Demand-driven AUGEX

Forecast review

The Power of Commitment

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[illegible]	[illegible]	[illegible]					[illegible]
[illegible]		[illegible]			[illegible]	[redacted]	[illegible]

The Power of Commitment

Executive summary

[illegible]

[illegible] processes used to develop previous years' forecasts.

[illegible]

[illegible]

[illegible]

Table 1 Impact of load forecasts on the specified AUGEX projects

Project description	TransGrid reference	Impact of load forecast
[illegible]	[illegible]	[illegible] Under last year's forecast [illegible]
[illegible]	[illegible]	[illegible] under last year's forecast [illegible]
[illegible]	[illegible]	[illegible] later than under last year's forecast [illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Project description	TransGrid reference	Impact of load forecast
		[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible] [redacted] [illegible] [redacted] [illegible]

[illegible] understanding demonstrated suggest that each of TransGrid's connection point [illegible]

This report is subject to, and must be read in conjunction with, the limitations set out in section 1

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Attachments

No table of contents entries found.

1. Introduction

TransGrid's [illegible]

Table 1 TransGrid demand driven AUGEX projects of concern and associated locations

Location	Project description	Project reference	Connection point(s)
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Source: TransGrid.

[illegible]

1.1 Purpose of this report

[illegible]

- [illegible]
- [illegible]
- [illegible]

1.2 Scope and limitations

[illegible]

- [illegible]
- [illegible] n outline of AEMO's Transmission Connection Point methods and parallel forecast outcomes, reconciling differences in methods and outcomes in comparison with TransGrid's forecasts (section [illegible]
- [illegible]
- [illegible]

– [illegible]

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1.3 Assumptions

[illegible]

[illegible]

2. Overview and high-level assessment

[illegible]

[illegible] AEMO's 2021 ESOO 50% POE forecast for NSW between [illegible]

[illegible]

Table 2 Connection points of interest

TransGrid substations	Maximum demand 2019/20*	Maxiumum demand 2029/30**	DNSP	New spot loads included in the demand forecast	Comments
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] Evoenergy's Fishwick zone [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	**2,391**	**4,496**			

* *Estimated 50% POE summer maximum demand for all named connection points except Cooma and Munyang (MW) – winter for Cooma and Munyang.*
*** Forecast medium scenario 50% POE summer maximum demand for all named connection points (MW).*
Source: TransGrid, partially based on information supplied by Endeavour Energy and Essential Energy.

TransGrid's forecast is now 35

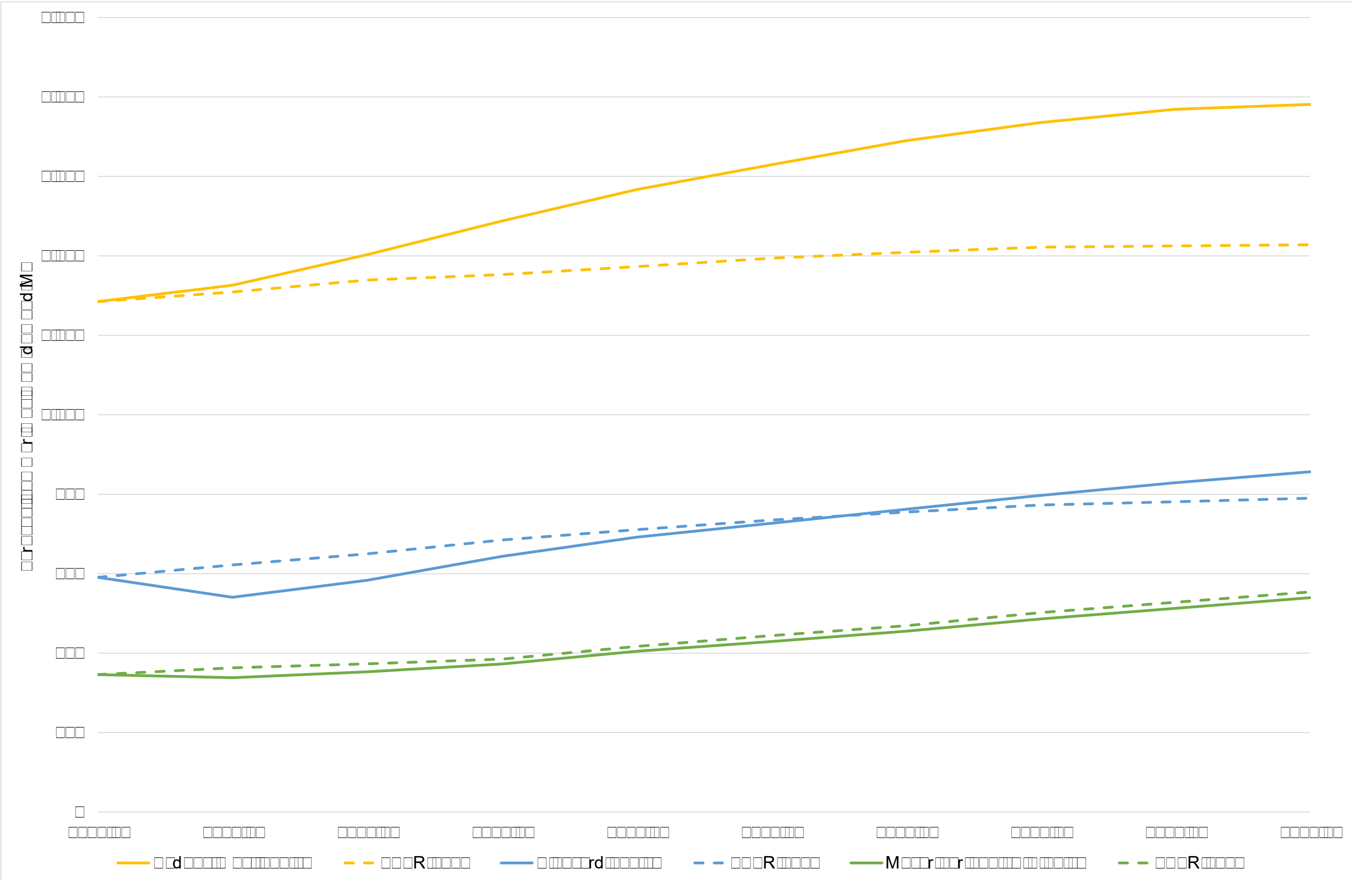

Figure 1 Forecasts for Sydney West, Vineyard and Macarthur (combined 66 kV and 132 kV) published in 2021 and 2020

