

Embracing Uncertainty in Operational Forecasting

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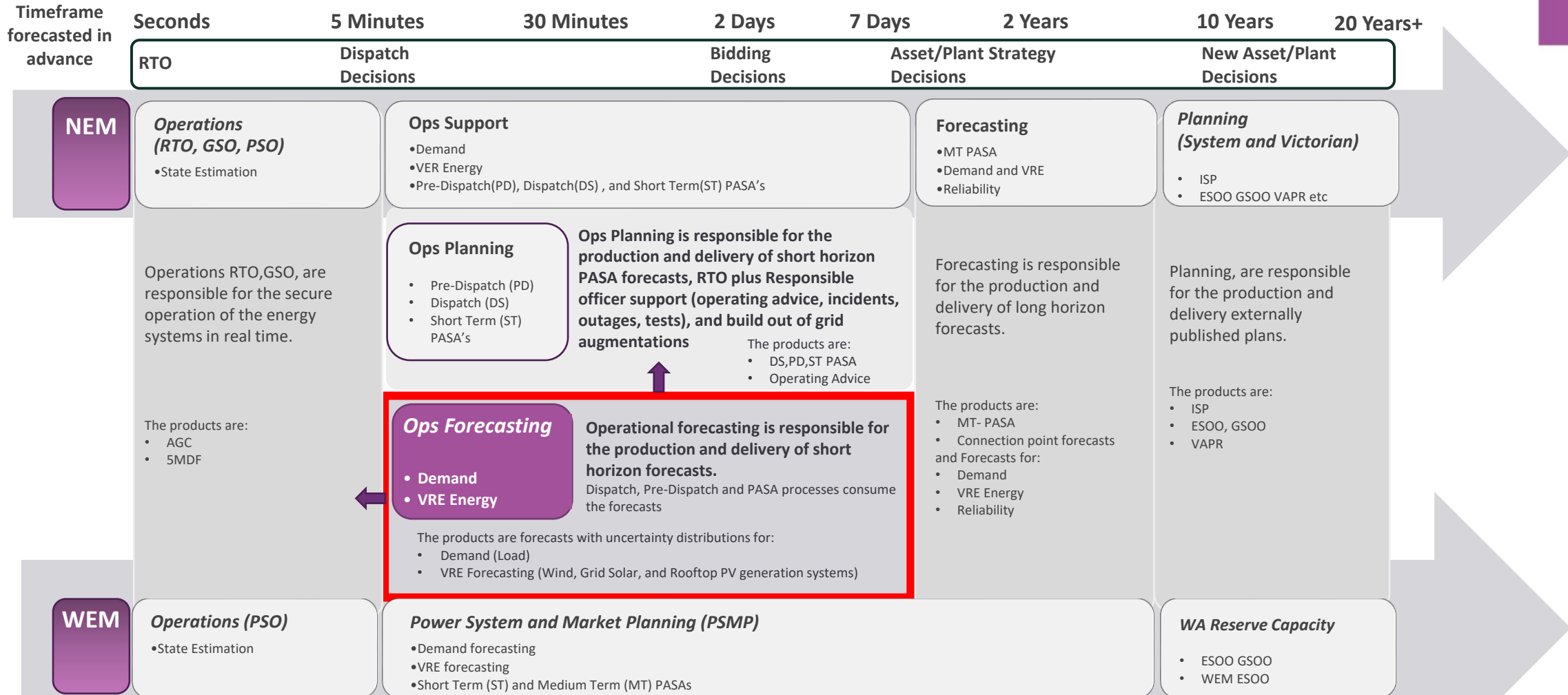


Themes & Topics

1. Operational Forecasting at AEMO
2. Evolving Landscape of Operational Forecasting
3. A Probabilistic Approach to Forecasting Uncertainty of Reserves
4. Future of Operational Forecasting

Operational Forecasting at AEMO

The Role of Operational Forecasting



Ops Forecasting

- Demand
- VRE Energy

Operational forecasting is responsible for the production and delivery of short horizon forecasts.

