AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

FRG CONSULTATION

LONG-TERM BUSINESS MASS MARKET FORECASTS

Published: **September 2021**

1. STAKEHOLDER CONSULTATION PROCESS

The Australian Energy Market Operator (AEMO) commenced a consultation on its Electricity Demand Forecasting Methodology[1] (the Methodology) in December 2020, one component of which was Business Mass Market (BMM). During the 26 May 2021 Forecasting Reference Group (FRG) meeting, AEMO presented draft 2021 consumption forecasts, including a slide indicating the linear decline in energy intensity assumed in the Methodology was unlikely in the long term, and inviting discussion. Further, as the long term projections from multi-sectoral modelling became available to AEMO, it became apparent that a change to the Methodology's energy intensity modelling was required to align the multi-sectoral modelling with the BMM consumption forecasts.

As the Methodology is part of AEMO's Forecasting Approach, Section 2.1 of the FBPG sets out the use of FBPG Appendix B as the relevant consultation process. Appendix B requires that Consulted Persons be invited to make written submissions over no less than 30 calendar days. In planning the consultation, AEMO saw several factors as relevant in considering how to meet the intent of the stakeholder engagement principles:

- The 30 calendar day submission window would leave no time for the change in methodology to be implemented for the 2021 demand forecasts and therefore limit ability for AEMO to integrate the multi-sectoral modelling into the consumption forecast.
- The long term nature of the matter ensures there are no material impacts of the proposed change in the timeframe of the Reliability Forecast (that is, 0-5 years).
- The change is compatible with the extensive stakeholder consultation feedback on the inputs, assumptions and scenarios.

As AEMO was unable to conduct a full single stage consultation in accordance with FBPG Appendix B in the remaining time available to produce the demand forecasts, AEMO concluded it was appropriate to instead conduct an FRG Consultation, consisting of a 14 calendar day submission window, with 26 May FRG considered as the opportunity for discussion. AEMO's process for FRG Consultations is set out in Section 2.3.2 of its Reliability Forecasting Guidelines. To further support stakeholders in understanding the technical nature of the topic, AEMO distributed a six page consultation document[2], which is essential background for readers of this report.

As the discussion during the 26th May FRG is reflected in the meeting minutes[3], this FRG Consultation report focuses on the two written submissions received – one from Origin Energy, and a combined submission from CitiPower & Powercor.

AEMO's timeline for this consultation is outlined below.

Deliverable	Indicative date
Electricity Demand Forecasting Methodology consultation	18 Dec 2020 – 26 May 2021
FRG discussion on energy intensity trajectories	26 May 2021
Notice of FRG Consultation circulated to stakeholders	10 June 2021
FRG Consultation submissions due	25 June 2021
Inputs Assumptions and Scenarios Report (IASR) published[4]	30 July 2021

[1] Available at: https://aemo.com.au/en/consultations/current-and-closed-consultations/electricity-demand-forecasting-methodology

[2] Available in: https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/other_meetings/frg/consultations/2021/frg-consultation-long-term-bmm-forecasts.zip

[3] Available at: https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/other_meetings/frg/2021/frg-meeting-5-pack.zip

[4] Available at: https://aemo.com.au/en/energy-systems/major-publications/integrated-system-plan-isp/2022-integrated-system-plan-isp/current-inputs-assumptions-and-scenarios

Deliverable	Indicative date
FRG Consultation report published	21 September 2021

AEMO notes that two written submissions were received to this consultation, which is the same number of submissions received on details of BMM forecasts when consulted on under the Methodology earlier in the year.

2. CONSULTATION DETAILS

AEMOs Electricity Demand Forecasting Methodology, describes all demand forecasting components of AEMO's Forecasting Approach, including residential and business demand. Business demand is separated into Large Industrial Loads (LIL) and the remainder, titled 'Business Mass Market' (BMM). Electricity Consumption in the BMM is modelled as:

$$BMM_Cons_t = economic\ impact_t + electricty\ price\ impact_t + electrification\ impact + energy\ efficiency\ impact_t + climate\ change\ impact_t$$

During AEMO's 2021 Inputs, Assumptions and Scenarios Report (IASR) consultation, stakeholder input identified the need to consider a range of energy futures that incorporate the broader impacts of fuel-switching and electrification of new and existing sectors that may not have been strongly captured in previous demand forecasting approaches.