2.1 Growth in Western Sydney

locations, superimposed against AEMO's forecast

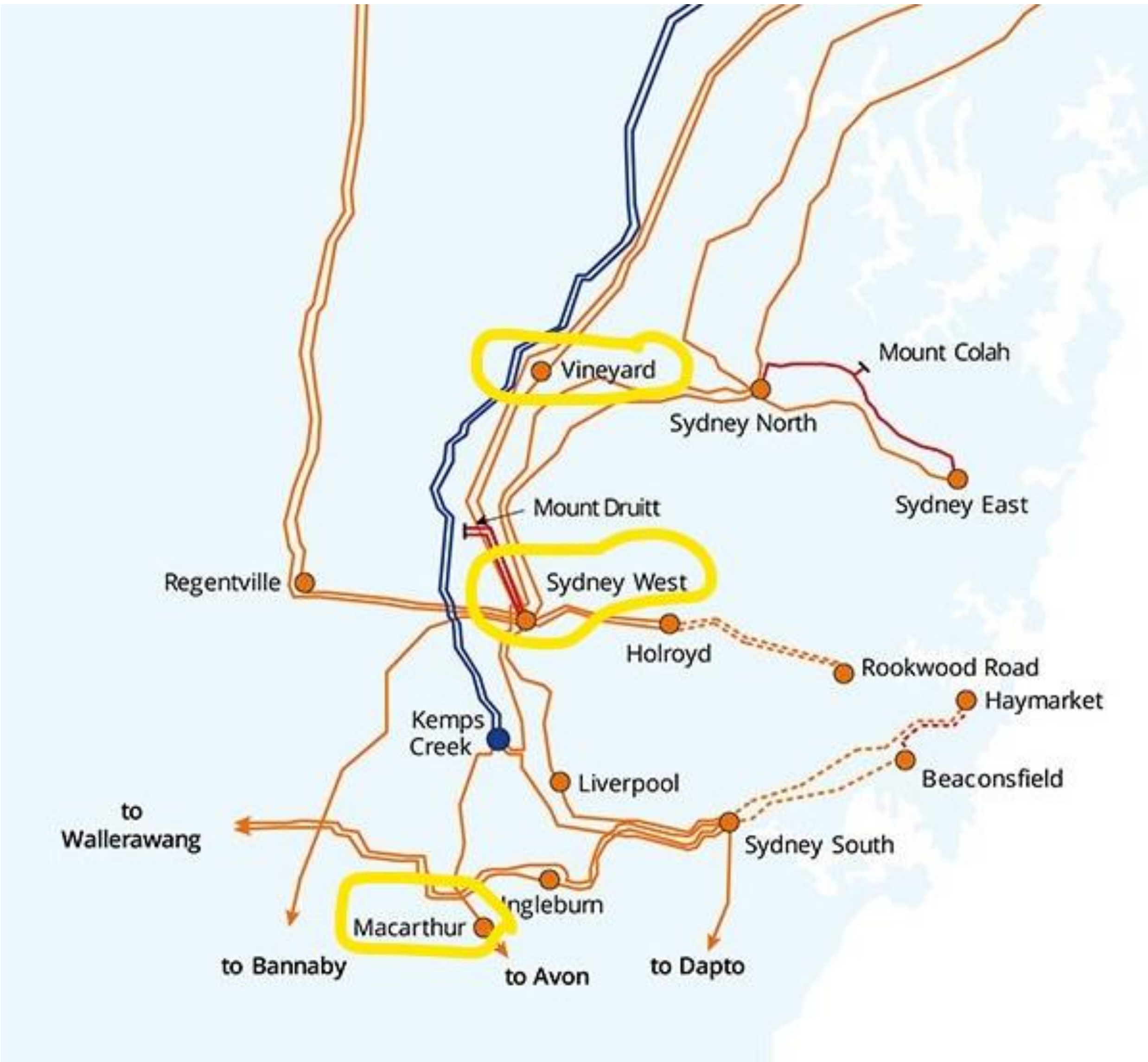

Figure 2 ***Western Sydney connection points of interest***

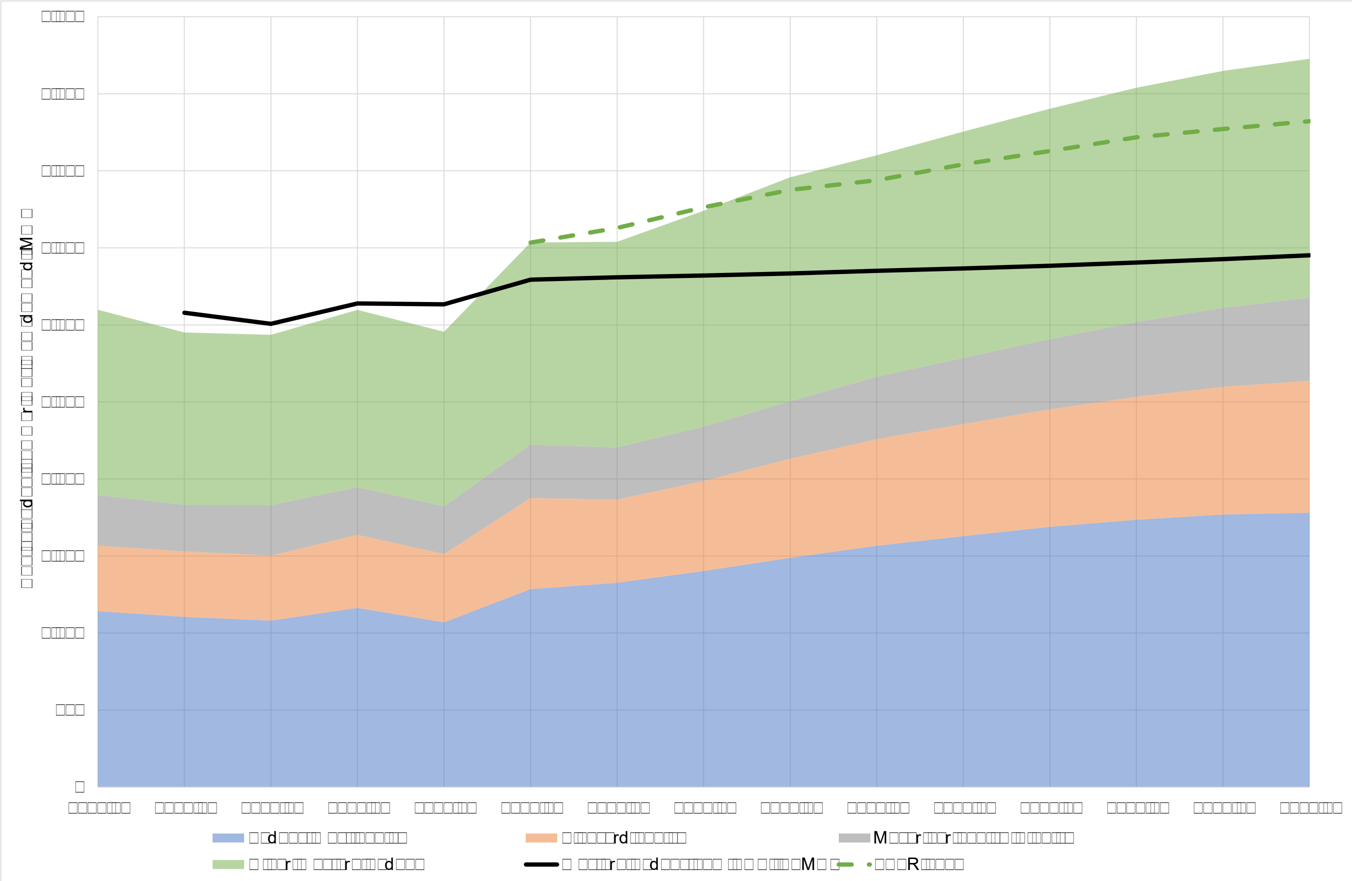

Figure 3 Actual and forecast 50% POE summer maximum demand for Western Sydney

Figure 4 Actual and forecast 50% POE summer maximum demand for Macarthur, Sydney West and Vineyard (MW)

2.2 North-west New South Wales

[illegible] are connected to TransGrid's 132 [illegible]