Dispatch, Pre-Dispatch and PASA processes consume the forecasts

The products are forecasts with uncertainty distributions for:

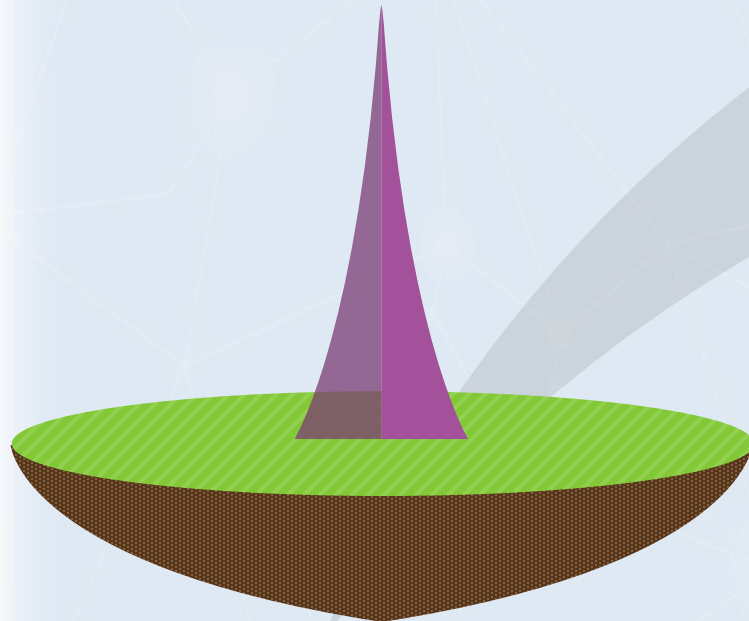
- Demand (Load)
- VRE Forecasting (Wind, Grid Solar, and Rooftop PV generation systems)

The Evolving Landscape of Operational Forecasting



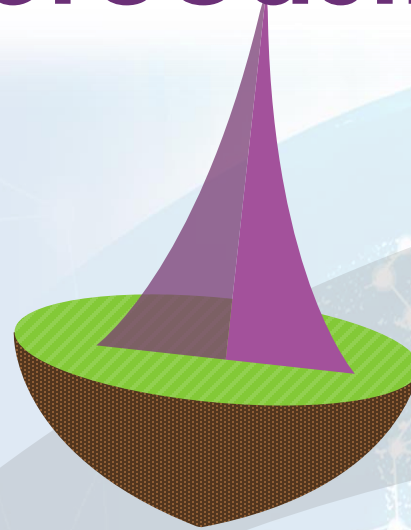
1998

At the start of the NEM the operating envelope for a stable grid state was large compared to the uncertainty of the forecasts used to operate it.



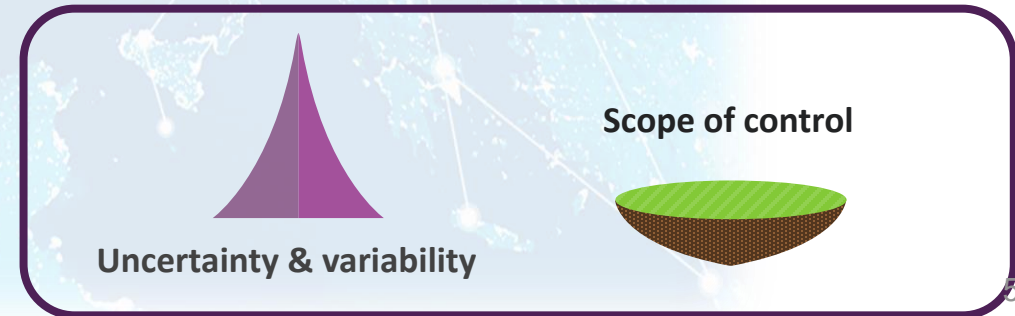
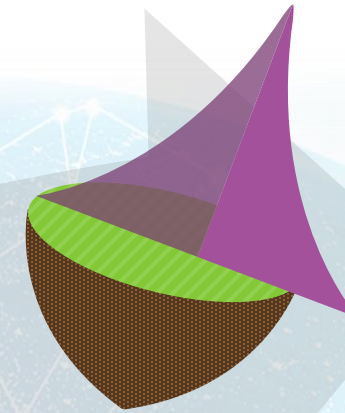
2023