AEMO engaged the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and ClimateWorks Australia (CWA) to forecast potential pathways for emissions reductions of Australia's economy. This multi-sectoral modelling[5] projected the impact such pathways may have on future electricity demand in the National Electricity Market (NEM), among other things. This required AEMO to reconsider its existing approach to forecasting BMM in particular, to better align with the multi-sectoral modelling and maintain internal modelling consistency. A new approach that leveraged scenario-specific changes in energy intensity over time was therefore proposed and consulted on.

The proposed method entailed the use of energy intensity within the economic impact component of BMM. Specifically, applying an exponential decay equation with two fitting parameters on 10 years of historical energy intensity data based on using ordinary least squares regression:

$$\text{energy intensity} = \mathrm{A} * t^{-B}$$

where A and B are the fitting parameters and t is time in financial years. In the forecast this equation is applied with the extrapolation adjusted by multi-sectoral modelling outputs (that capture energy intensities for different business sectors) where available.. For scenarios where no multi-sectoral modelling outputs are available, a simple extrapolation is used instead. Following the above development of energy intensity forecasts for each scenario, the economic impact to BMM energy consumption is calculated by multiplying the energy intensity forecast by the economic forecast. The 2021 economic forecast used GDP as an economic metric, which reasonably explained the data.

In the context of its consultation document, AEMO asked for stakeholder feedback on the following questions:

a) Is it appropriate to use a method which can reflect sectoral energy use? Is the use of energy intensity suitable for that purpose?

[5]CSIRO's Multi-sector modelling report is available at: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/isp/2021/csiro-multi-sector-modelling.pdf

b) Should the model allow energy intensity to change as a function of time, thus allowing bottoming out, plateauing, step changes or other shapes to occur where the inputs, assumptions and scenarios describe them?

c) Given that scenario narratives don't detail energy use of all sectors individually, is it appropriate to apply a dispersion in the manner described, or are superior alternatives available?

d) Should, and how might, the multi-sectoral modelling results or other studies be used to validate the BMM forecasts?

AEMO received two written submissions, from Origin Energy and CitiPower & Powercor.

3. DISCUSSION OF MATERIAL ISSUES

3.1. Application of long term trends

3.1.1. Issue summary and submission

Origin Energy requested further transparency on how AEMO intends to use these long-term trends in its modelling. Specifically,

> We support the proposal to use non-linear trends, such as an exponential decay, for long-term energy intensity projections. It is not clear, however, how these will be applied in practice for each sector and scenario. We understand AEMO may need to make distinct assumptions for energy intensity trends for the different sectors and across the various scenarios to capture the likely differences in consumption drivers, such as electrification and uptake of electric vehicles.
>
> AEMO should therefore clearly explain how these assumptions and trends will be chosen to improve transparency. In addition, AEMO should ensure its energy intensity and other assumptions (such as electrification) are consistent with the IASR.

3.1.2. AEMO's Assessment

AEMO have used the same approach for each scenario which incorporated Multi-sector modelling. The approach was described in the June FRG[6], which occurred after the above submission was made. In that FRG meeting, CSIRO presented various long-term energy use trajectories for different sectors. These trajectories guide AEMO's energy intensity figures. For the remaining scenarios without electrification (Slow Change and Steady Progress), the regression modelled trend of energy intensity decline was utilised for the long term outlook. AEMO considered CSIRO's manufacturing and mining forecasts to be indicative of the LIL segment as it is dominated by these industries. AEMO aggregated the results of the remaining industries that CSIRO provided per scenario, and from that, inferred the equivalent energy intensity value per scenario. AEMO applied this long term energy intensity trend to guide its long term BMM forecast, checking the outcomes were consistent with the application of the energy efficiency forecast provided by SPR as well. The outcomes of this process were shown in Presentation 3 of the June FRG and the method is now documented in Section 2.3.2 – 'Long-term causal model' of the Demand Forecasting Methodology.

3.1.3. AEMO's conclusion

CSIRO's multi-sectoral modelling report, informed and published alongside the IASR on 30 July 2021, described its view of each sector's energy use. The methodology has now been updated to incorporate AEMO's use of CSIRO's forecasts.

