



Regulatory Submission

ACTEWAGL

Review of ActewAGL 2014 Demand Forecast

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 Project manager: Jeff Butler
 Author: Cliff Jones
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Jacobs Group (Australia) Pty Limited
 ABN 37 001 024 095
 32 Cordelia Street
 PO Box 3848
 South Brisbane QLD 4101 Australia
 T +61 7 3026 7100
 F +61 7 3026 7300
www.jacobs.com

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Document history and status

Revision	Date	Description	By	Review	Approved
Draft	10/12/2014	Draft for client comment	C Jones	J Butler	
Final	15/12/2014	Client comments incorporated. Impact of Royalla solar farm included (Exec Summary & section 4). Table, section 3 updated. Minor editorials.	C Jones	J Butler	S Hinchliffe
Final A	05/01/2015	Updated based on client comments, and version 0.5 of 2014 Peak Demand Forecast report dated 05/01/2015	C Jones	C Jones	S Hinchliffe

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Executive summary

Attachment 6, Section A of the AER's draft decision document outlines the AER's view of the ActewAGL's 2013 demand forecast, which was contained within the SRP.

The AER gave qualified acceptance of the 2013 demand forecast but indicated that it expected to see an updated 2014 demand forecast, with appropriate adjustments to the requested levels of augmentation expenditure, before making a final decision. The AER also made several observations about the ActewAGL 2013 demand forecast, and these are summarised in section 2 of this report.

Jacobs® has conducted a high level review of the 2014 demand forecast (version 0.3, effective date 8/12/2014), and makes the following key findings and observations:

- 1) The coincident system maximum demand in summer 2013/14 was 634.9 MVA, down 21.1 MVA (3.2%) on the previous year.
- 2) The coincident system maximum demand in winter 2014 was 623.5 MVA, up 0.6 MVA (0.1%) on the previous year.
- 3) The 2014 demand forecast report includes a new section (section 2) dealing with the accuracy of the previous 2013 forecast, and appropriate adjustments are made to the forecasts of those zone substations which had an error of greater than $\pm 5\%$ in the previous year. This is an excellent innovation, and will go a long way to satisfying the AER's concerns about inaccurate or biased forecasting.
- 4) The 2014 demand forecast report contains a 'bottom-up' zone substation forecast and a 'top-down' system level forecast, which are then reconciled. However the two forecasts are both developed using the same ActewAGL methodology, so one would expect that they will 'track each other'. It would be preferable to compare the ActewAGL system level forecast with an independent system level forecast using a different methodology. The Australian Energy Market Operator (AEMO) forecast would be ideal if it can be aligned with the time of the ACT peak demand, not the NSW peak demand.
- 5) Version 0.5 of the 2014 Peak Demand Forecast Report (dated 05/01/15) has been updated to show the continued declining trend in the system annual average load factor. This trend has been evident since at least 2004, and except for the exceptionally mild summer of 2012, when the maximum demand declined by about 15 – 20 %, it continues to show a declining trend out to 2019. The forecast period from 2014 to 2019 has been calculated based on the forecast energy growth rates contained in ActewAGL's revised regulatory proposal, which has yet to be accepted by the AER.
- 6) There has been no change to the underlying methodology used in the 2013 demand forecast, as described in section 3, 4, and 5 of the 2014 demand forecast report.
- 7) ActewAGL has made good progress on many of the process improvement and data validation issues raised in Jacob's (SKM) report of February 2014, these are summarised in section 3 of this report.
- 8) Jacobs strongly urges ActewAGL to implement a formal process for notifying of temporary load transfers (inter-zone, and intra-zone) from system control to the asset management/system planning groups.
- 9) The 2014 demand forecast report does not make any mention of demand side solutions or projects. At an absolute minimum it should comment on the Royalla solar farm, which may account for the 2 MVA load reduction that has occurred at Theodore. It should also make mention of other committed or probable demand side/embedded generation, even if the forecasts don't reflect them until they are committed projects.
- 10) ActewAGL has provided some preliminary information on the initial impact of the Royalla solar farm on the loading of Theodore zone substation, and this is summarised in section 4 of this report. It does not impact on ActewAGL's augmentation capital expenditure forecast.

