AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Demand Side Participation forecast methodology

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Issues Paper

A report for the National Electricity Market

Executive summary

The publication of this Issues Paper commences AEMO's consultation on its methodology for forecasting the level of Demand Side Participation (DSP) in the National Electricity Market (NEM), in accordance with the Forecasting Best Practice Consultation procedure published in the AER's Interim Forecasting Best Practice Guidelines.

DSP is a critical input into a number of AEMO's reliability processes specified in the National Electricity Rules (NER), including the Electricity Statement of Opportunities (ESOO) and its associated Reliability Forecast.

Given the importance of the Reliability Forecast in potentially triggering obligations under the Retailer Reliability Obligation (RRO), AEMO strives to engage with all relevant stakeholders, to ensure the methodologies used for each component of the forecast meet stakeholder expectations. This consultation in particular covers the DSP component.

On completion of the consultation, a revised DSP forecast methodology document will be published mid-year, reflecting any updates to the approach as result of the consultation.

Stakeholders are invited to submit written responses to the questions outlined in this Issues Paper, and on other issues related to AEMO's DSP forecasting methodology, by 5.00 pm (Australian Eastern Standard Time) on Friday 27 March 2020.

Submissions should be sent by email to energy.forecasting@aemo.com.au.

Contents

Tables

1. Introduction

1.1 Background

AEMO's Demand Side Participation (DSP) forecast is an input into a number of AEMO reliability and planning processes in the National Electricity Market (NEM), including:

- The Medium Term Projected Assessment of System Adequacy (MT PASA).
- The Electricity Statement of Opportunities (ESOO) and its associated Reliability Forecast.
- The Integrated System Plan (ISP).

AEMO is required to produce Reliability Forecasts[1] in accordance with Forecasting Best Practice Guidelines[2] developed by the Australian Energy Regulator (AER) and Reliability Forecast Guidelines established by AEMO.

AEMO published its Interim Reliability Forecast Guidelines[3] in December 2019 and must consult on and publish final Guidelines by 28 February 2021, according to the National Electricity Rules (NER) clause 11.116.4.

The Interim Reliability Forecast Guidelines outlined a number of methodology documents that explain the methodologies used for the various processes required to produce the Reliability Forecast. These methodology documents must be consulted on at least every four years using the AER's Forecasting Best Practice Consultation Procedure, to determine:

- The fundamental methodologies needed in the forecasting processes.
- The components on which the forecasts are to be based, and the way they are to be determined and used.
- The stakeholder engagement process for determining the forecasting methodologies, inputs, and assumptions.

The consultation of the DSP Methodology is one of these methodology document consultations to be undertaken by AEMO.

1.2 Consultation process

As outlined above, this consultation is being conducted in accordance with the Forecasting Best Practice Consultation procedure published in the AER's Interim Forecasting Best Practice Guidelines.

The process has been implemented to adhere to the principles outlined in NER clause 4A.B.5:

- Forecasts should be as accurate as possible, based on comprehensive information and prepared in an unbiased manner.
- The basic inputs, assumptions, and methodology that underpin forecasts should be disclosed.
- Stakeholders should have as much opportunity to engage as is practicable, through effective consultation and access to documents and information.

AEMO's 2019 DSP forecast and methodology[4], published alongside the 2019 ESOO, explains how AEMO currently forecasts DSP.

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[1] The implementation of the Retailer Reliability Obligation (RRO) was agreed at the Council of Australian Governments (COAG) Energy Council meeting on 26 October 2018. The necessary legislative and National Electricity Rules (NER) changes took effect on 1 July 2019.

[2] See https://www.aer.gov.au/retail-markets/retail-guidelines-reviews/retailer-reliability-obligation-interim-forecasting-best-practice-guideline.

[3] See https://www.aemo.com.au/consultations/current-and-closed-consultations/interim-reliability-forecast-guidelines/.

[4] See https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2019/Demand-Side-Participation-Forecast-Methodology-2019.pdf.