Today the balance between uncertainty and control is becoming challenging



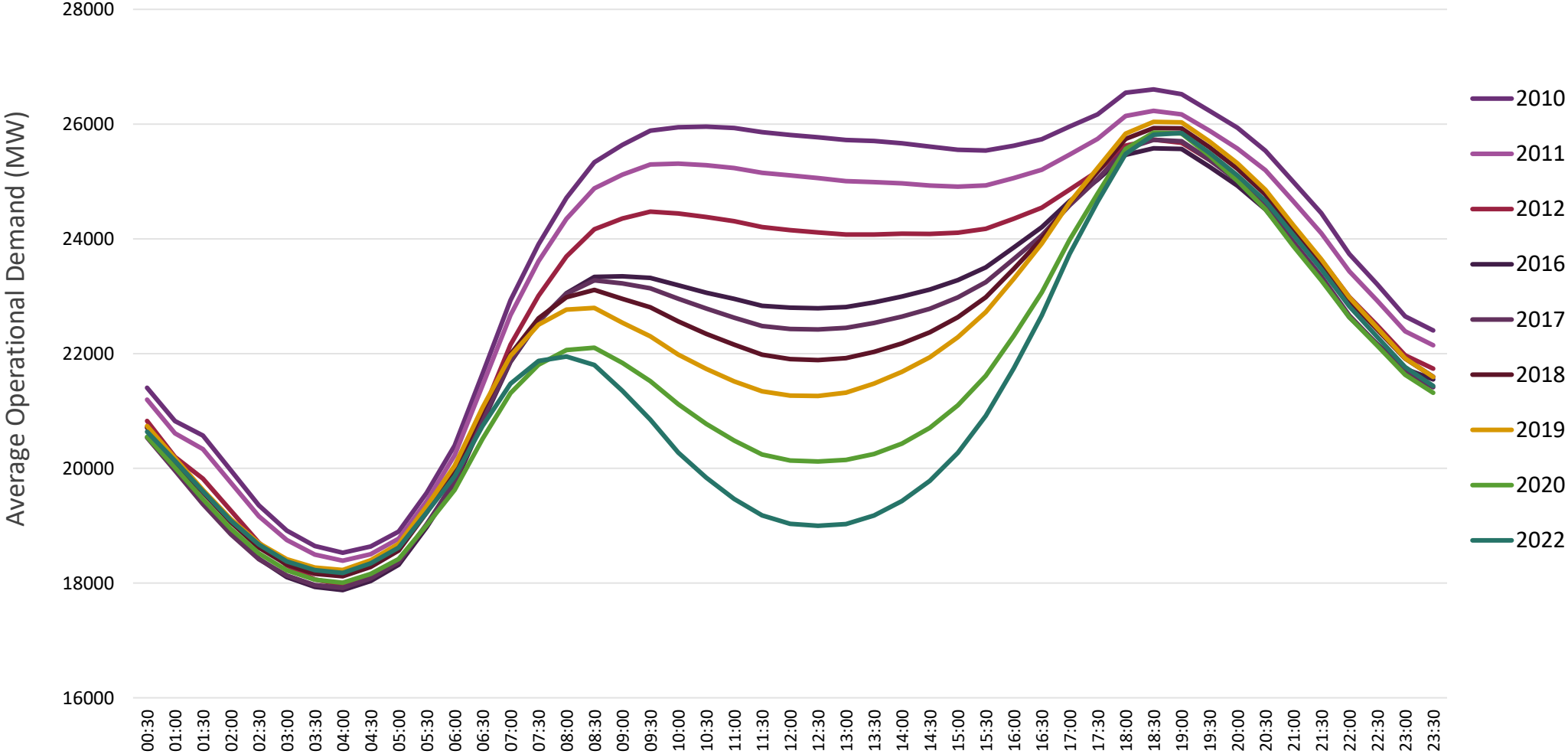
Undesirable Future State

Where the level of uncertainty and variability exceeds the span of control of the system operators.