Observations that relate specifically to proposed system augmentation projects in the 2014-19 regulatory period are as follows:

- The 2014 demand forecast for Molonglo is marginally different to last year's forecast, but the commissioning date in the forecast appears to have slipped back to pre-winter 2020. The 2014 demand forecast report neither supports nor undermines the justification for Molonglo.
- The 2014 demand forecast for Belconnen starts off lower than the previous forecast, but rises quickly to 73.5 MVA by 2019, due to an increased magnitude of known block load increases. However, the peak summer demand then 'flat-lines' at 73.5 MVA from 2019 to 2024, making it difficult to justify the upgrade proposed for Belconnen.
- The 2014 demand forecast for East Lake zone substation includes significant load transfers in 2016 (10.2 MVA) and 2018 (12.7 MVA). The subsequent magnitude of total load on East Lake virtually dictates that the second transformer be installed there in 2016. There do not appear to be any system constraints at Fyshwick or Telopea Park that requires these load transfers to be made.

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to provide input into ActewAGL's 2014-19 Regulatory Proposal in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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1. Introduction

Jacobs Australia Pty Ltd has been engaged by ActewAGL to conduct a high level review of the ActewAGL 2014 Peak Demand Forecast Report, and to provide a brief assessment of:

- The general accuracy of the input data used to generate the report
- The reasonableness of any assumptions or estimations used in generating the demand forecast
- The extent to which ActewAGL have addressed the recommendations and suggestions previously made by Jacobs after reviewing the 2013 Peak Demand Forecast Report
- The extent to which the 2014 peak demand forecast supports (or otherwise) the need for the major projects included in the augmentation capex forecast for the 2014 – 19 regulatory period.

Initially, Jacobs proposed also to conduct an audit of the functionality of the “R” statistical model, and to conduct validation checks on a sampling basis, of the historical maximum demand data used as inputs into the model. Ultimately, these validation and audit checks were not undertaken, but Jacobs would recommend to ActewAGL that they should consider undertaking such checks for future demand forecasts.

This report summarises the results of Jacobs’ investigations, and presents an opinion of the robustness of the 2014 zone substation peak demand forecast.

2. Overview of AER's position on ActewAGL's 2013 demand forecast

Section C of the AER's draft decision document summarises the AER's view of ActewAGL's 2013 demand forecast. AER expresses qualified acceptance of the ActewAGL demand forecast, with some reservations about differences with AEMO demand forecasts for the ACT, and an historical tendency towards over-forecasting by DNSP's.

Some key statements from the AER's draft decision are:

- We are satisfied the system demand forecasts in ActewAGL's regulatory proposal for the 2014–2019 period reasonably reflects a realistic expectation of demand. The demand forecasts in ActewAGL's regulatory proposal for the 2014–2019 period exhibit similar growth trends to its regulatory proposal for the 2009–2014 regulatory control period
- Accurate, or at least unbiased, demand forecasts are important inputs to ensuring efficient levels of investment in the network. For example, overly high demand forecasts may lead to inefficient expenditure as NSPs install unnecessary capacity in the network
- However, we understand the NSPs are in the process of further updating their demand forecasts. We consider the forecasts in our decisions should reflect the most current expectations of the forecast period. Hence, we will consider updated demand forecasts and other information in the final decision to reflect the most up to date data. We would also expect ActewAGL's expenditure forecasts to reflect updates to its demand forecasts
- The AEMO forecasted similar trends of system demand growth for ActewAGL's network and for the NSW region more generally. We note AEMO downgraded its demand forecast for the NSW region in its most recent report
- ActewAGL's forecast demand growth rates display a similar trend to AEMO's forecasts, although the absolute values of ActewAGL's demand forecasts are higher than AEMO's forecasts
- Figure C-1 shows our comparison between ActewAGL's system demand and AEMO's CP demand for the ActewAGL network. It shows the growth trend for ActewAGL's system demand forecast is consistent with AEMO's CP forecasts for the 2014–2019 period. This is despite having different datasets and forecasting approaches (see below). This gives us a level of confidence the trend in ActewAGL's forecasts are realistic
- Figure C-1 also indicates there are differences in ActewAGL's and AEMO's historical data. In addition, ActewAGL's forecasts are consistently higher than AEMO's forecasts. Indeed, ActewAGL's forecast at 50 per cent probability of exceedance (PoE) is consistently above AEMO's 10 per cent PoE forecasts.
- ActewAGL, and the other NSW/ACT DNSPs, noted several differences in the datasets it used to derive its forecasts and AEMO's datasets. These included:
 - Different treatment of major customers and embedded generation
 - Different timing: several NSPs stated they used financial years whereas AEMO used seasons to define their data
 - Different levels of coincidence: ActewAGL noted AEMO's coincident demand figures are coincident to the NSW regional demand. On the other hand, ActewAGL's coincident demand was coincident to its own system demand
- Our analysis in Figure C-1 indicates ActewAGL's demand forecasts exhibit growth patterns consistent with AEMO's. However, we will monitor the accuracy of ActewAGL's demand forecasts in future regulatory years to check for any indications of bias. This in turn would aid in monitoring potentially inefficient expenditure levels in the network.