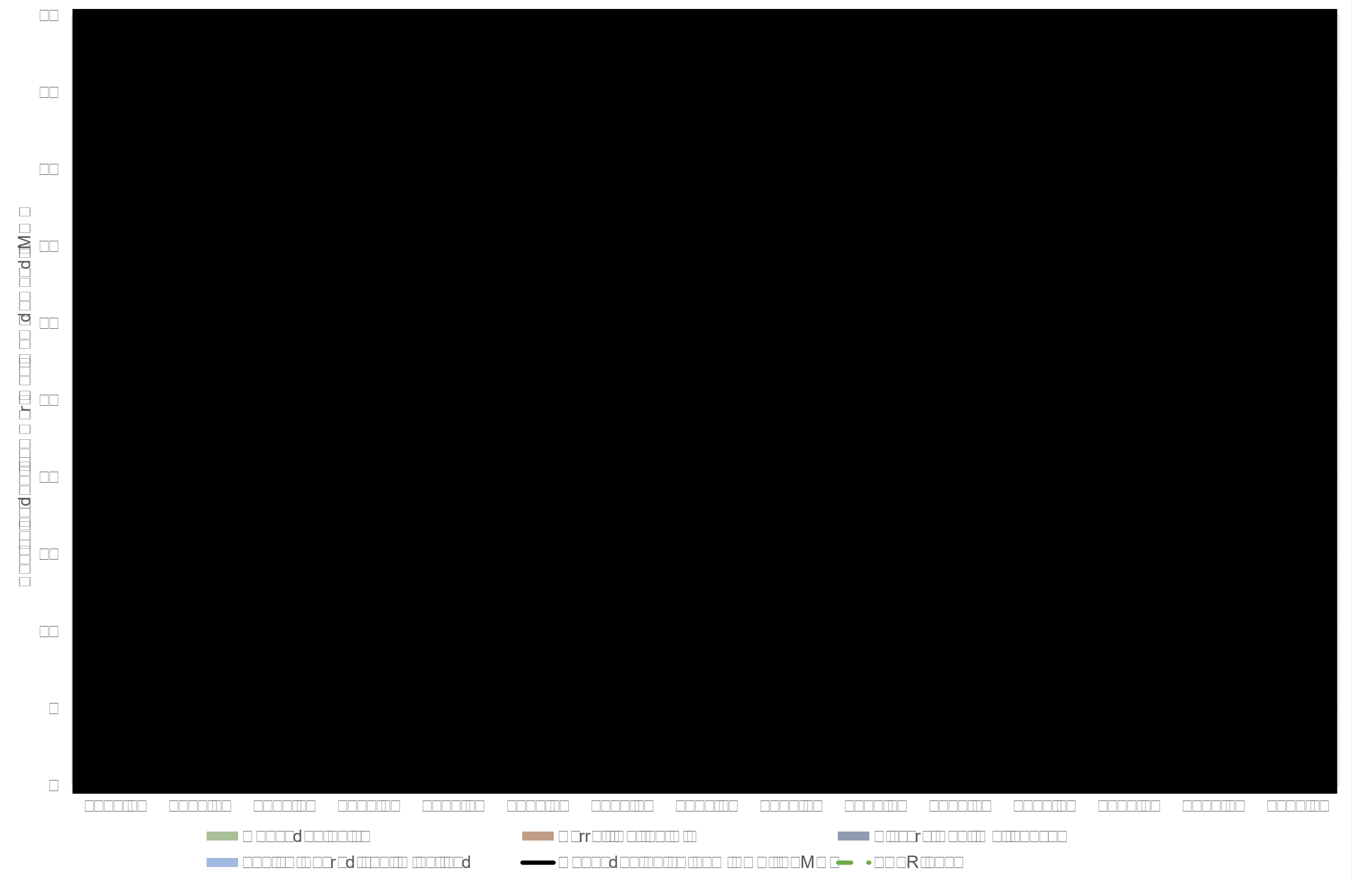

Figure 5 ***Actual and forecast 50% POE summer maximum demand for Gunnedah***

[1] Boggabri North and Bogabri East mines are connected to TransGrid's 132 kV network between Narrabri.

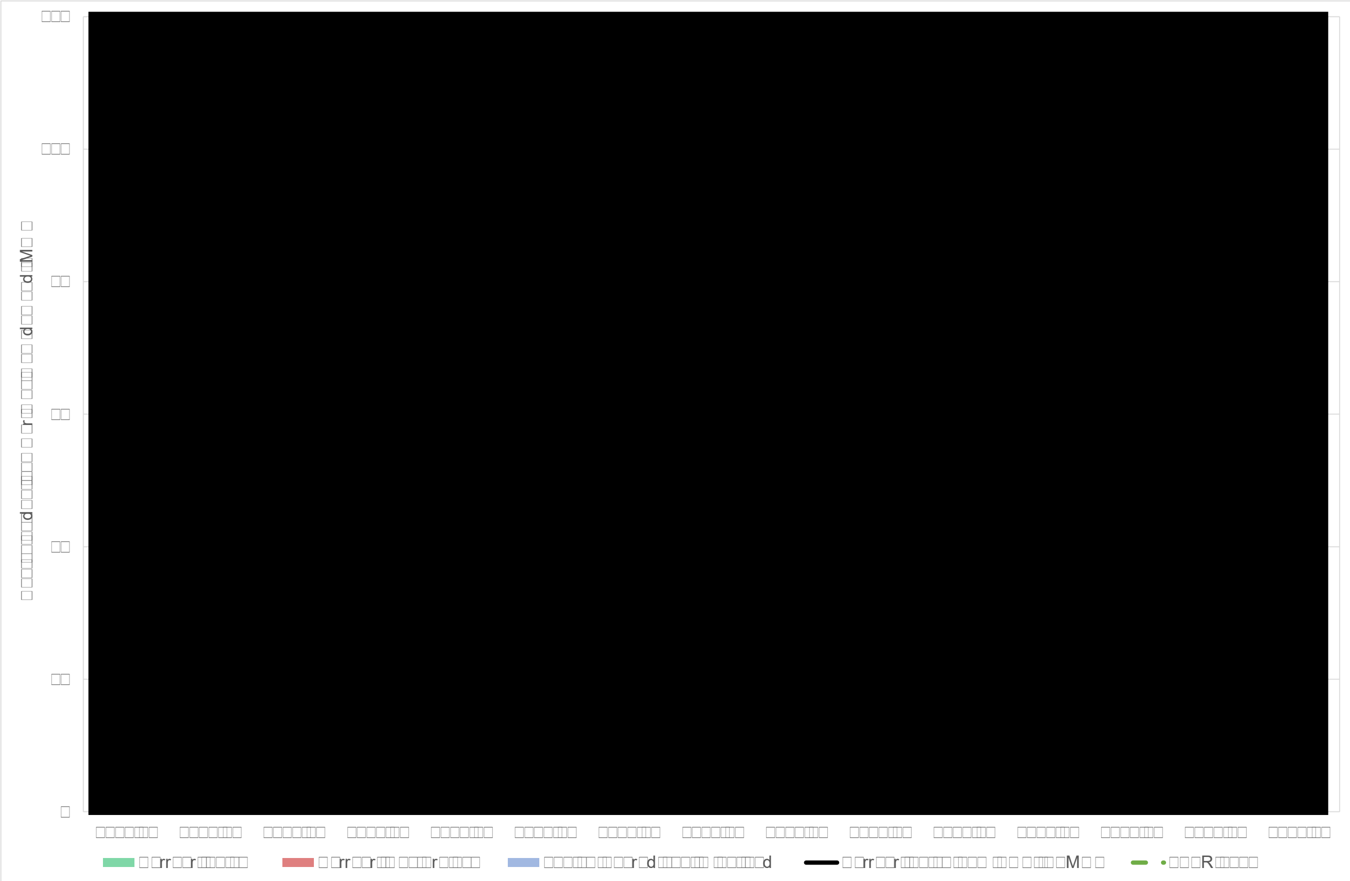

Figure 6 Actual and forecast 50% POE summer maximum demand for Narrabri

2.3 Central west NSW

[illegible]

[illegible]

[illegible] There have been no significant changes since the previous year's forecasts.