Evolving Shape of the Demand Profile

NEM Average Operational Demand (2010 to 2022)



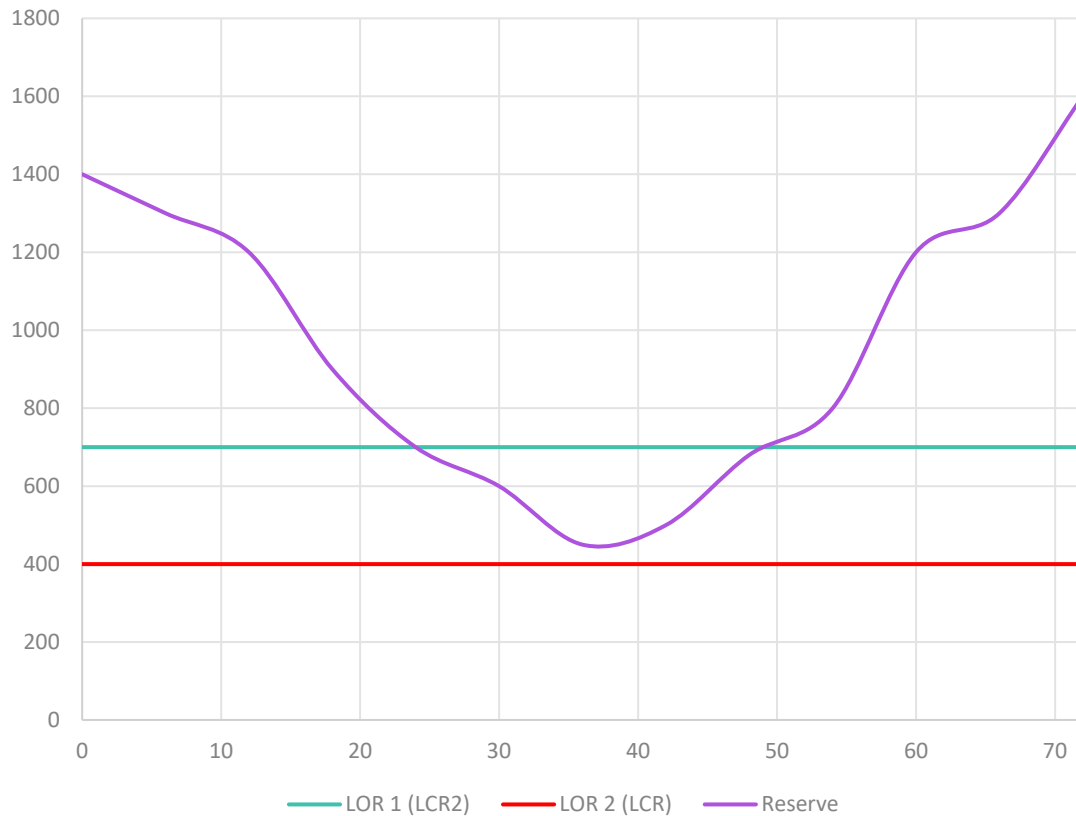
A Probabilistic Approach to Forecasting Uncertainty of Reserves

Where we've been, where we are, and where we are going

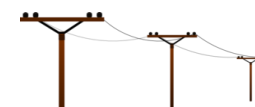
Reserve levels in the NEM

Reserve levels were historically set based on the largest supply to the system.

Historical reserve conditions (without FUM)