AEMO seeks feedback on the methodology it has been using to forecast DSP, to inform any changes to be applied in 2020 or beyond.

AEMO's indicative timeline for this consultation is outlined below. Dates may be adjusted depending on the number and complexity of issues raised in submissions and outcomes of any meetings with stakeholders.

Table 1 Indicative timeline for consultation

Deliverable	Indicative date
DSP forecast methodology – issues paper published	26 February 2020
Submissions to issues paper due	27 March 2020
Draft determination published	28 April 2020
DSP methodology discussion at Forecasting Reference Group meeting	29 April 2020
Submissions to draft determination due	29 May 2020
Final determination published	10 July 2020

1.3 Seeking feedback

AEMO invites stakeholders to provide feedback on AEMO's DSP forecast methodology. The topics presented in Section 2 and questions summarised in Section 3 of this paper can be used as a guide. The feedback will inform any changes to be applied to AEMO's approach in 2020 or beyond.

Stakeholders are invited to submit written responses on the questions provided and other issues related to AEMO's DSP forecasting methodology by **5.00 pm (Australian Eastern Standard Time) on Friday 27 March 2020.** Submissions should be sent by email to energy.forecasting@aemo.com.au.

Based on the feedback to the issues paper and draft determination, AEMO will publish an updated DSP methodology document in mid-2020 as part of its final determination.

2. AEMO's DSP forecasting methodology

This section outlines the key themes AEMO is seeking feedback on in this consultation. It refers to the sections in the 2019 DSP methodology document[5] where these themes are covered and elaborates, where required, on issues AEMO is particularly seeking feedback on.

In this context, three other AEMO processes are relevant:

- The Demand Side Participation Information (DSPI) process, which is the process through which AEMO collects DSP information from registered participants under NER clause 3.7D(b). The collection and use of the DSP data is governed by AEMO's DSPI Guidelines[6], which are updated regularly.
- Development and maintenance of the Distributed Energy Resources (DER) register in accordance with NER clause 3.7E. As distributed generating units and storage systems may both be considered DSP-enabling and DER, AEMO must ensure that information collection processes do not duplicate efforts by market participants, and that the DER and DSP processes use the relevant DER or DSP data, regardless of which information process that has collected it.
- Publication of AEMO's Forecast Accuracy Report (FAR), which in 2019 included a section that discussed the accuracy of the 2018 DSP forecast against observed DSP on high demand days over the 2018-19 summer[7].

2.1 Requirements for AEMO to forecast DSP

Collecting DSP information and accounting for this in its forecasts is a Rules requirement, as outlined in the DSP methodology document Section 1.3 referring to NER 3.7D. Further specifics are provided in NER clause 4.9.1(c), which lists the factors that must be taken into account in the development of demand forecasts, to the extent that such are relevant to the particular forecast. DSP is included in this list as 4.9.1(c)(6b).

The DSP approach consulted on here is the one used by AEMO to produce the DSP forecast that is applied in the following processes:

- MT PASA.
- NEM ESOO (and Retailer Reliability Obligation [RRO] reliability forecasts).
- Energy Adequacy Assessment Projection (EAAP).
- ISP.

The DSP forecast is made specifically to be consistent with the load forecast used in these processes. The load forecast estimates demand in the absence of DSP, and the forecast DSP is used as a resource to lower demand, should insufficient supply be available in the modelling to meet demand otherwise.

For processes other than these, such as Pre-dispatch and Short Term PASA (ST PASA), AEMO uses a different approach to account for DSP, including this only when committed and subject to a materiality test.

[5] See https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEM_ESOO/2019/Demand-Side-Participation-Forecast-Methodology-2019.pdf.

[6] See: https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/scenarios-inputs-assumptions-methodologies-and-guidelines/forecasting-and-planning-guidelines/demand-side-participation-information-guidelines.

[7] See https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/accuracy-report/forecast_accuracy_report_2019.pdf.