3. Summary of progress against previous Jacobs recommendations

The following table summarises the key elements of Jacobs previous recommendations for enhancing ActewAGL's demand forecasting methodology and data collection processes, together with ActewAGL's progress to date against each recommendation.

Jacobs Recommendation	ActewAGL Progress to Date
1. Update with 2013 (and 2014) load data (excl. temporary load transfers)	Done
2. Review 2013 summer data to ensure all temporary load transfers are excluded	Not done
3. Change selection of three peak demands (S) and (W) to three absolute highest demand days	Done. In addition, peak demand days are correlated directly with the maximum and minimum temperatures on the exact day
4. Establish formal notification process from system control all for inter-zone load transfers	Being considered for 2015
5. Establish formal notification process from system control for all intra-zone load transfers	Being considered for 2015
6. Cease practice of forecasting peak 11 kV feeder loads outside of summer and winter peak months	Not applicable to current review
7. Reduce 11 kV feeder forecasts from 10 years to three or five years	Not applicable to current review
8. Continue to update the PV and DM sections of the zone development reports	The PV and DM sections of the zone development reports should include similar information to that included in this report in respect of the Royalla solar farm (refer section 4). Similarly, the SAPR should include the impact of PV and DM, as well as permanent load transfers on future systems loads. The demand forecasts in both documents should be aligned, and should be 'future state forecasts', not 'current state forecasts'.
9. Continue to update demand forecasts with planned block load increases from Customer Service database	Done. ActewAGL estimates of block load demand increases are used, to the extent that they exceed normal annual growth. Good level of confidence in the information.
10. Reconcile ActewAGL zone historical and forecast loads and diversity factors with BSP's and system	Not done. Requires revenue class metering at zone subs. Future project
11. Produce zone MD forecast in a 'future state' format, including new zones and load transfers	Done
12. Reconcile demand forecast with energy forecast to produce average annual system load factor	Version 0.5 of the 2014 Peak Demand Forecast has been updated to include the system annual average load factor, based on a revised energy forecast included in the revised regulatory proposal

Jacobs Recommendation	ActewAGL Progress to Date
<p>13. In longer term, consider revisiting the 'confidence interval approach'</p>	<p>Confidence interval has been retained, but minor adjustments have been made to forecasts for individual zones where past forecasts exceed $\pm 5\%$ error. This should progressively improve the accuracy of future forecasts</p>

4. Review of zone substation forecast outcomes

The following 'substation by substation' review has been undertaken by comparing the 2013 demand forecast contained in the SRP (which the AER has accepted as reasonable) with the new 2014 demand forecast. ActewAGL should be in a position to explain any material differences in the forecasts at the time of the final submission to the AER (mid-January).

Angle Crossing:

Not shown in 2013 forecast. Good move to include it here for the sake of completeness.

Belconnen:

Forecast summer load in 2015 is down 1.1 MVA from previous forecast, but increases to 73.5 MVA by 2019. This is just below the new two hour emergency rating of 74 MVA. The forecast demand 'flat-lines' at 73.5 MVA from 2019 to 2024. The flat-lining is reported to be due to the well-established nature of the supply area, no known block load increases after 2018, and any generic load growth being minimal.