Interconnector supplying 300MW



Load



Coal supplying 400MW



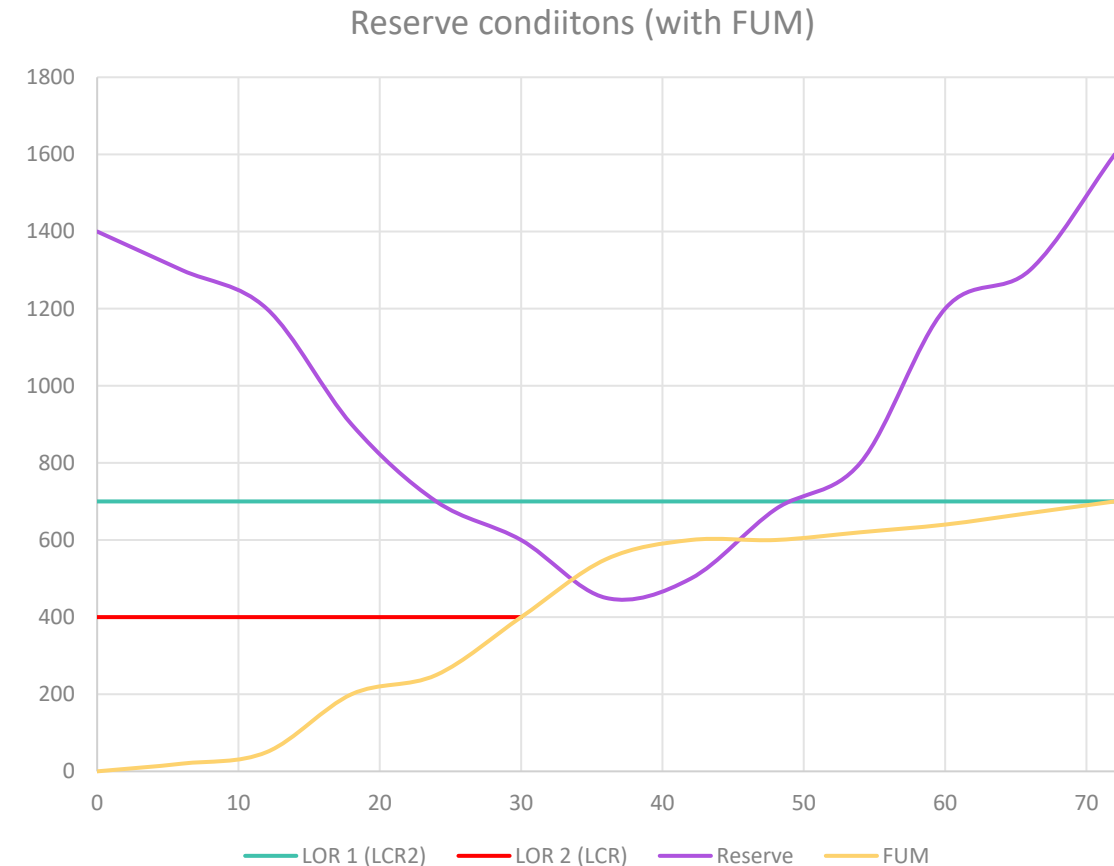
Wind supplying 220MW

To address dynamically evolving reserves in the NEM, AEMO introduced the FUM

The FUM (Forecast Uncertainty Measure)

The FUM Model is trained on historical forecasting errors and situational conditions present at time forecast was produced. These can include weather and time of day.

- Deployed in 2017
- This forecasts reserve levels using sophisticated Bayesian Belief Networks.
- Acts as a mechanism to address supply uncertainty.
- Over 1 billion forecasts are used to train the network using advanced AI techniques
- Retrained quarterly