Figure 7 Actual and forecast 50% POE summer maximum demand for Orange

Last year’s forecasts were slightly higher.

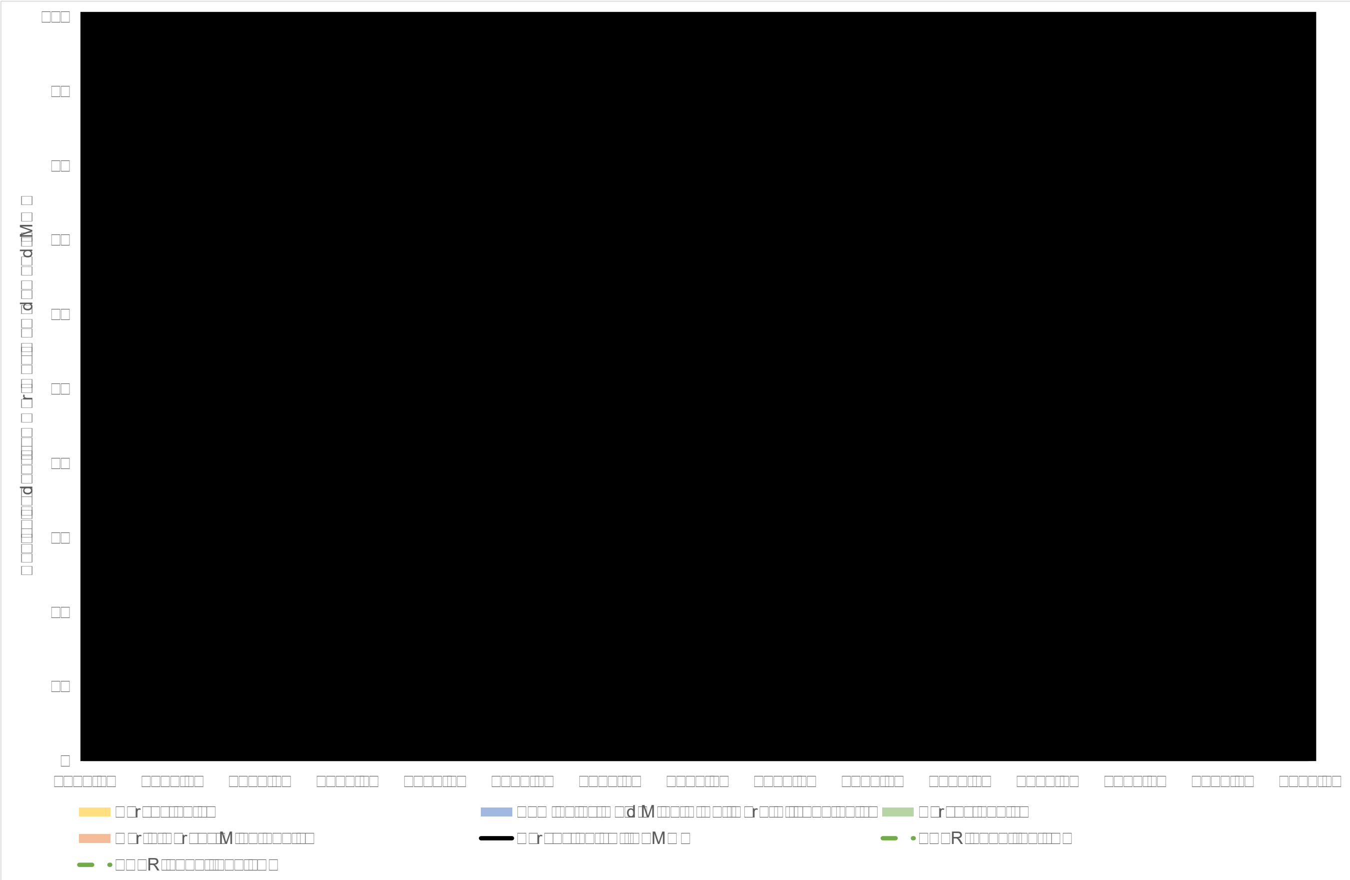

Figure 8 Actual and forecast 50% POE summer maximum demand for Parkes

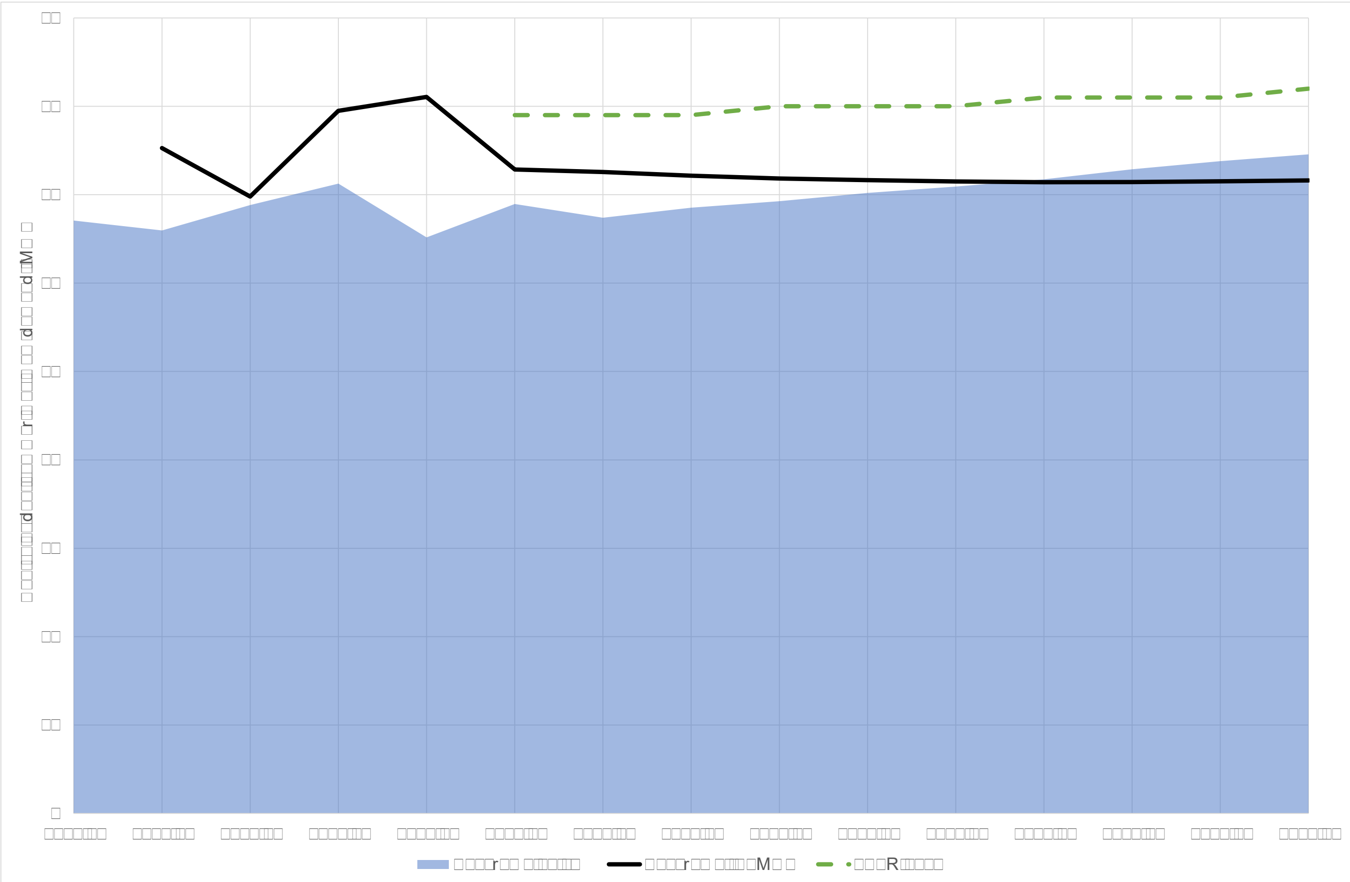

Figure 9 Actual and forecast 50% POE summer maximum demand for Panorama

[illegible]

