# Forecast accuracy report update

FRG July 2018

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# Agenda

1. Purpose
2. Demand forecast inputs
3. Forecast Accuracy Metrics: Maximum Demand
4. Next steps
5. Industry forecast accuracy experiences and suggestions

# Purpose

The purpose of the Forecast Accuracy Report (FAR) is:

- Transparency
- Accountability
- Accuracy

The purpose of today's meeting:

- Present progress against commitment made in 2017 FAR to develop a Forecasting Monitoring System.
- Get industry feedback on content and structure of data inputs sought to improve understanding of forecast accuracy in Medium Term Projected Assessment of System Adequacy (MTPASA) and Electricity Statement of Opportunities (ESOO) time frame.

# Why assess forecast accuracy?

1. Build trust in forecasts
    1. Better allocation of resources in the market
    2. Improved investment (and divestment) decisions

2. Highlight areas for improvement (continuous improvement process)
    1. Better models
    2. Improved input data
    3. Enhanced understanding of uncertainty

# Demand forecast inputs

# Annual and MD drivers

Demand forecasts can change due to changes in input.

Where possible we could assess how the actual inputs compare to forecasts.

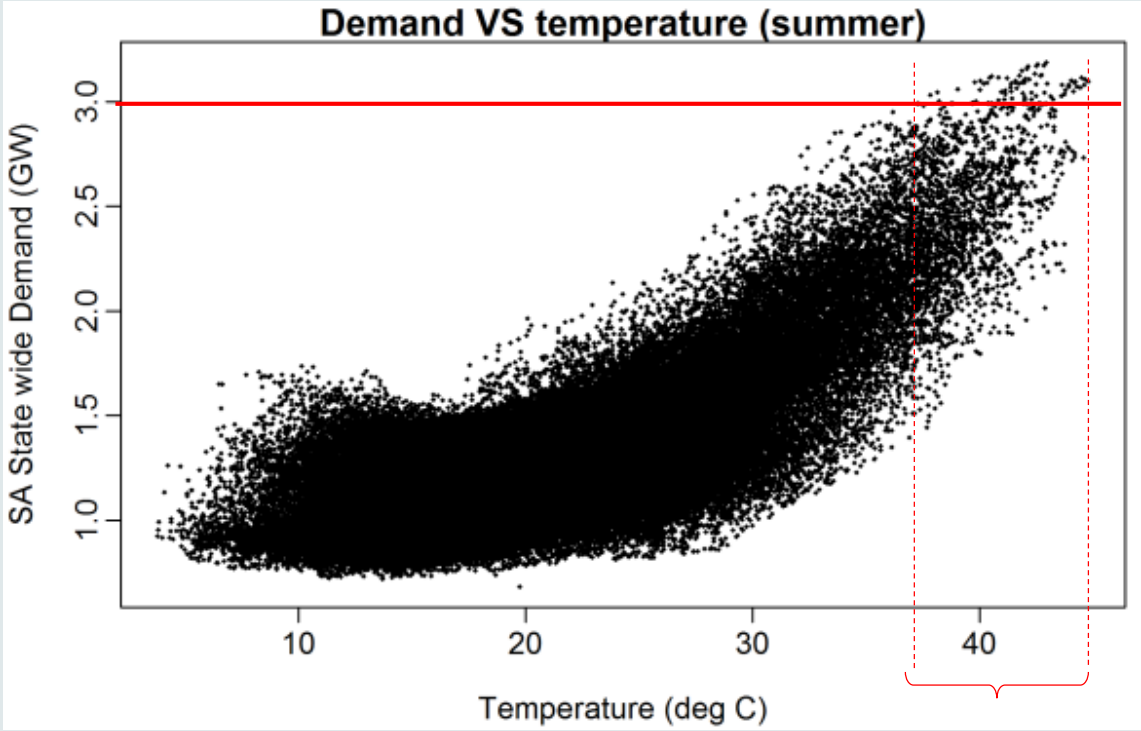
| Input | Forecast component |
|---|---|
| **Prices (wholesale & network cost), green schemes, retail** | Price elasticity of demand, technology adoption rates |
| **Population and household numbers** | Commercial sector outlook NMI (connection) forecasts |
| **Housing Building Data** | NMI forecasts |
| **Gross State Product** | Manufacturing sector outlook |
| **Household Disposable Income** | Commercial sector outlook |
| **Producer Price Index** | Manufacturing sector outlook |
| **Automotive consumption segmentation** | Automotive Manufacturing sector |
| **Coal consumption segmentation** | Coal sector |
| **LNG consumption segmentation** | LNG sector |
| **Aluminium consumption segmentation** | Aluminium sector |
| **Large Industrial Load (100 customers) survey / interviews** | Large load adjustment verification / feedback |
| **Dept. Environment & Energy business data** | Split for manufacturing and commercial sector |
| **Energy efficiency schemes: appliance (52-star rating schemes)** | Energy efficiency forecast (residential & commercial) |
| **NABERS schemes (building codes)** | Energy efficiency forecast (residential & commercial) |
| **Electric vehicles (truck, commercial, residential)** | EV forecast |
| **Energy storage systems (residential, commercial)** | Battery forecast |
| **Rooftop PV (residential, commercial)** | PV forecast |
| **Appliance sales data** | Residential appliance uptake |
| **Fuel switch (gas to electric)** | Residential usage changes |
| **Weather** | Short-term consumption outlook |
| **Climate** | Long-term climate change impact |
| **CER Large PV installation data** | PVNSG forecast |
| **Technology uptake curves** | Emerging technology forecasts |

