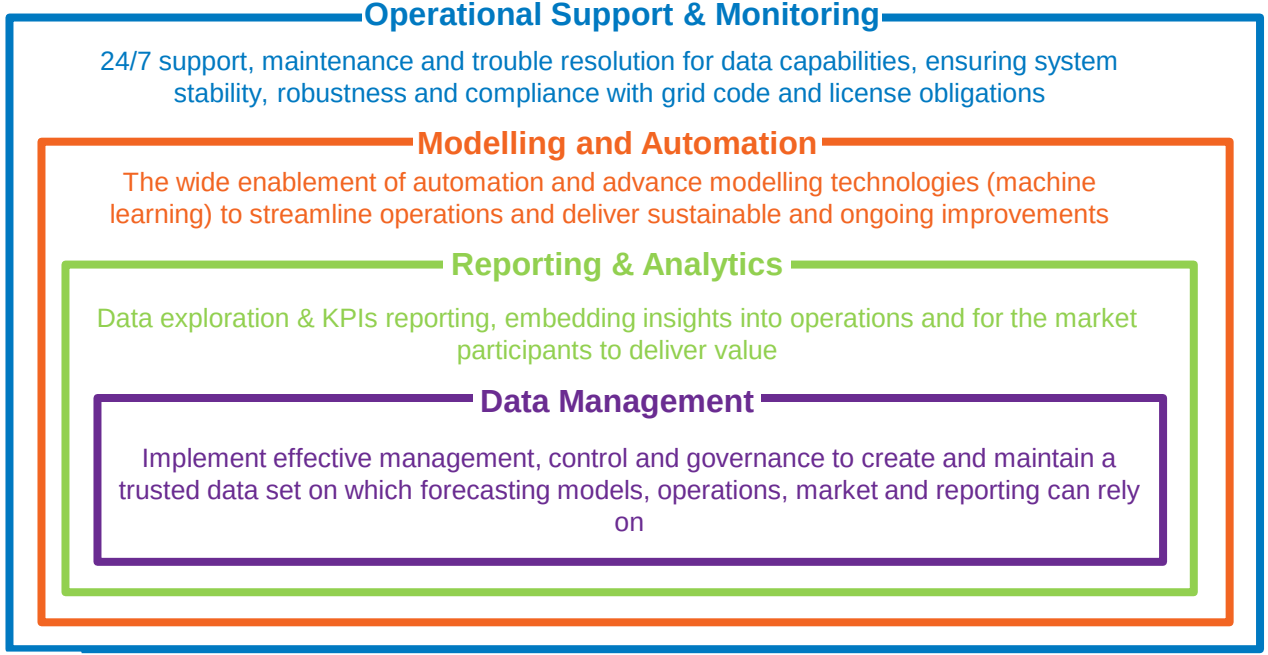
New Forecasting Capability Build

Four Core enabling capabilities that will sit at the heart of ESO's new Energy Forecasting with the ability to bring ad-hoc project as per business and customer requirements



Acquire feedback, Learn and iterate

Ability to launch ad-hoc projects (Innovation) with specialised skillsets/capabilities to meet business and client new requirements and develop new solutions to improve or extend forecasting capabilities