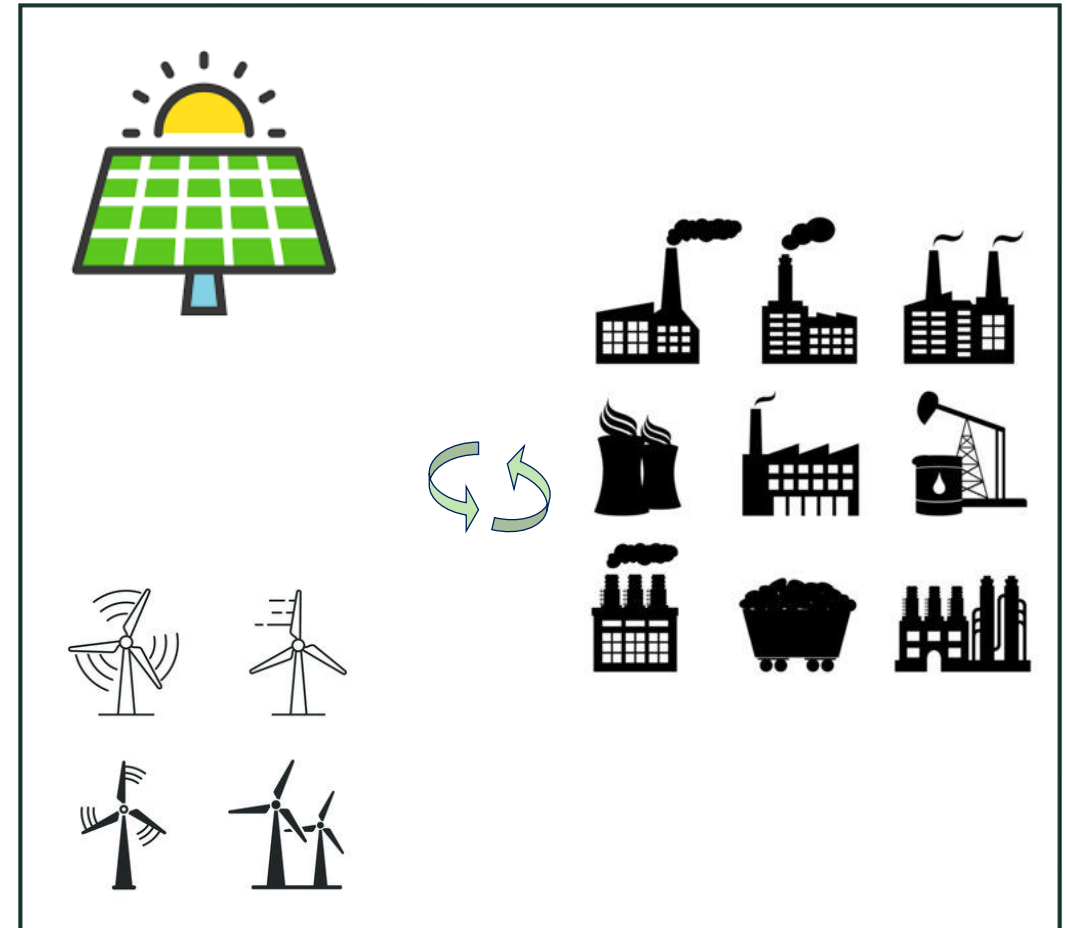
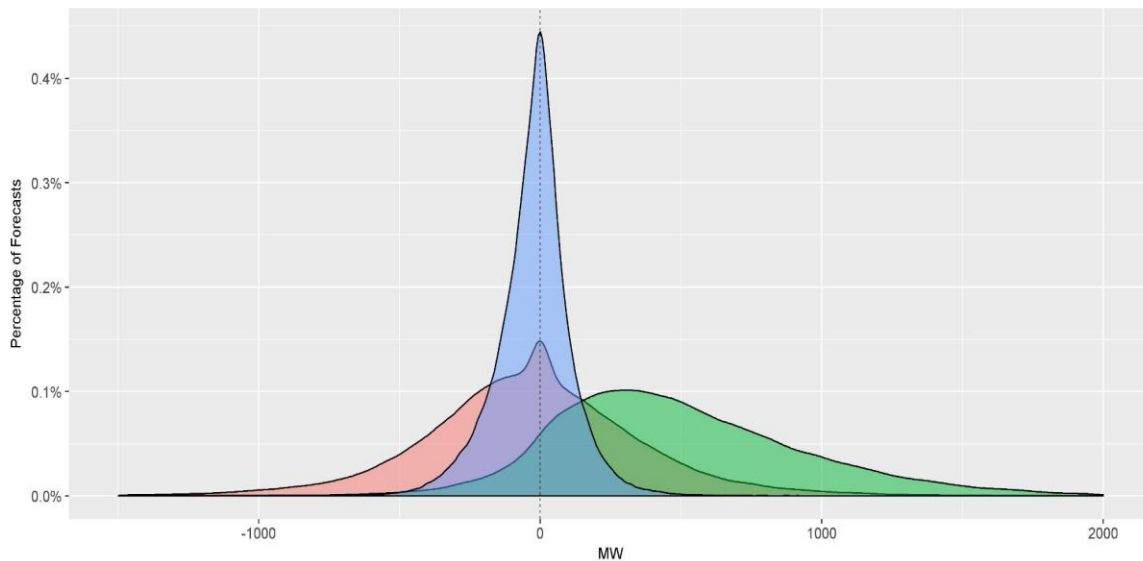