# Forecast accuracy report: MD

# MD challenges

Temperature is just one driver of demand.

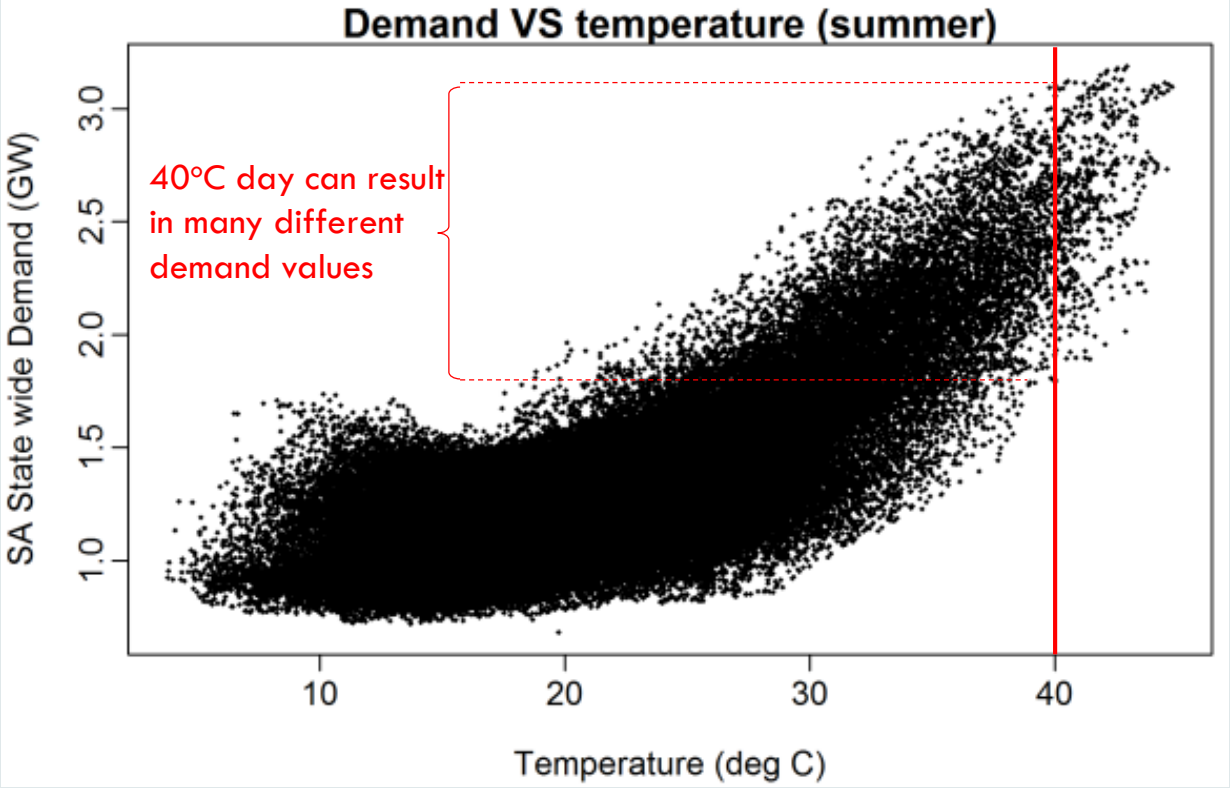
A high demand day can be driven by a wide range of temperatures.