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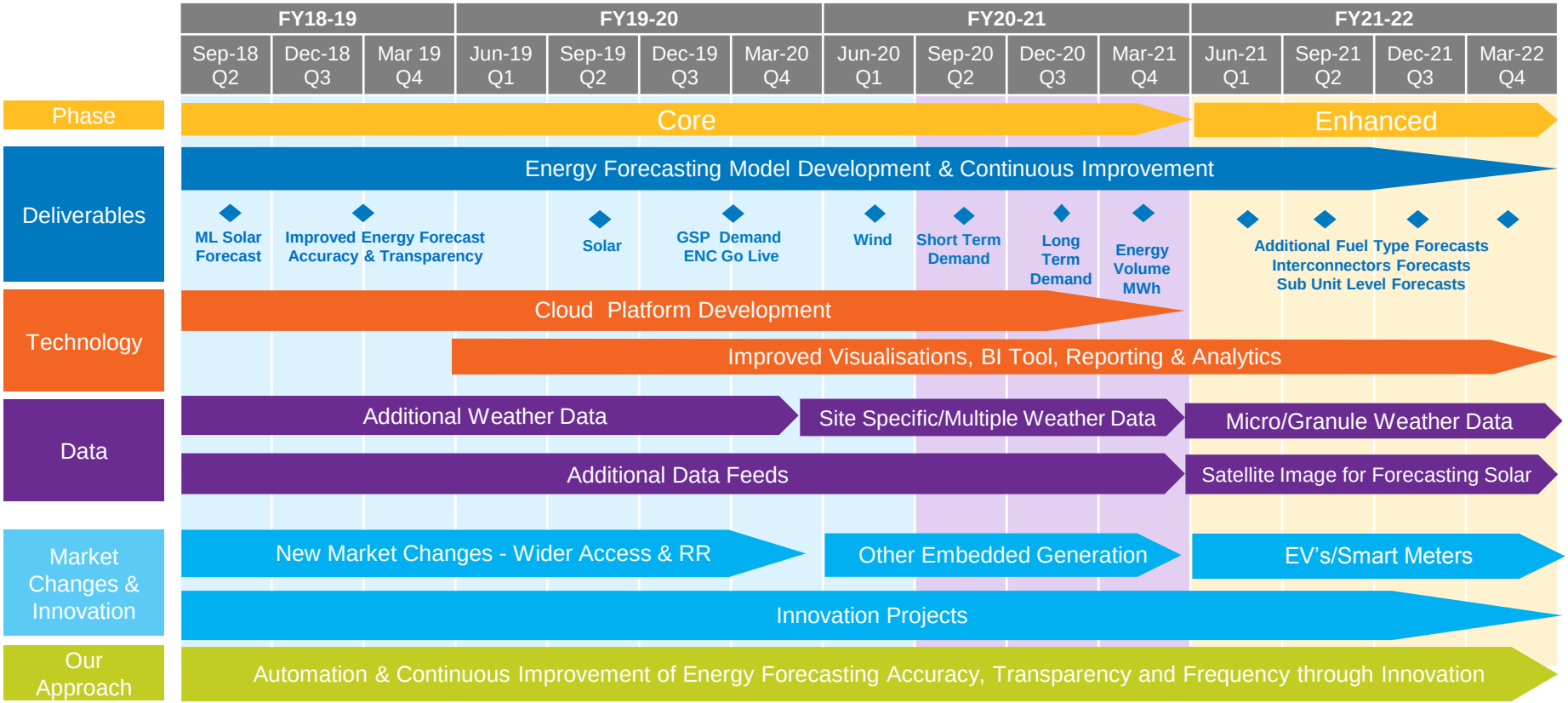
Energy Forecasting Strategic Project – Roadmap