2.2 Definition of DSP forecast by AEMO

The DSP methodology document Section 1.1 presents two broad types of DSP:

- Market-driven responses:
  - This category includes residential, commercial, and industrial responses that are typically triggered in response to high electricity prices.
  - Examples include industrial facilities that are exposed to the wholesale price and elect to reduce electric load at times of high prices, consumers that agree to let their battery be controlled by a third party or are incentivised to switch off air-conditioners, and small non-scheduled generators that have the ability to produce electricity during high price periods, offsetting local consumption.
- Reliability event responses:
  - This category includes responses that are called on when power system reliability requires support. They are most common under Lack of Reserve (LOR) conditions, although they often also coincide with high wholesale prices. These responses can be contracted.
  - Examples include load reductions in response to directions from AEMO's Reliability and Emergency Reserve Trader (RERT) function[8]. Additionally, network event programs that may be aimed at distribution network demand management are included in the reliability event group; on a set maximum number of days per year, networks may call on agreements to reduce demand or incentivise reductions through temporary increases in electricity costs.

The definition of DSP as forecast by AEMO is explained in Section 1.2 in the DSP Methodology document. It captures only part of what would be considered DSP in a wider context[9], but has to be restricted to:

- Avoid double counting with DSP responses covered by other parts of AEMO's forecasting processes, such as operation of Other Non-Scheduled Generation (ONSG) or battery storage, which both are modelled separately, and the daily operation of hot water load control, which is instead built directly into the regional demand forecast assuming the historical response continues.
- Forecast potential reliability shortfalls in the absence of AEMO intervention, such as the activation of RERT resources, to accurately forecast the need for intervention.

For clarity, the DSP methodology document Section 2.1 summarises all program groups submitted to AEMO through the DSPI process and explains what are not used when estimating DSP and why.

For 2020, as identified in the AEMO's forecast improvement plan published in AEMO's 2019 Forecast Accuracy Report[10], AEMO plans to alter the way peaking-type[11] ONSG is accounted for in the DSP forecast. In 2019, any ONSG response was excluded, as it was included as an offset to the demand forecast instead. To increase the visibility of this rather significant contributor to total DSP, AEMO will include this as DSP in the 2020 forecast (and as result no longer offset the demand forecast).

2.3 DSP methodology

A1.1.1 Existing level of DSP

For practical application in electricity supply adequacy and market modelling studies, AEMO forecasts the level of DSP likely to respond to high price or reliability events (in general referred to as trigger events) in the

[8] RERT is a function conferred on AEMO to maintain power system reliability and system security using reserve contracts.

[9] For this reason, the forecast may look lower than the changes to demand that can be observed during particular events.

[10] See https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/accuracy-report/forecast_accuracy_report_2019.pdf.

[11] Generating plants only operating during high price events.

NEM where the responses are not already accounted for in its demand forecasts (such as the operation of hot water load control mentioned above) or supply models (such as aggregated battery storage systems operated as a virtual power plant).

A large part of the DSP is controlled by market participants who use it to hedge against price risks or provide it as a service to others. Others may use DSP to manage their own cost of energy if exposed to spot prices or for example reliability event tariffs. Portfolios in control of DSP may not choose to trigger DSP during high price periods or reliability events, where they are long in generation (generating more than their contract positions), but will do so when short. Large loads exposed to spot prices may reduce consumption if they can still meet their contracted sales, but potentially not when they are behind in their production schedule. The ability to respond may also depend on time of day. There have also been cases where the cumulative price threshold (CPT) has been triggered[12], muting the price spot signal at times with reserves shortfall.

As result, DSP responses vary significantly from time to time, even for identical market price outcomes. AEMO has therefore developed a process that investigates the recent (three-year) historical distribution of DSP responses for different price triggers, and AEMO has adopted the 50th percentile of historical response as its estimate of expected DSP (half the time response will be higher, half the time it will be lower) for each trigger level.