Temps resulting in 3GW demand

# MD challenges

Similarly, a hot day may not necessarily lead to a very high demand.



# Forecasting Accuracy Report – what we do now

NSW 2016 NEFR forecasts against actuals for 2016–17:

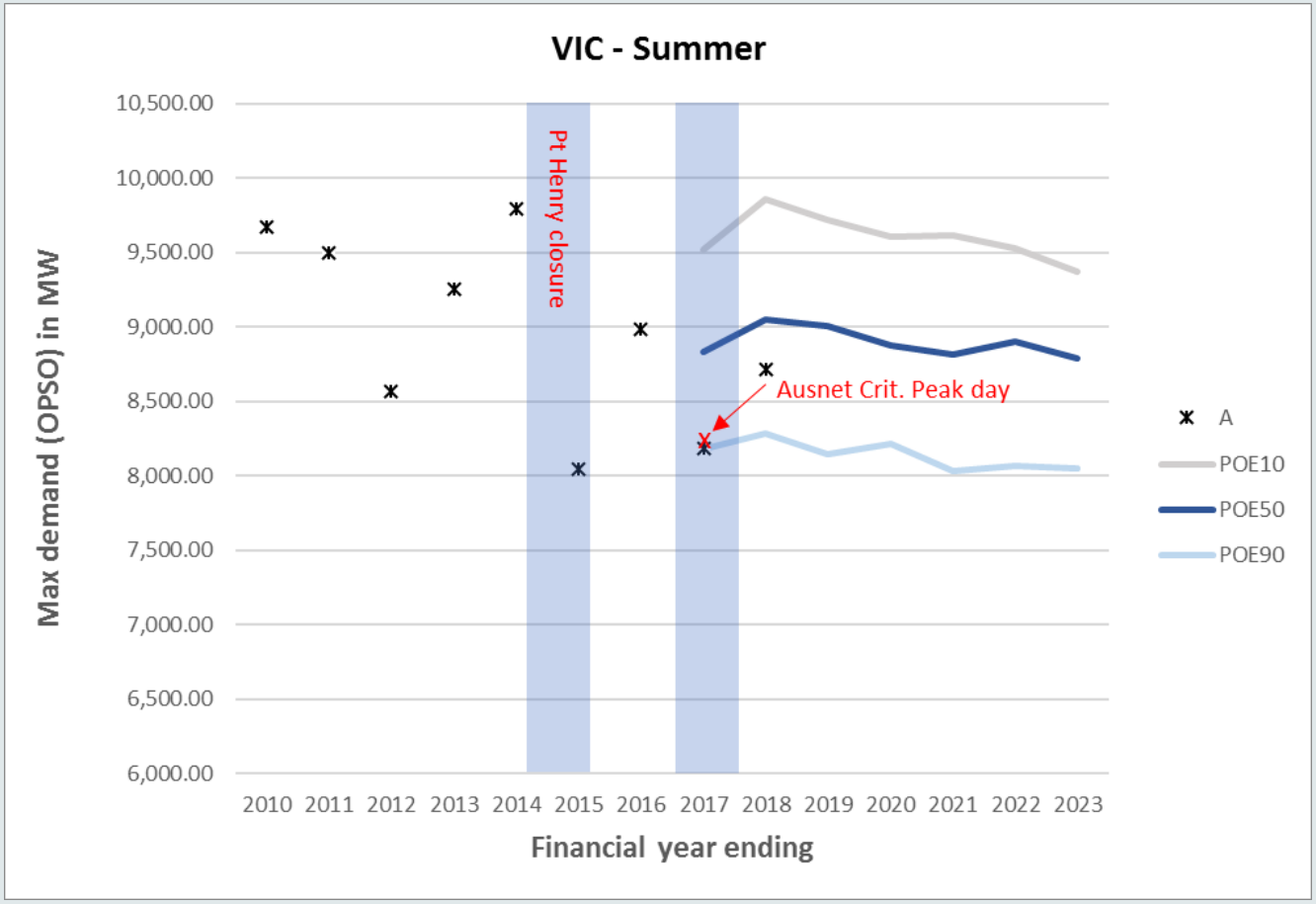
| Annual consumption | 2016 NEFR forecast | Actual | Difference | Difference (%) |
|---|---|---|---|---|
| **Operational consumption – sent out (GWh)** | **67,812** | **68,545** | **734** | **1.1%** |
| Auxiliary load (GWh) | 3,165 | 2,821 | -344 | -12.2% |
| **Operational consumption – as generated (GWh)** | **70,977** | **71,367** | **390** | **0.5%** |
| SNSG (GWh) | 1,409 | 1,619 | 210 | 12.9% |
| **Native consumption – as generated (GWh)** | **72,386** | **72,986** | **600** | **0.8%** |
| **Significant input forecasts** | | | | |
| Rooftop PV (GWh) | 1,579 | 1,597 | 18 | 1.1% |
| Transmission losses (GWh) | 1,481 | 1,518 | 37 | 2.4% |
| **Weather – annual** | | | | |
| Heating degree days (HDD) | 685 | 572 | -113 | -19.7% |
| Cooling degree days (CDD) | 404 | 582 | 178 | 30.5% |
| **Maximum demand** | **Actual** | **Forecast 10% POE** | **Forecast 50% POE** | **Forecast 90% POE** |
| **Maximum demand – sent out (MW)** | **13,670** | **14,151** | **12,760** | **11,306** |
| **Weather – at time of maximum demand** | | | | |
| Temperature (°C) | 43.7 | 40.0 | 37.5 | 34.8 |