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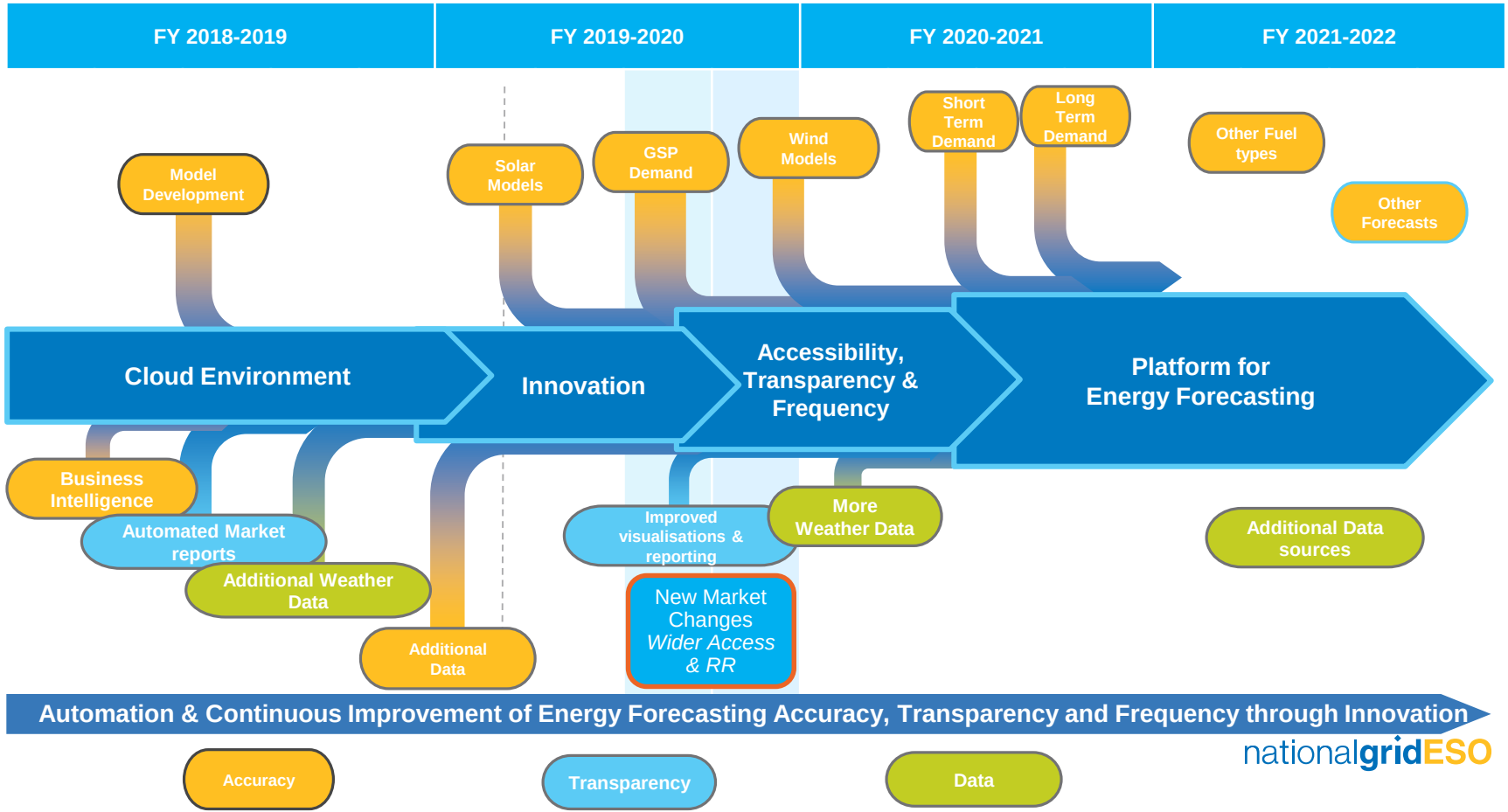
Platform for Energy Forecasting - Roadmap



Energy Forecasting has delivered value to consumers

VALUE TO CONSUMERS

ACCURACY

Accurate forecasts will allow market participants to better adjust their generation/consumption positions ahead of real time.

FREQUENCY

More frequent forecasts will allow market participants to better adjust their positions closer to real time.

TRANSPARENCY

Easy to understand and more accessible forecasting data will lead to more efficient markets and potentially remove barriers to entry.

DELIVERABLES DURING 2018/19

IMPROVED ON BOTH SO FORWARD PLAN FORECASTING METRICS TO DRIVE ACCURACY:

- DA DEMAND **(9%)**
- DA WIND BMU FORECASTS **(4%)**

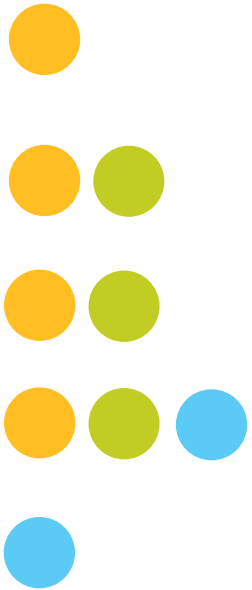
FIRST MACHINE LEARNING MODEL (PV FORECASTING)

IMPROVED & INCREASED WEATHER FORECAST DATA

ADDITIONAL DATA FEEDS – ELECTRALINK

INITIATED THE ENERGY FORECASTING STRATEGY PROJECT TO DELIVER NEW FORECASTING CAPABILITIES AND SERVICES.

MAKE ENERGY FORECASTS AND DEMAND DATA MORE ACCESSIBLE VIA A DEDICATED WEBSITE



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Energy Forecasting has promised to deliver value to consumers

VALUE TO CONSUMERS

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Accurate forecasts will allow market participants to better adjust their generation/consumption positions ahead of real time.