[illegible] AEMO's zero [illegible] as well as last year's TransGrid [illegible]. AEMO's actual data, which is not temperature corrected, [illegible]

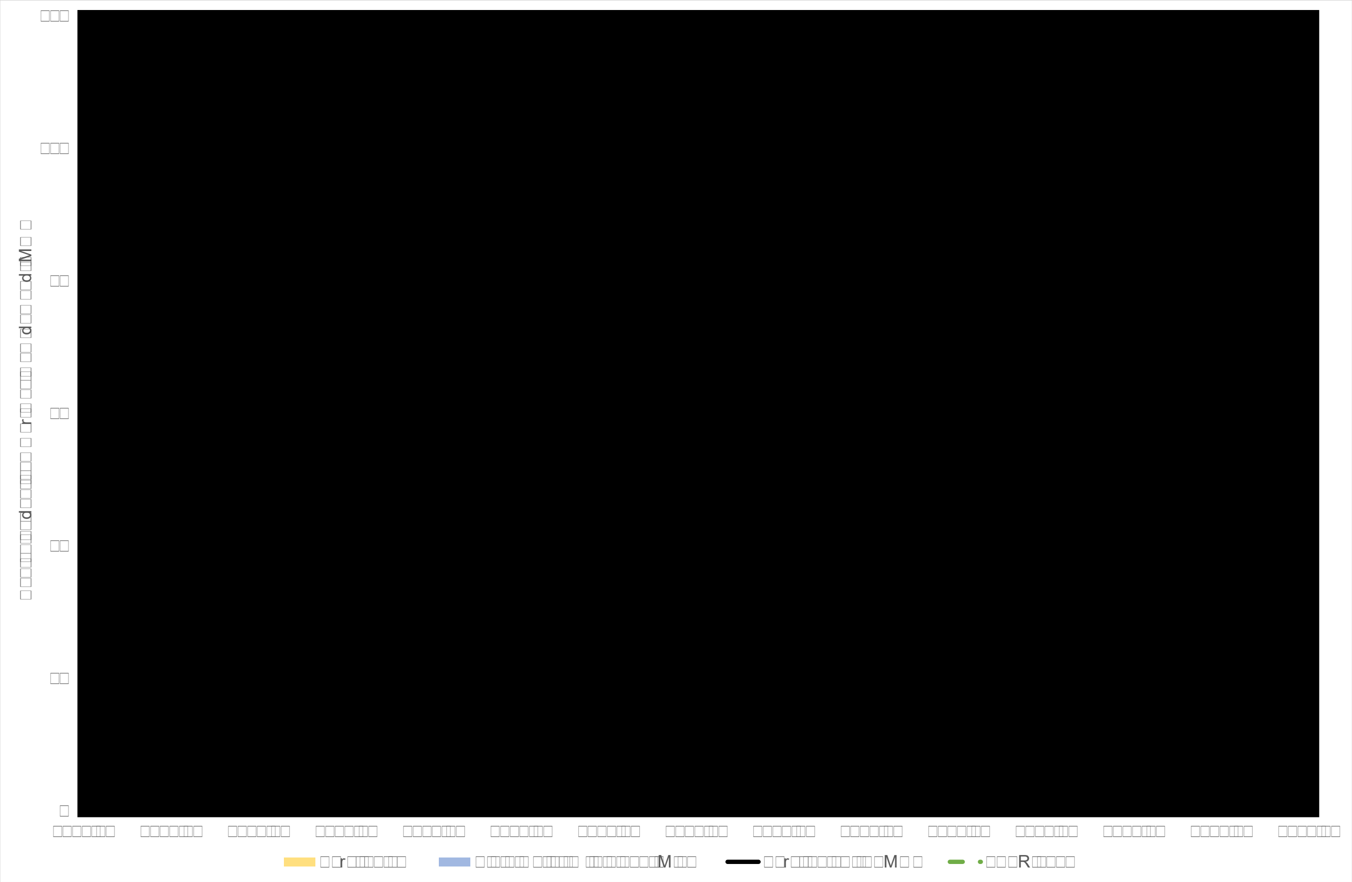

Figure 10 Actual and forecast 50% POE summer maximum demand for Beryl

2.4 Australian Capital Territory

[illegible] kV substations and from the supply to Evoenergy's Fyshwick zone substation from Queanbeyan at 66 [illegible] forward compared to the previous year's forecast.

[illegible]

Figure 11 Actual[3] and forecast 50% POE summer maximum demand for Williamsdale, Stockdill, Canberra and Queanbeyan (Evoenergy)

[3] [illegible]

2.5 Snowy Mountains

[illegible] kV and Munyang are below last year's forecasts and the forecast for [illegible]

AEMO's total forecast increase is similar, rising from 101 [illegible] AEMO include similar spot load increases at Munyang, However, AEMO's share of total [illegible] towards Munyang, compared to TransGrid's estimated 50% POE load levels.