We plan on doing something similar for annual consumption in this year's FAR.

Performance metric options for Maximum Demand include:

- Qualitative (as 2017 Forecast Accuracy Report)
- Visual (next slides)
- Statistical tests (2015 Forecast Accuracy Report)

# March 2018 demand forecast update
# MD forecast accuracy - Victoria



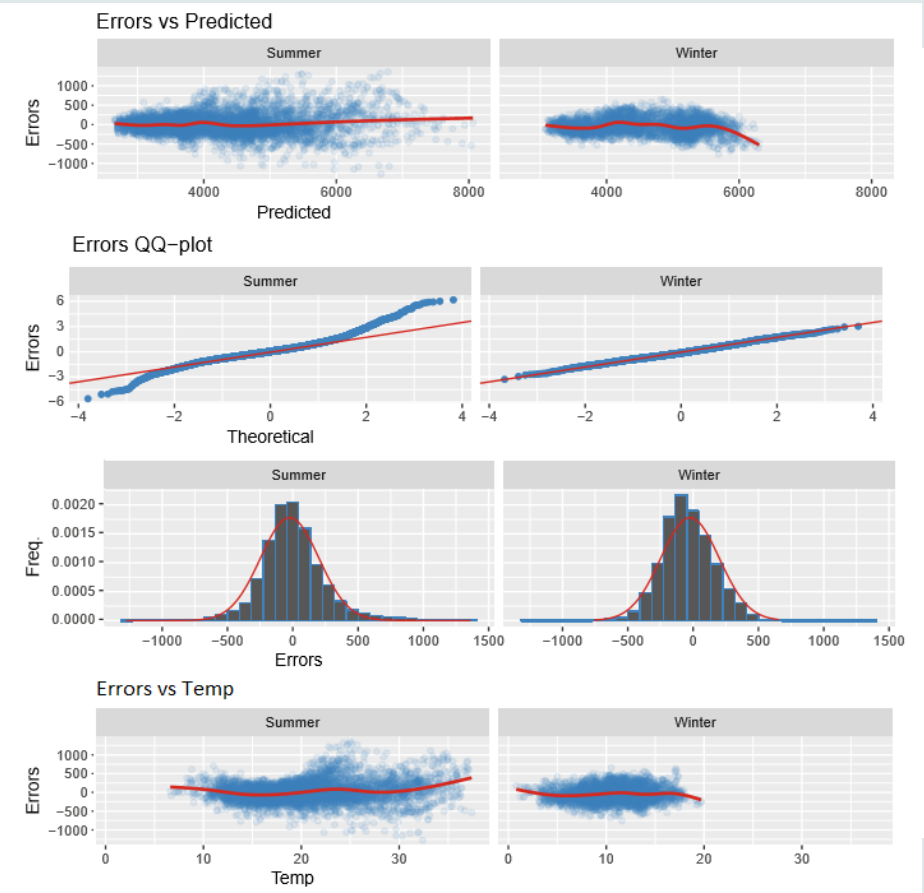

- Need DSP to calculate counterfactual historical demand to:
  - Remove any bias in Max Demand model during high demand periods.
  - Assist in assessing the accuracy of maximum demand forecasts when comparing with actuals.