FREQUENCY

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DELIVERABLES FOR 2019/20

- 2 METRICS TO DRIVE ACCURACY: DA DEMAND AND DA WIND BMU FORECASTS
- PUBLISH FORECASTING STRATEGY PROJECT ROADMAP
- PUBLISH HALF-HOURLY PHOTOVOLTAIC (PV) FORECASTS TO MARKET, 24 TIMES A DAY
- PUBLISH ADDITIONAL BMU WIND FORECASTS TO THE MARKET
- PUBLISH AN ADDITIONAL DAY-AHEAD DEMAND FORECAST UPDATE AT 12:00PM EVERY DAY
- MAKE ENERGY FORECASTS MORE ACCESSIBLE VIA A DEDICATED WEBSITE AND APPLICATIONS PROGRAMMING INTERFACES (APIs)

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We delivered on all promises made in the Forward Plan

Improve accuracy of our forecasts (1)

Mobilization of the Demand Forecast Modelling review

Deliverables

- Initiated the **Energy Forecasting Strategy Project** to deliver new forecasting capabilities and services.
- Project already delivered:
  - **PEF (Platform for energy forecasting**. First cloud platform to run forecasting models
  - **First machine learning** model (PV forecasting)
  - **Automation** of forecasting reports to the market

Improve accuracy of our forecasts (2)

Incremental improvements to our demand, wind and solar forecasts

Deliverables

- Positive step change in demand and wind **accuracy**
- **9%** YoY improvement on DA demand accuracy
- 12% YoY reduction in DA large demand forecasting errors
- **4%** YoY improvement on Wind power forecast accuracy
- **33%** PV modelling error improvement with new ML model

Publications

Publication of wind generation and demand forecasts.

Deliverables

- **100%** publications went to market
- **99%** publications were on time
- Results achieved by implementing **Market publications automation**

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Energy Forecasting

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What do we forecast : Timescales & Frequency

	Timescales	Frequency at present	Frequency to be*
Demand	• With in Day	• 5 x daily	• 24 times daily
Sum of Generation**	• Day Ahead	• 2 x daily	• 24 times daily
	• 2DA & 7DA	• Daily	• Daily
	• 2-14Days ahead	• Daily	• Daily
	• 11 Weeks ahead	• Weekly	• Weekly
	• 2-52 Weeks ahead	• Quarterly or as per needs	• Monthly or Weekly
Wind Power	• With in day – 14days ahead	• 6 times daily	• 24 times daily
Metered & Embedded			
Solar Power	• With in day – 14days ahead	• 24 times daily	• 24 times daily
Embedded			
GSP Demand	• With in Day – 14days ahead	• 4 times daily	• 24 times daily

*Subject to change post completion of forecast model development, evaluation and outcomes
**Sum of BM (grid controllable) generation (including Interconnector import) - Based on National Grid operational metering

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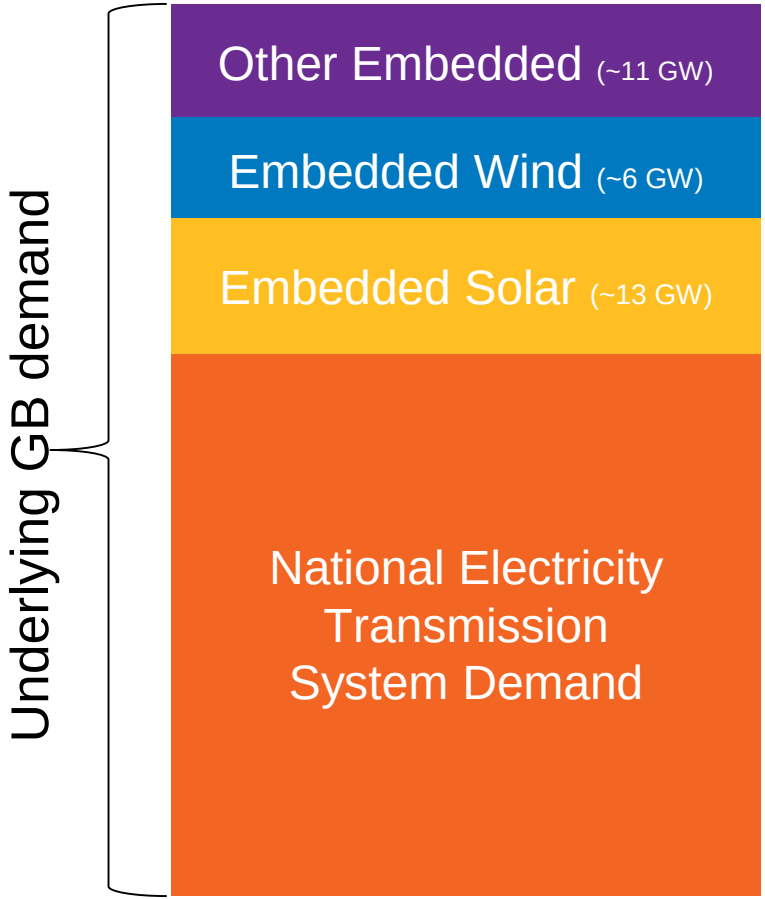
National Electricity Transmission System Demand