The approach is explained in detail in the DSP methodology document Section 2, including input data, data flow and the methodology for calculating baseline consumption during the trigger events. In AEMO's 2019 Forecast Accuracy Report[13], the historical assessment currently used was found to reasonably estimate the observed DSP during the high demand days of summer 2018-19.

Through the DSPI process, AEMO collects reported DSP potential in megawatts from participants. It is currently used for validating the historical-based estimates. As this is still a new data source, it is not yet clear whether it fully represents the uncertainty of actual DSP responses discussed above. Given the accountability for accuracy of the forecast rests with AEMO, and not with the participants who provided the data, AEMO is currently monitoring the accuracy of the reported numbers against observed outcomes to build confidence in the estimate. This comparison will help identify if any adjustment factor is required to account for both the uncertainty in how many providers respond and whether there is any overlap in resources between multiple programs[14]. As AEMO gains a better understanding of the reported data, it may choose to use this a primary source of the forecast, with the historical analysis used as validation instead.

AEMO is also open to alternative suggestions that will meet the intended purpose of input into its reliability and planning processes as outlined earlier.

AEMO will review whether the reported DSP potential, adjusted if necessary with an availability factor, can be reliably used as an alternative to the current historical analysis. The findings will be reported in the draft determination currently planned to be published in April 2020, along with any recommendation for change if required.

A1.1.2 Future DSP

AEMO is currently using the existing DSP capacity as a proxy for the level of DSP expected in future years in its reliability processes (MT PASA, ESOO, and EAAP – see DSP methodology document Section 2.4 for further information). This is consistent with AEMO's approach to future generating sources, where new generation is only included if committed.

[12] See https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/Operation-of-the-administered-price-provisions-in-the-national-electricity-market.pdf.

[13] See https://www.aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/accuracy-report/forecast_accuracy_report_2019.pdf.

[14] For example, one customer may have a capacity charge depending on its load during announced critical event periods and also have spot exposure for its energy consumption in general with both reporting its full potential response.

In its final report concluding the consultation of the Reliability Forecast Methodology, AEMO noted:

> However, as market changes facilitate growth in DSP, using historical data to estimate future capability will become less appropriate. As experience is gained in reporting, understanding and validating future DSP opportunities, future growth may be forecast. For the 2019 ESOO, AEMO will maintain a current estimated level of DSP, consistent with other supply options, which are only included if committed. For future ESOOs, AEMO will consider adding future growth once communicated as a qualifying contract through its DSP Information Portal.

Through the DSPI process, participants can also provide text form information about future programs. This is voluntary and AEMO gets very few responses here, and being in text form it is difficult to translate into an actual forecast number.

To gain better information with respect to future DSP potential, AEMO proposes to ask participants for future estimates of DSP for the next three years and enable the participants to indicate whether this is:

- A qualifying contract under RRO.
- Intended to respond as wholesale demand response according to the Australian Energy Market Commission's (AEMC's) current Rules change proposal[15].

For the ISP, AEMO does forecast growth in DSP based on the approach outlined in the DSP methodology document Section 3. This includes projected growth driven by policies (such as the wholesale demand response proposal) and the adoption of smart appliances that can respond to tariffs or other signals by utilities, retailers, or DSP aggregators.

Rather than estimating growth in DSP from the bottom up (development of new DSP programs and/or expansion of existing), AEMO has used a top-down approach looking into a reasonable upper bound (DSP in percentage of annual maximum demand) of DSP in markets with advanced DSP incentives (and no DSP barriers) in place.

AEMO's long-term high DSP forecast assumes DSP grows linearly year-on-year to approach this upper bound by 2050. This is used in scenarios where strong growth of DSP is part of the narrative. AEMO's medium DSP forecast includes half the growth of the high DSP forecast from today's level (currently the assumption in AEMO's Central scenario), while AEMO's low DSP forecast assumes the current level of DSP is maintained.