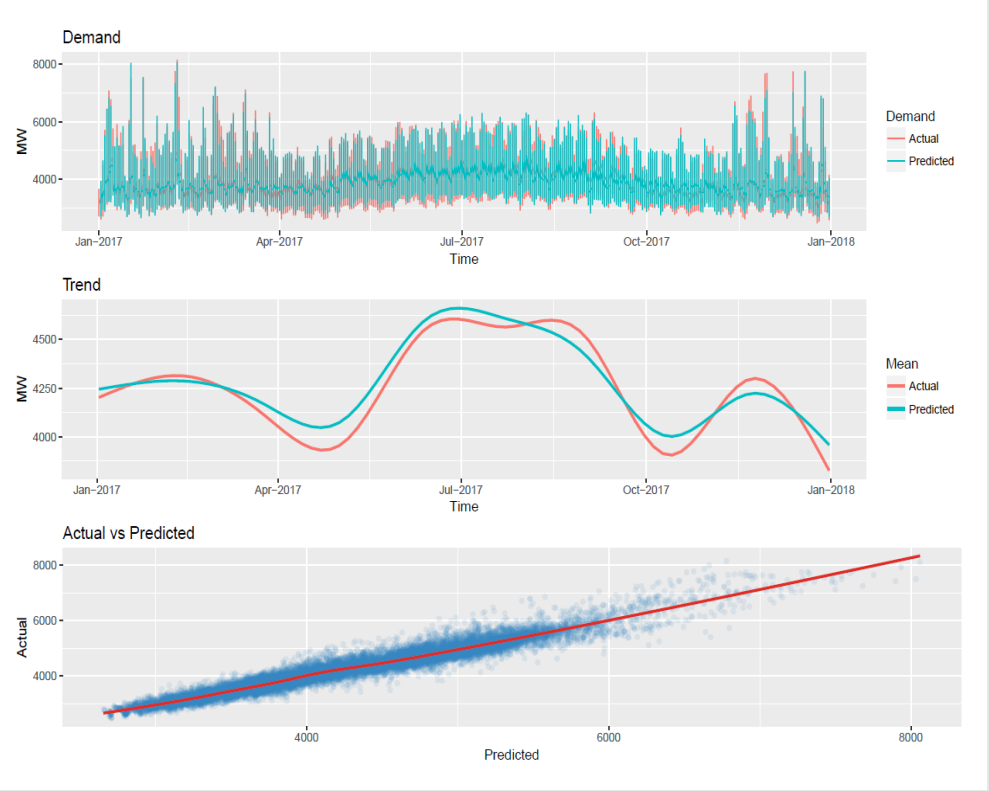
# Performance monitoring system

- Delivery of online data dashboard with aggregated (non-confidential) data now expected in 2019.
  - Through consultation, seeking to understand what metrics industry would like to have reported on this external dashboard
  - Scope to be finalised by December 2018, with system implementation planned in 2019.
  - 2018 Forecasting Accuracy Report (assessing the impact of 2017 ESOO forecast) will be in paper format only as previously.
- Challenge with assessing performance of probabilistic models:
  - 1 data point per year (for summer).
  - 1 POE10 per 10 years to (very rare event) – in which time the market has significantly changed.
- Proposed solution:
  - Downscale the maximum demand forecasting model (producing daily, weekly, or monthly maximum demand forecasts) for the purpose of model validation only.
  - Higher frequency forecasts will provide more data points to compare the distribution of actual demand against the forecast distribution.

# ESOO2018 model development

VIC: forecast accuracy metrics for model selection



# Next steps

# Next steps

- The ESOO will commence the process of developing improved techniques for reporting on forecast performance.
- As the key forecasts are probabilistic, measurement of their accuracy requires consideration and development.
- The proposed techniques will be consulted on and expert input will be obtained.
- We will also measure the accuracy of the generator availability modelling (and other supply inputs) to address the broader purpose of assessing Unserved Energy forecasts.
- Once forecasting performance metrics have been agreed, AEMO will explore options to report these metrics more dynamically through an online data dashboard.

# Industry forecast accuracy experiences and suggestions


AEMO
AUSTRALIAN ENERGY MARKET OPERATOR