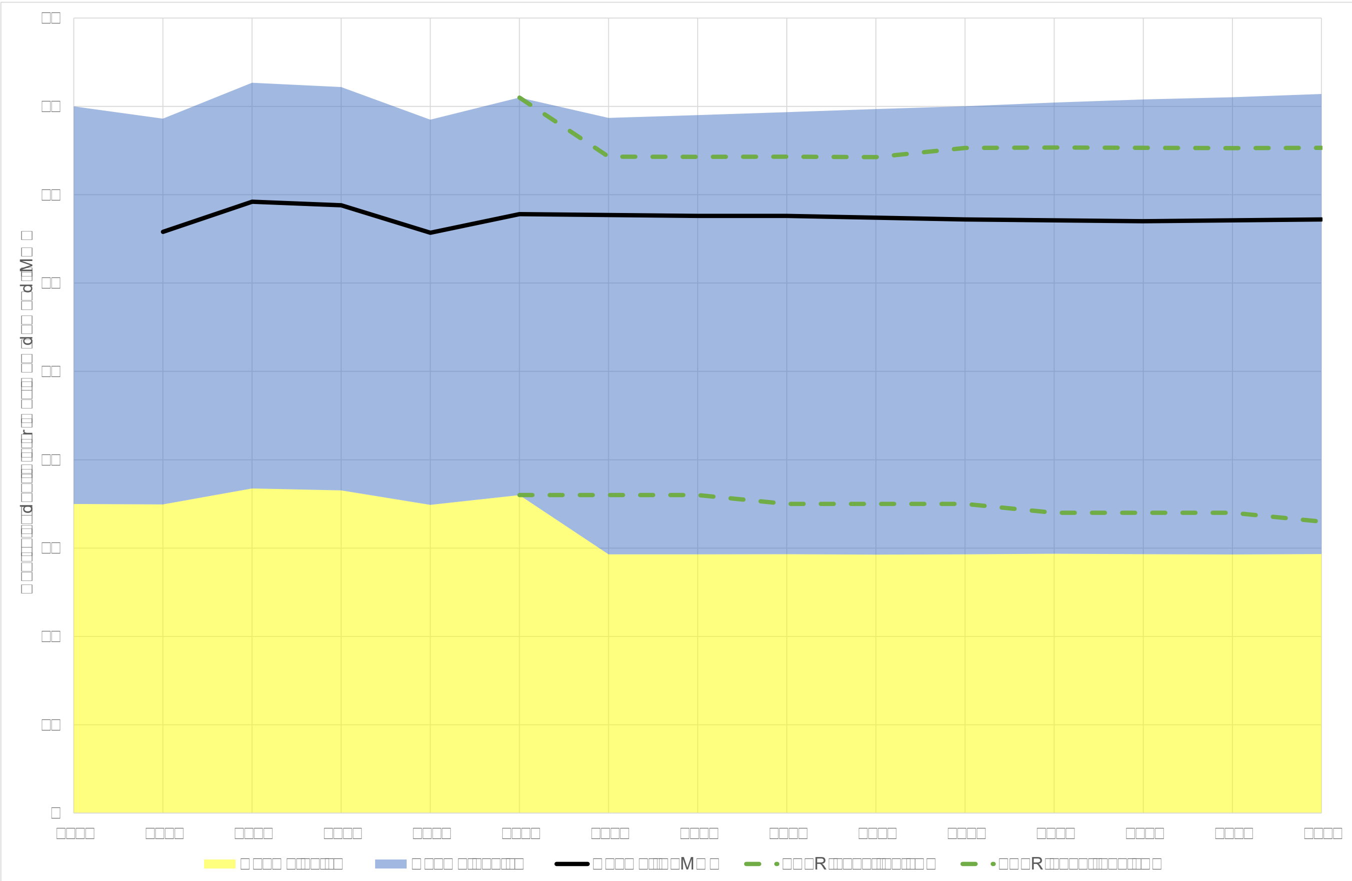

Figure 12 Actual[5] and forecast 50% POE winter maximum demand for Cooma

[4] [illegible]

[5] [illegible]