How to Improve the FUM Approach

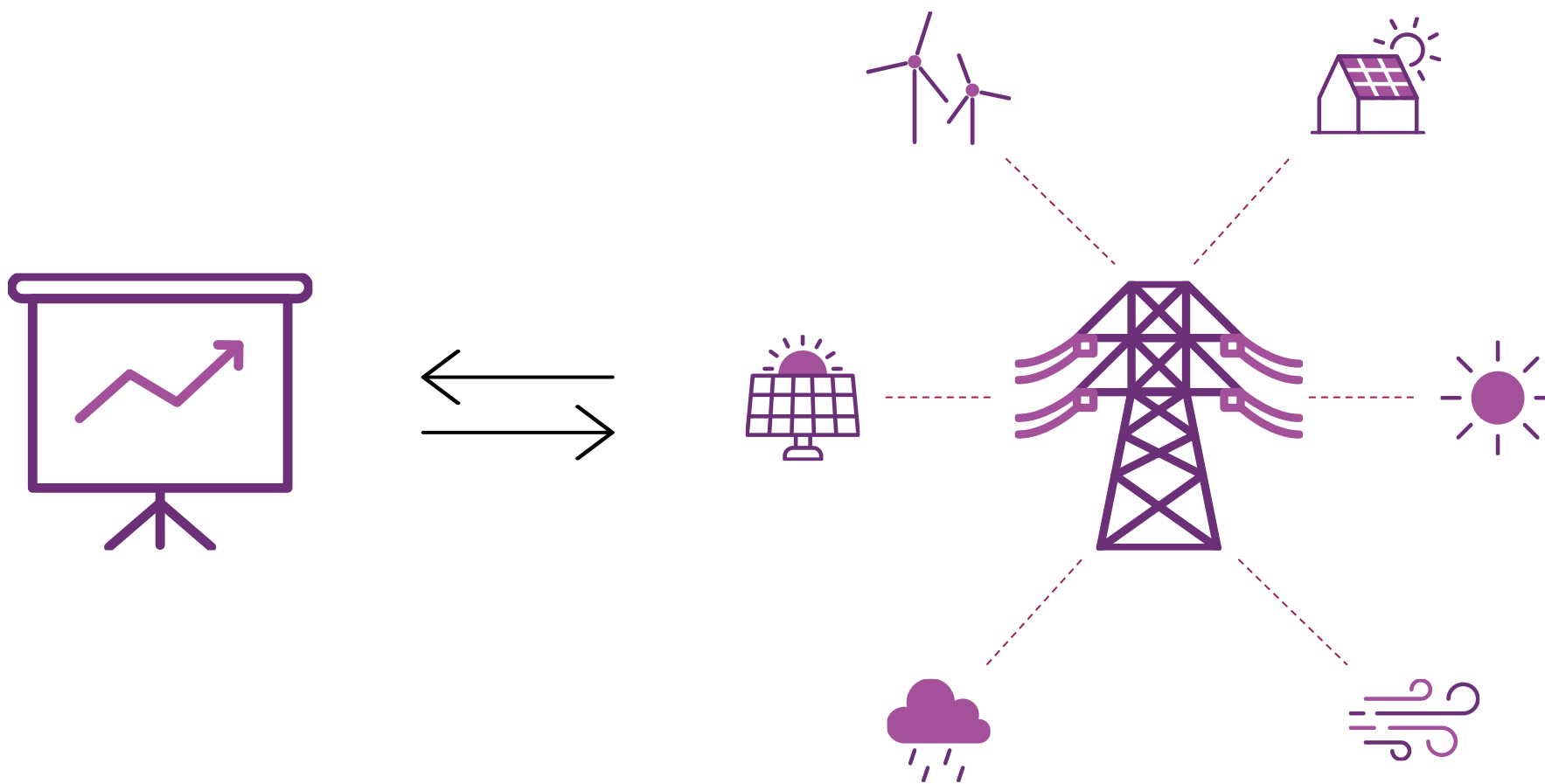
Disaggregate FUM & Sources of Uncertainty for more intuitive and improved decision making

NEM Sources of Forecasting Uncertainty 12 Hours Ahead

Legend Demand Forecasting Error Scheduled Generation Forecasting Error Semi-Scheduled Generation Forecasting Error



Probabilistic Forecasting for the future





For more information visit

aemo.com.au