2.4 Timing of forecast publication and updates

The current timing for collecting data through the DSPI process is for participants to provide the data by the end of April. The timing, just after summer, has been determined to have the most up-to-date data for typical high demand days (where high prices or reliability events are most likely to occur) and yet allow sufficient time for the DSP forecast to be finalised in May/June for use in the next ESOO, which will be published in August. Overall, this leads to a regular annual publication cycle of the DSP forecasts along with the ESOO.

AEMO has not previously seen sufficient change in behaviour within a year to update the DSP forecast ahead of the next regular annual update.

For its updated DSP methodology, AEMO will add a section formalising the process AEMO will follow to update the DSP forecast and what would trigger this, noting that DSP is a core component of the reliability forecast and any material change in the DSP forecast could trigger the need for a reliability forecast update.

[15] See https://www.aemc.gov.au/rule-changes/wholesale-demand-response-mechanism.

One possible trigger for an update is observed consistent change in delivered DSP over those forecast for the region of a magnitude of at least 1% of the regional forecast maximum demand. Consistent observed biases would likely also trigger consultation on a change in methodology.

2.5 Reported DSP statistics

Based on the information reported through the DSPI process, AEMO will continue to report various DSP statistics as per Appendix A1 in the DSP methodology document. In future years, the statistics will be reported annually as part of the DSP forecast, separate from the methodology document that will be produced as part of this consultation.

In 2019 AEMO reported the following statistics:

1. The number of DSP programs for each of the following program categories:
   - Connections on network event tariffs.
   - Connections on retail time-of-use tariffs.
   - Connections with energy storage.
   - Connections with network-controlled load.
   - Market exposed customers.
   - Other.
2. Number of connections by load type (Residential, Commercial, Industrial, aggregated, not specified).
3. Number of connections by program category and DSP type.

As 2019 was the first year with good data (in 2018 a number of responses were missing or partially missing), it was not possible to report any year-on-year trends. In 2020, AEMO will report how the metrics above have changed from 2019.

Also, as 2019 was the first year AEMO published statistics, it is keen for feedback on additional statistics that would be useful for stakeholders.

2.6 Impact on DSPI process

Feedback given through the consultation may lead to potential changes in the requirements of the data to be collected through the DSPI portal. If changes are required, AEMO will consult on the DSPI Guidelines during the second half of 2020 in relation to the data requirements and underlying data model.

3. Consultation questions

AEMO invites stakeholders to provide feedback on whether the presented methodology for DSP is appropriate for its use in MT PASA, NEM ESOO, EAAP, and ISP, and to meet industry expectations in general. The questions below can be used as a guide.

Stakeholders are invited to submit written responses on the questions below and other issues related to AEMO's DSP forecasting methodology by **5.00 pm (Australian Eastern Standard Time) on Friday 27 March 2020.** Submissions should be sent by email to energy.forecasting@aemo.com.au.

Questions for consultation

Question 1 Considering the intended purpose of the forecast, are the inclusions and exclusions of the various DSP types appropriate and well explained?

Question 2 Given the purpose of the forecast in AEMO's reliability processes, is the approach for estimating the current level of DSP appropriate?

Question 3 AEMO could ask for a forward-looking MW estimate for existing and future DSP programs for up to three years for all participants.

- What are the pros and cons for such as request?
- In particular, is it feasible for participants to estimate this with a reasonable level of confidence?
- How might AEMO validate the information provided?

Question 4 Is the approach for forecasting future levels of DSP appropriate? And if not:

- What alternative approaches could be considered?
- What data should be used for such assessments and where should it be sourced?

Question 5 Is it appropriate to have an annual update cycle as outlined in Section 2.4?

- If not, what data should drive more frequent regular updates?
- Is the proposed trigger in Section 2.4 appropriate for an out-of-cycle update?

Question 6 What additional DSP statistics from data collected through the DSPI process should AEMO consider reporting on? Should AEMO seek additional data from participants for reporting purposes only?