[6] Available at: https://aemo.com.au/-/media/files/stakeholder_consultation/working_groups/other_meetings/frg/2021/frg-meeting-6-pack.zip

3.2. Sector specific energy use

3.2.1. Issue summary and submission

CitiPower & Powercor requested further information on other methods to represent business market sectors, including data centres and other new greenfield or brown field developments.

> Spatial factors are critical to any assessment, as new development or increased energy intensity will not always occur in areas where energy usage has previously declined. Even in the cases where this has occurred, the existing network may need extensive modification to meet customer needs. We would like to see further information on this topic and how AEMO intends to reflect these nuances.

3.2.2. AEMO's Assessment

AEMO notes that stakeholders with an interest in spatial outcomes should refer to its Connection Point forecast[7]. Following stakeholder feedback to the Electricity Demand Forecasting methodology consultation, AEMO clarified that the Electricity Forecast is not appropriate for use by organisations seeking insights into distribution costs at a spatial level.

As outlined in the BMM consultation document, AEMO faces practical challenges in obtaining suitably defined data to support spatial forecasts, and sub-regional or regional demand forecasts are sufficiently granular for ESOO and ISP purposes.

AEMO has meter data aggregated across sectors for regional consumption forecasts. Thus, data centres, which are not large enough to constitute an LIL, are contained within Business Mass Market. In contrast, the economics forecast captures Data Centres under the IT component within the Services category rather than as a standalone item. The different classifications are a fundamental challenge to providing more detailed forecasts.

AEMO understands that Data Centre electricity consumption has experienced essentially linear growth in the last four years, and this understanding has been used in the BMM forecast. As there has not been a step change in Data Centre load, AEMO does not consider a special adjustment at the regional level to be warranted.

AEMO receives information from NSP's on significant connections such as data centres, and this is incorporated in the Connection Point forecast.

3.2.3. AEMO's conclusion

The 2021 ESOO and 2022 ISP use regional and sub-regional level forecasts described above in Section 3.1 and the IASR on 30 July 2021.

AEMO works with NSP's to publish Connection Point Forecasts[7] to support the needs of organisations needing spatial information.

3.3. Dispersion of energy intensity

3.3.1. Issue summary and submission

Responding to AEMO's question on applying the dispersion method to scenarios described in the FRG Consultation document, CitiPower & Powercor submitted that:

> We believe that all attempts should be made to gather energy usage data for individual industries before utilising a dispersion technique.

[7] Available at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-and-planning-data/transmission-connection-point-forecasting

3.3.2. AEMO's Assessment

AEMO's electricity meter data is stored by National Meter Identifier (NMI). As AEMO has a list of LIL NMIs, their data can be separately totalled, with the remainder split as Business Mass Market or Residential. As the relevant NEM metering data procedures do not natively support industry classification, this has historically limited AEMO forecasts to these highly aggregated sector level (LIL, Business Mass Market, Residential).

For 2021, CSIRO provided projections for manufacturing, mining, agriculture, stationary transport and commercial buildings. AEMO has used CSIRO's projections to guide its long term forecast trajectory at the aggregated level across several scenarios.

While AEMO considers that CSIRO's sub-sector level projections increase the collective understanding of forecast drivers, it notes that increased granularity does not necessarily translate to increased accuracy[8].

3.3.3. AEMO's conclusion

AEMO notes that obtaining reliable and cost-effective data sources with harmonized industry definitions (sub-segments) cannot be achieved in the short term. AEMO continues to work with suppliers of forecast data to harmonise definitions to support future forecasts.

In the meantime, AEMO's forecast uses the CSIRO industry level trajectories to inform a scenario-specific energy intensity for each region.

4. CONCLUSION

AEMO appreciates the submissions provided and has considered their feedback, as addressed in Section 3 above.

Stakeholder feedback was supportive of non-linear energy intensity trends to incorporate CSIRO's projections into AEMO's longer term forecast. AEMO has noted that more information is available in CSIRO's report, which includes industry level insights. While AEMO's long term energy intensity forecast has been guided by the CSIRO outlook, it cannot reflect this level of detail due to data limitations at the metering level. The updated method is now documented in the Section 2.3.2 of the Electricity Demand Forecasting Methodology.

For further information on spatial results, please refer to AEMO's Connection Point forecast.

[8] See Appendix B of AEMO's Electricity Demand Forecasting Methodology determination, available at: https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2020/electricity-demand-forecasting-methodology/final-stage/electricity-demand-forecast-methodology-final-determination.pdf