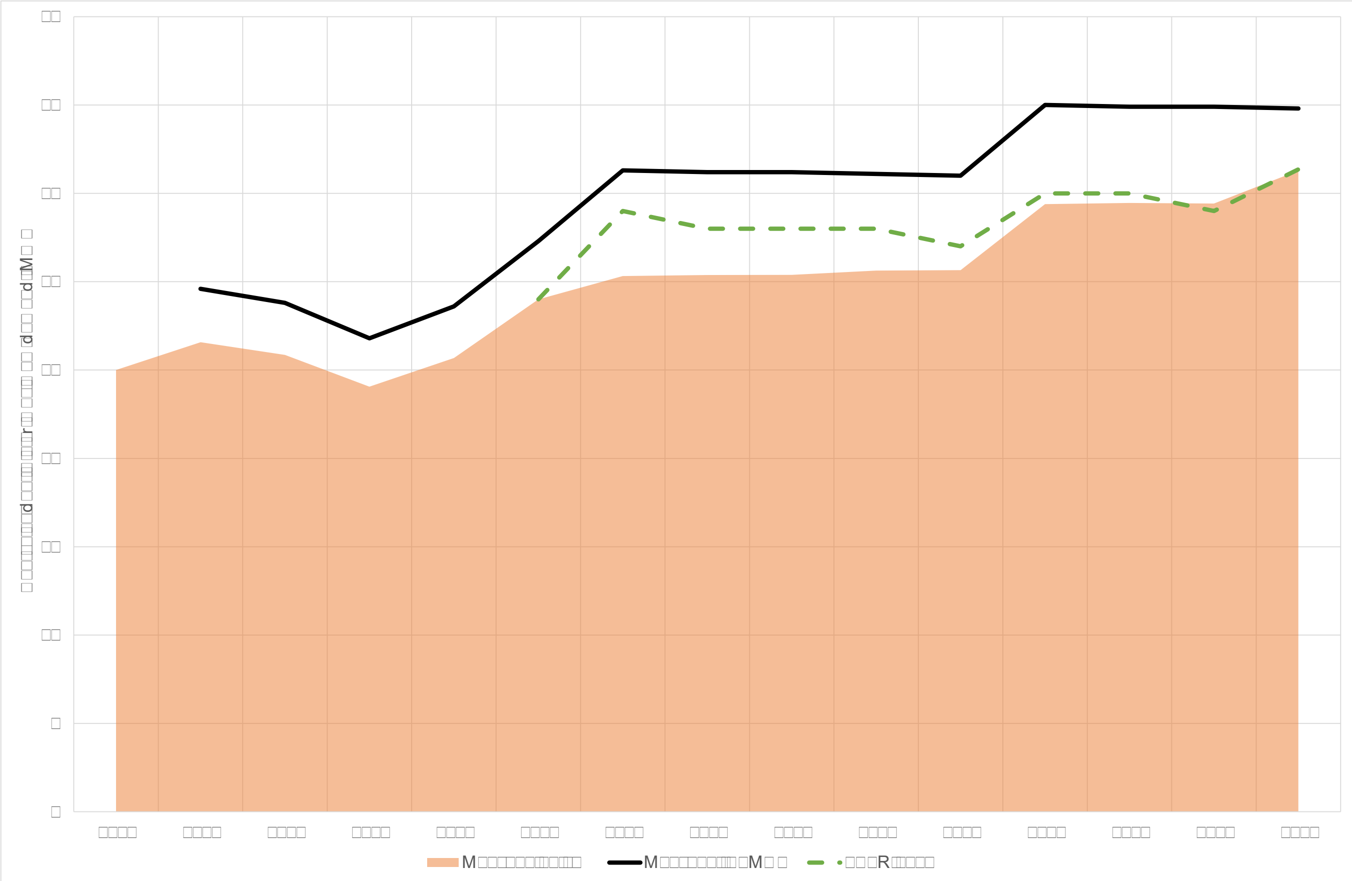

Figure 13 Actual and forecast 50% POE winter maximum demand for Munyang

2.6 Broken Hill

Last year's forecast for the 22

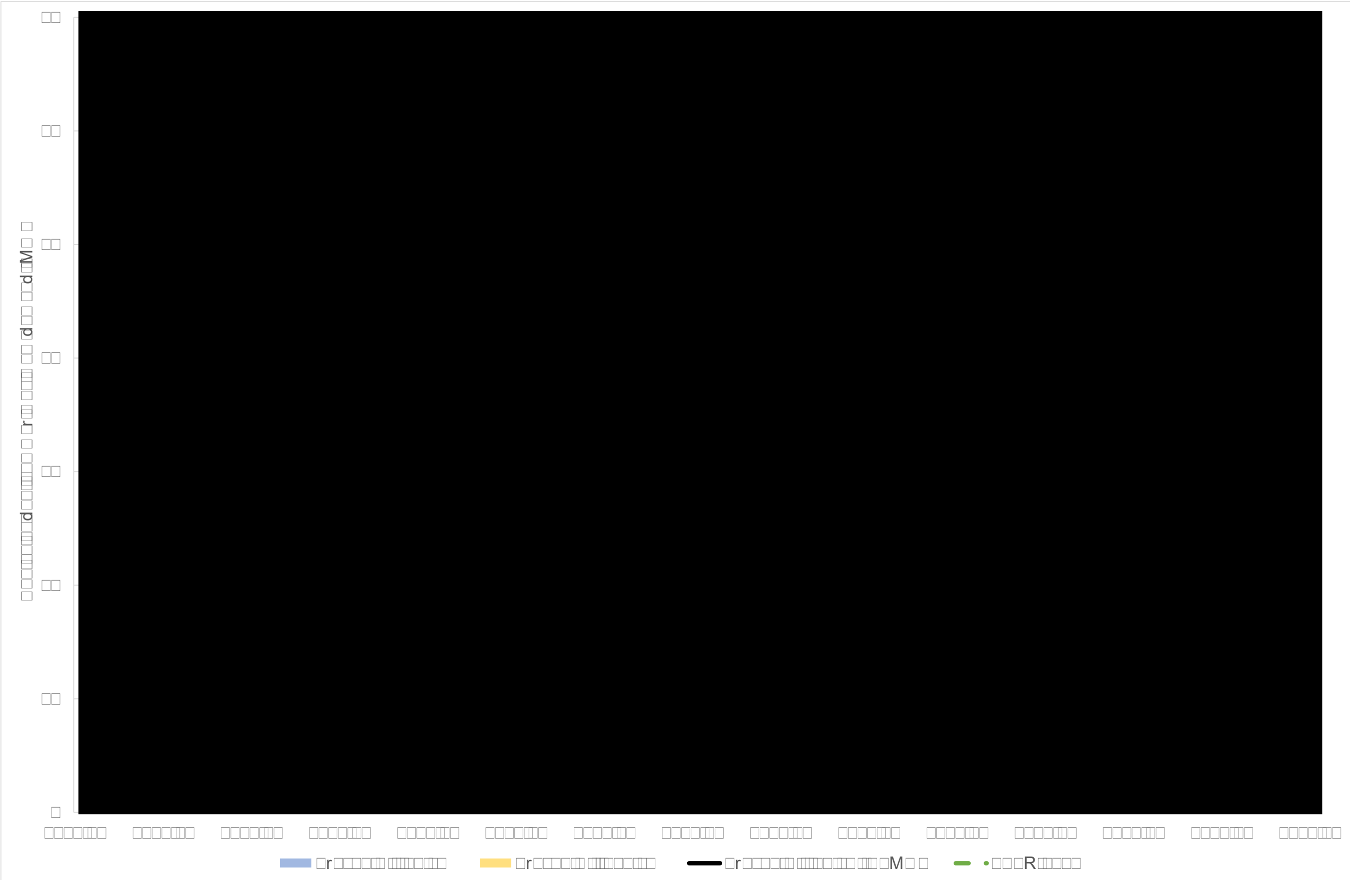

Figure 14 Actual and forecast 50% POE summer maximum demand for Broken Hill

3. Forecasting methodology

[illegible]

[illegible]

3.1 Overview of AEMO demand forecasting process

[illegible]

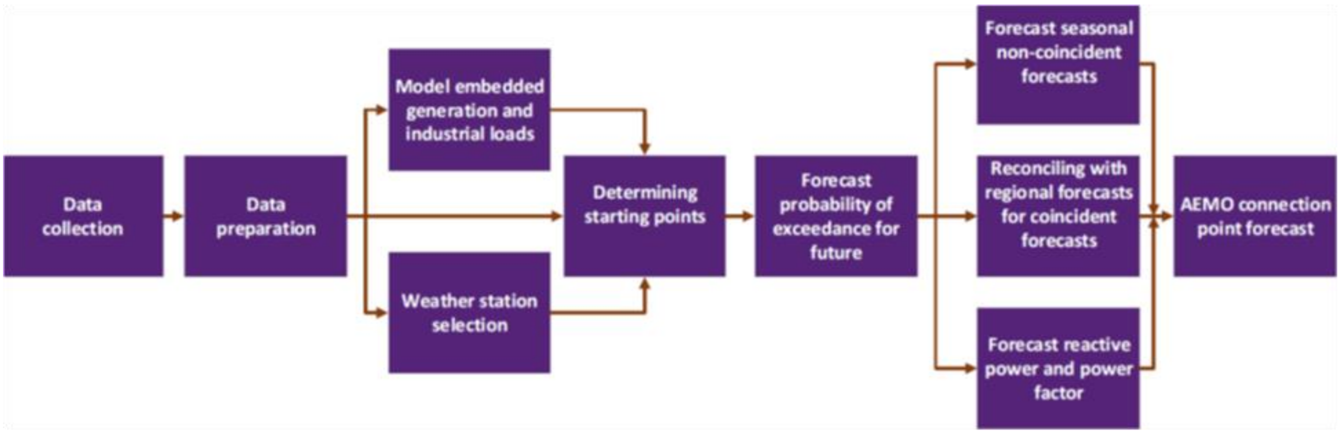

Figure 15 Complete AEMO Connection Point Forecasting Methodology

[illegible]

[illegible]

- [illegible]
- [illegible]
- [illegible]
- [illegible]
- [illegible]

[illegible]

- [illegible]
- [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Rooftop and other PV generation is added based on capacity installed forecasts provided by AEMO's consultant. [illegible]

[illegible]

[illegible]

- [illegible]
- [illegible] nting developers' projects will be converted into actual homes, [illegible]
- [illegible]

[illegible] d. AEMO also apply a "75% probability of proceeding" threshold for including [illegible]

[illegible] On AEMO's request. [illegible] AEMO's conservative approach to including [illegible] a downwards bias in AEMO's [illegible]

[illegible]

AEMO's non [illegible]

[illegible]

[illegible]

[illegible] transmission losses. AEMO's reconciliation [illegible] he past biased AEMO's connection point forecasts downwards [illegible]

3.2 Comparison of DNSP with AEMO demand forecasting processes

[illegible] of the DNSP forecast methods, compared with AEMO's approach. [illegible] of 50% POE demand levels and is a standard industry approach. While each organisation's specific forecast

Table 3 *Comparison of DNSP forecast methods with AEMO procedure*

AEMO steps in forecast preparation	Endeavour	Essential	Evoenergy
Overall:			
[illegible]	[illegible]	[illegible]	[illegible]
Data collection:			

AEMO steps in forecast preparation	Endeavour	Essential	Evoenergy
[illegible]	[illegible]	[illegible]	[illegible]
Data preparation:			
[illegible]	[illegible]	[illegible]	[illegible]
Treatment of embedded generation and industrial loads, and weather station selection:			
[illegible]	[illegible]	[illegible]	
Determining starting points:			
[illegible]	[illegible]	[illegible]	

AEMO steps in forecast preparation	Endeavour	Essential	Evoenergy
	[illegible]		
Forecast probability of exceedance for future:			
[illegible] • [illegible] • [illegible] • [illegible] [illegible]	Incorporates planner's [illegible] each zone substation's [illegible]	[illegible] "reasonably firm" step [illegible]	[illegible]
Forecast seasonal non-coincident forecasts, reactive power and power factors:			
[illegible]	Not dissimilar to AEMO's [illegible]	Not dissimilar to AEMO's [illegible]	Not dissimilar to AEMO's [illegible]
Reconciling with regional forecasts for coincident forecasts:			
[illegible] of "missing" load (those locations for [illegible] AEMO's [illegible]	[illegible]		