- We are required to forecast National Electricity Transmission System Demand (NETSD)
- Broadly, this is demand that is met by generation connected to the transmission system
- This differs from the underlying GB demand due to the significant volumes of generation connected to the distribution systems (embedded generation)
- The uncertainty around the NETSD has increased with the growth in embedded generation making the forecasting process more challenging

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What is Demand

NETSD : National Electricity Transmission System Demand

National demand (ND)

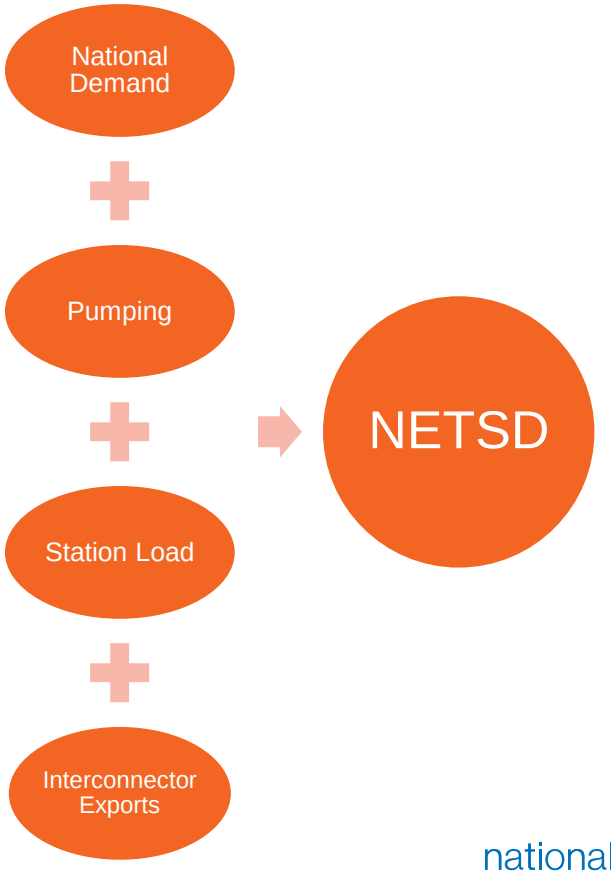
+ power used by generation stations

+ Interconnector exports

National Demand (ND)

Sum of BM generation (including Interconnector import)

Based on National Grid operational metering



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Benefits of Our Forecasts

Our Forecasts contributes to the decision making of market participants through operational and pricing decisions delivering better functioning markets. Better forecasts with less uncertainty also benefits our ENCC, as less uncertainty means less contingency and lower spend on those products.

- The energy forecasts are an important component of delivering secure, economic dispatch of the system
- The key customers of the forecasts are the market participants and the Electricity National Control Centre (ENCC)
- Accurate energy forecasting can improve economic dispatch of the market through informing market participants
  - Understand the potential supply/demand balance of the system over a range of timescales
  - Input to price forecasting models
- The forecasts are a key input for the ENCC when ensuring system security and economic balancing
  - Understanding and resolving operability or difficult supply/demand issues ahead of real time
  - Forecasts of wind and PV used to determine response and reserve holding
  - Managing special events such as the Royal Wedding or World Cup

What We Publish

- Our forecasts & data as required by grid-code & licence obligations are published through BMRS ;
- Our incentivised forecasts & Historic demand data is available at our dedicated Website for energy forecasting;
- We also provide a subscribable email service to deliver our incentivised forecasts and historic demand data – Click to Subscribe ;
- By end of June 2019 , Our embedded generation power forecasts from Wind and Solar energy will be published every hour at our Website in half-hourly resolution for InDay-14days ahead timescales;

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