City East:

Forecast summer load in 2015 is up 8.6 MVA from the previous forecast, possibly due to a load transfer from Civic. Demand 'flat-lines' at 92.6 MVA after 2017, just below the two hour emergency rating of 95 MVA.

Civic:

Forecast summer load in 2015 is down 11.1 MVA from the previous forecast, possibly due to a load transfer to City East. Demand 'flat-lines' at 61.8 MVA after 2020, well below the two hour emergency rating of 114 MVA.

East Lake:

Forecast summer load in 2015 is unchanged from the previous forecast, but jumps by 10.2 MVA in 2016 and a further 12.7 MVA in 2018. This is as a result of planned 11 kV load transfers from Fyshwick zone substation. These load transfers necessitates ActewAGL give serious consideration to installing a second transformer at Eastlake in 2016 or 2017.

Fyshwick:

Forecast summer load in 2015 is down by 5.8 MVA from the previous forecast, and down by 10.0 MVA by 2019. This reflects a deliberate attempt to offload the Fyshwick substation (onto East Lake zone), even though upgrade works are planned for Fyshwick at the same time.

Gilmore:

Forecast summer load in 2015 is up 1.9 MVA from the previous forecast, increasing to 2.5 MVA in 2019. The forecast model for Gilmore has been adjusted to compensate for the error in the previous forecast (-16%).

Gold Creek:

Forecast summer load in 2015 is up 3.6 MVA from the previous forecast, and is 1.4 MVA higher in 2019. The forecast model for Gold Creek has been adjusted to compensate for the error in the previous forecast (-8%).

Latham:

Forecast summer load in 2015 is down 2.2 MVA from the previous forecast, and is down 2.0 MVA in 2019. The forecast is within the $\pm 5\%$ accuracy objective, and no adjustments have been made to the model. The maximum

load is well below the two hour emergency rating of 95 MVA, and load is transferred off Latham in 2023 with the establishment of West Belconnen zone substation.

Telopea Park:

Forecast summer load in 2015 is down 3.8 MVA from the previous forecast due to load transfers to East Lake. The 2019 summer load forecast is up by 6.9 MVA due to highly probable block load increases.

Theodore:

The summer and winter maximum demand on Theodore zone substation is currently being assessed to determine the impact of the operation of the new Royalla Solar Farm.

The solar farm was commissioned in late 2013, or early 2014, and the first registered meter reading was recorded on 15/08/2014. The solar farm is operating on a 24 hour, seven day a week basis, but is only generating energy into the Theodore 11 kV bus during daylight hours. Outside daylight hours, the solar farm is consuming an average of 39.65 kW per 15 minute interval.

During winter the solar farm reaches its peak output between 11am and 1pm Australian Eastern Time, at approximately 20.3 MVA, but did not materially contribute to any reduction on the peak winter loading on Theodore zone substation, as sunset is typically before 6pm, while the peak winter load is between 6pm and 7pm.

The solar farm's output in summer will have some impact on Theodore zone substation peak summer demand, due to the longer daylight hours, and the effect of daylight saving, however the magnitude of the impact is yet to be determined.

Excluding the potential impact of the Royalla Solar Farm, forecast summer load on Theodore zone substation in 2015 is down 1.9 MVA from the previous forecast. The 2019 summer load forecast is down by 2.3 MVA.

Wanniassa:

Forecast summer load in 2015 is down 2.5 MVA from the previous forecast, and down by 1.9 MVA in 2019. Probable block load increases have been included, and there are no known load transfers planned. The forecast is within the $\pm 5\%$ range of acceptability.

Woden:

Forecast summer load in 2015 is up by 7.7 MVA from the previous forecast, and is forecast to be up by 12 MVA in 2018 over the previous forecast. The main reason for the significant increase is a range of residential, commercial and community developments in Woden and Molonglo.

Molonglo:

The forecast summer load for Molonglo is down by 1.0 MVA initially, but increases quickly to be 1.5 MVA higher than the previous forecast by 2023. In addition, the commissioning date for Molonglo appears to have been put back by one year to pre-winter 2020. When established, Molonglo will pick up load from Woden and Civic zone substations.

West Belconnen:

West Belconnen zone substation was not listed on the previous 2013 demand forecast, and is shown in this forecast commencing in the winter of 2022. West Belconnen is expected to be required to supply a future planned development in NSW.