3.3 Treatment of spot loads

[illegible]

realisation using an 'S curve'. However, in situations where developers target a specific number of lots per year lot

connection applications proceeding as planned, Endeavour Energy applies an across the board 'load realisation probability factor'

80% is assumed for each year's specific factor. The connection point forecasts are therefore significantly below

TransGrid's Kemps Creek site. Until this new connection point is available, Sydney West will have to sup

Sydney's third city "Bradfield". Some limited support will be available from Macarthur once Endeavour Energy's

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

4. Assessment of forecast outcomes

[illegible]

[illegible]

[illegible]

4.1 Western Sydney

[illegible]

[illegible] casts cannot be directly compared with AEMO's forecasts. [illegible]

[illegible]

[illegible]

[illegible] expectations about lot releases and spot loads. The forecasts cannot be directly compared with AEMO's forecasts. [illegible]

[illegible]

[illegible]

[illegible] expectations about lot releases and spot loads. The forecast cannot be directly compared with AEMO's forecasts. [illegible]

[illegible]

[illegible]

4.2 Essential Energy north-west

[illegible]

[illegible] AEMO's forecast. The forecast w[illegible]

[illegible]

[illegible] AEMO's forecast. The forecast w[illegible]

4.3 Essential Energy central west

[illegible]

[illegible]. The underlying growth exceeds AEMO's forecast for zero [illegible]

[illegible]

[illegible] and is almost identical to AEMO's independent forecast [illegible]

[illegible]

[illegible]

[illegible]

[illegible]. The underlying growth exceeds AEMO's forecast for [illegible] growth and is almost identical to AEMO's independent forecast. Both forecasts appear to include

4.4 Australian Capital Territory

4.5 Snowy Mountains

y different to AEMO's forecast growth rate for

due to planned ski field projects. Taken together this not significantly different to AEMO's forecast growth rate for

4.6 Broken Hill

historical growth and is almost identical to AEMO's independent forecast. The forecast was prepared by Essential

5. Findings in relation to the demand forecasts

AEMO's top [illegible] st AEMO is relegating local knowledge that contributes to each connection point's future growth to [illegible]

[illegible]

[illegible] AEMO's [illegible]

It is always possible that some future spot loads that have been included in TransGrid's forecasts (i.e., after [illegible]

[illegible] d suggest that each of TransGrid's [illegible]

[illegible]

6. Implications of the findings for the AUGEX projects

6.1 Impact of Demand Forecasts

[illegible]

Table 4 Impact of load forecasts on the specified AUGEX projects

Project description	TransGrid reference	Impact of load forecast
[illegible]	[illegible]	[illegible] Under last year's forecast [illegible]
[illegible]	[illegible]	[illegible] later than under last year's forecast.
[illegible]	[illegible]	[illegible] later than under last year's forecast.
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

6.2 Project Drivers[12]

[illegible]

OER N2371

The need to provide additional bulk supply capacity into the Sydney West area to meet customers' demands for [illegible]

[illegible]

NOSA 1687

[illegible]

Endeavour Energy's existing zone substations of Luddenham, Bringelly and Kemps Creek will initially provide [illegible] currently provide supply into the area via Endeavour Energy's subtransmission and distribution network. The [illegible]

[illegible]

OER N2373

The North West Growth area in NSW Government's Precinct Planning has significant new developments pla[illegible]

[12] [illegible]

[illegible]

[illegible]

OER N2360

[illegible]

[illegible]

NOSA 1693

[illegible]

[illegible]

OER 1316

[illegible]

[illegible]

OER N2384

[illegible]

[illegible]

[illegible]

OER N2293 [illegible]

TransGrid’s Canberra 330/132 kV Substation has four 132 kV capacitors that support main grid voltage levels, [illegible]

[illegible]

[illegible]

[illegible]

OER N2645

[illegible]

[illegible]

[illegible]

NOSA 1698

[illegible]

[illegible]

Appendices

Appendix A

Endeavour Energy forecasting methodology

and TransGrid's Bulk S

forecasts for Endeavour Energy's network area. Two reference weather stations are employed for temperature

as: New Year's Day, Australia Day, and Christmas Day. In addition, a school holida

– Incorporating the network planner's inputs into the base level forecast.

[illegible]

[illegible] ast for each zone substation based on the zone substation's [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Appendix B

Essential Energy forecasting methodology

[illegible]

sites' growth (e.g. significant changes in histor [illegible]

[illegible]

model is chosen as the starting point of each sites' forecast. Where both models ge [illegible]

[illegible]

Appendix C

Evoenergy forecasting methodology

sts with those from last year's annual planning report using the same historical data. 10

$$
\begin{aligned}
\mathrm{MD}_i &\sim N(\mu_{\mathrm{MD},i}, \sigma_{\mathrm{MD}})\,, \\
\mu_{\mathrm{MD},i} &= \mu_{\mathrm{baseline},i} + \mu_{\mathrm{temp},i} + \mu_{\mathrm{growth},i}\,,
\end{aligned}
$$

$$
\begin{aligned}
\mu_{\mathrm{baseline},i} &= \beta_{00,\mathrm{MD}} + \sum_{k=1}^{N_{\mathrm{ch}}} I\,(t_i, t_{\mathrm{ch,\,k}})\beta_{0k,\mathrm{MD}}\,, \\
\mu_{\mathrm{temp},i} &= \beta_{1,\mathrm{MD}}(T_i - \min(T_i))\,, \\
\mu_{\mathrm{growth},i} &= \beta_{2,\mathrm{MD}} t_i\,,
\end{aligned}
$$

$$
\begin{aligned}
T_i &\sim \mathrm{Gumbel}(\mu_{T,i}, \sigma_T)\,, \\
\mu_{T,i} &= \beta_{0,T} + \beta_{1,T} t_i\,.
\end{aligned}
$$

$$
\begin{aligned}
\beta_{0,T} &\sim \mathrm{N}(\min(T), \sqrt{\mathrm{abs}(\min(T))})\,, \\
\beta_{1,T} &\sim \mathrm{N}(0.01, 0.001)\,, \\
\sigma_T &\sim \text{Half-Cauchy}(0, 2.5)\,, \\
\beta_{00,\mathrm{MD}} &\sim \mathrm{N}(\mathrm{mean(MD)}, 10\sqrt{\mathrm{mean(MD)}})\,, \\
\beta_{0k,\mathrm{MD}} &\sim \mathrm{N}(0, 10)\,, \\
\beta_{1,\mathrm{MD}} &\sim \begin{cases} \mathrm{N}(0,10) & \text{for maximum demand modelling}\,, \\ \mathrm{N}(0,0.1) & \text{for minimum demand modelling}\,, \end{cases} \\
\beta_{2,\mathrm{MD}} &\sim \mathrm{N}(0, 3)\,, \\
\sigma_{\mathrm{MD}} &\sim \text{Half-Cauchy}(0, 2.5)\,.
\end{aligned}
$$

$$
I(t_i, t_{\mathrm{ch},k}) = \begin{cases} 1 & \text{if } t_i \geq t_{\mathrm{ch},k}\,, \\ 0 & \text{else}\,, \end{cases}
$$

- [illegible] around zero is chosen for $\beta_{1,MD}$ [illegible]

- [illegible] model with posterior densities for the location μ and scale parameters σ [illegible]

- [illegible] A table summarising future block loads is given in Table 29. Final MD estimates at the 100α% [illegible] α)% quantiles of the posterior predictive MD density at every year. [illegible]