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Embracing Uncertainty in Operational Forecasting

Andrew Akman

Data Scientist Principal Operational Forecasting Australian Energy Market Operator

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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



Timeframe forecasted in	Seconds	5 Minutes	30 Minutes	2 Days	7 Days	2 Years	10 Years	20 Years+
advance	RTO Dispatch Decisions		Bidding Decisions		Ass Dec	set/Plant Strategy cisions	New Asset/Plan Decisions	t
NEM	Operations (RTO, GSO, PSO) •State Estimation	Ops Suppor •Demand •VER Energy •Pre-Dispatch(P	t D), Dispatch(DS) , and Short	Term(ST) PASA's		Forecasting •MT PASA •Demand and VRE •Reliability	Planning (System and Victor • ISP • ESOO GSOO VAPR etc	ian)
	Operations RTO,GSO, are responsible for the secure operation of the energy systems in real time.	e Pre-Dispatch Dispatch (DS Short Term PASA's	Ops Planning production a PASA foreca officer suppo outages, tes augmentatio	g is responsible for the and delivery of short h sts, RTO plus Respons ort (operating advice, ts), and build out of gr ons The products DS,PD,ST Operating	e orizon ible incidents, id are: 2ASA Advice	Forecasting is responsible for the production and delivery of long horizon forecasts.	Planning, are responsi for the production and delivery externally published plans.	ble 1
	The products are: • AGC • 5MDF	 Ops Foreco Demand VRE Energy The products a Demand (I VRE Foreco 	Operationa the product horizon for Dispatch, Pre- the forecasts are forecasts with uncertainte .oad) asting (Wind, Grid Solar, and	Il forecasting is respon tion and delivery of sh ecasts. Dispatch and PASA process y distributions for: Rooftop PV generation syst	sible for ort es consume ems)	 The products are: MT- PASA Connection point forecasts and Forecasts for: Demand VRE Energy Reliability 	 ISP ESOO, GSOO VAPR 	
WEM	Operations (PSO) •State Estimation	Power Syste • Demand forec • VRE forecastin • Short Term (ST	e m and Market Plann asting g T) and Medium Term (MT) PA	n ing (PSMP) ASAs			WA Reserve Capacit • ESOO GSOO • WEM ESOO	′

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.



Uncertainty & variability

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Evolving Shape of the Demand Profile





A Probabilistic Approach to Forecasting Uncertainty of Reserves

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



The FUM (Forecast Uncertainty Measure)



- 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



Reserve condiitons (with FUM)

AFMC



How to Improve the FUM Approach

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







Probabilistic Forecasting for the future





For more information visit

aemo.com.au