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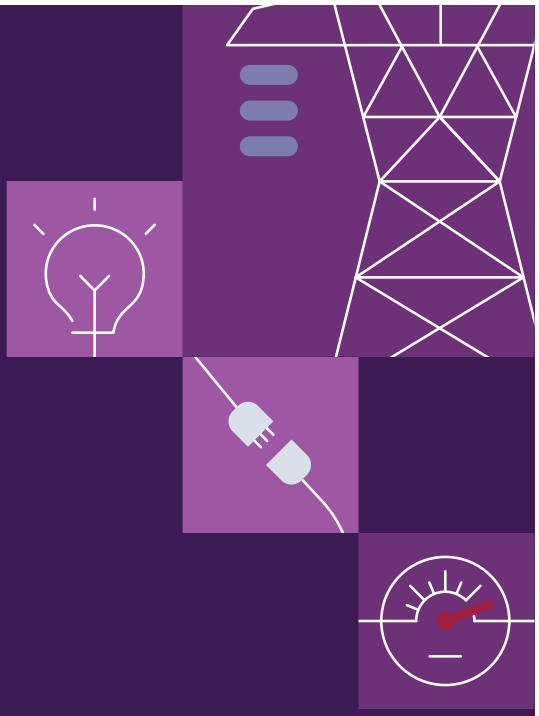

Demand side participation forecast methodology

Final Report

Published: 20 December 2023

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New South Wales | Queensland | South Australia | Victoria | Australian Capital Territory | Tasmania | Western Australia

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Executive summary and consultation notice

The publication of this final report concludes the two stage consultation process conducted by AEMO to review its Demand Side Participation (DSP) forecast methodology. This consultation is intended to satisfy the requirements on AEMO to review, at least every four years, each key component of its Forecasting Approach as required by both the Australian Energy Regulator's (AER's) Forecasting Best Practice Guidelines (FBPG)[1], and AEMO's Reliability Forecast Guidelines[2].

DSP is a key input into a number of AEMO's forecasting processes specified in the National Electricity Rules (NER), including the Electricity Statement of Opportunities (ESOO) and its associated reliability forecast. It refers to the flexibility by electricity consumers to reduce, or avoid, electricity consumption at times, typically if electricity prices are at high levels or if risks are forecast to the reliability of the power system.

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 reflect stakeholder feedback and insights.

In response to the draft changes proposed by AEMO for its DSP forecast methodology[3] and the reasoning outlined in the DSP forecast methodology draft report[4], AEMO received submissions from four stakeholders, with feedback on:

- The categories of DSP that AEMO collects information on
- AEMO's proposed DSP price trigger bands
- Gathering data on future DSP opportunities
- The criteria applied to DSP forecasts in the ESOO and Integrated System Plan (ISP) and how these publications compare.

This final report sets out the feedback received on the above topics, together with AEMO's responses and how the feedback has been considered in developing the final DSP forecast methodology, which is published alongside this final report. Only minor changes have been made to the final DSP forecast methodology compared to those proposed in the draft methodology.

[1] https://www.aer.gov.au/system/files/AER%20-%20Forecasting%20best%20practice%20guidelines%20-%2025%20August%202020.pdf

[2] https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/rsig/reliability-forecast-guidelines.pdf

[3] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/dsp-forecasting-methodology-and-dsp-information-guidelines-consultation/second-stage/draft-dsp-forecast-methodology-tracked-changes.pdf

[4] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/dsp-forecasting-methodology-and-dsp-information-guidelines-consultation/second-stage/dsp-forecast-methodology-draft-report.pdf

Contents

Tables

1. Stakeholder consultation process

This final report concludes the two stage consultation conducted by AEMO to review its Demand Side Participation (DSP) forecast methodology.

This consultation is intended to satisfy the requirements in the Australian Energy Regulator's (AER's) Forecasting Best Practice Guidelines (FBPG) and AEMO's Reliability Forecast Guidelines, which require that AEMO review each component of its Forecasting Approach at least once every four years. The DSP forecast methodology is one component of AEMO's Forecasting Approach and was last consulted on between February and August 2020.

AEMO's process and timelines for this consultation are outlined below.

Table 1 Consultation process and timeline

Consultation steps	Dates
Publication of consultation paper, with stakeholder consultation for this paper commencing	1 September 2023
Discussion at Forecasting Reference Group meeting	27 September 2023
Submissions on consultation paper due	29 September 2023
Publication of draft determination and draft methodology, with stakeholder consultation for these papers commencing	31 October 2023
Final day for submissions on draft determination	28 November 2023
Publication of final determination and final methodology to be applied in 2024 Electricity Statement of Opportunities and other relevant reliability modelling	**20 December 2023**

AEMO received four submissions from stakeholders on its consultation paper and a further three submissions on its draft report and draft DSP forecast methodology, which addressed the earlier feedback on the consultation paper.

AEMO thanks all stakeholders for their feedback on the consultation issues and the draft methodology. AEMO has considered the submissions provided at each stage of the consultation process, and they have enabled the preparation of this final report.

Concurrent with this consultation, AEMO has also been consulting on the DSP Information Guidelines. Stakeholders may benefit from reading this final report in conjunction with the final report for that consultation[5].

[5] Available at https://aemo.com.au/consultations/current-and-closed-consultations/demand-side-participation-forecasting-methodology-and-dsp-information-guidelines-consultation

2. Background

2.1. Context for this consultation

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

- The Medium Term Projected Assessment of System Adequacy (MT PASA).
- The ESOO and its associated reliability forecast.
- The Integrated System Plan (ISP) and the Inputs, Assumptions and Scenarios Report (IASR), which may be used across the industry in other planning activities.

AEMO is required to produce reliability forecasts in accordance with the AER's FBPG and the Reliability Forecast Guidelines.

AEMO's Forecasting Approach[4] sets out the various components that contribute to AEMO's NEM forecasting and planning publications, including the reliability forecast. AEMO's Reliability Forecast Guidelines outline a number of methodology documents that explain the methodologies used for the various processes required to produce the reliability forecast. These methodologies must be consulted on at least every four years using the consultation procedures outlined in Appendix A of the FBPG.

The DSP forecast methodology is one of the methodologies within AEMO's Forecasting Approach and was last consulted on between February and August 2020. This consultation therefore intends to meet the FBPG requirement to review and consult on the components of AEMO's Forecasting Approach at least once every four years.

2.2. The national electricity objective

Within the specific requirements of the NER applicable to this proposal, AEMO will seek to make a determination that is consistent with the national electricity objectives (NEO) and, where considering options, to select the one best aligned with the NEO.

The NEO is expressed in section 7 of the National Electricity Law as:

> to promote efficient investment in, and efficient operation and use of, electricity services for the long term interests of consumers of electricity with respect to:
>
> (a) price, quality, safety, reliability and security of supply of electricity; and
>
> (b) the reliability, safety and security of the national electricity system; and
>
> (c) the achievement of targets set by a participating jurisdiction—
>
> (i) for reducing Australia's greenhouse gas emissions; or
>
> (ii) that are likely to contribute to reducing Australia's greenhouse gas emissions.

3. List of material issues

In response to the draft report and proposed changes to the DSP forecast methodology, AEMO received written submissions from three stakeholders:

- Energy Queensland (EQ)
- Origin Energy (Origin)
- The Institute for Energy Economics and Financial Analysis (IEEFA)

The three written submissions are published on AEMO's consultation webpage. The list of all material issues raised in the first and second stage of the consultation process is included in Table 2.

Table 2 List of material issues

No.	Category	Issue	Raised by	Report section
1.	Categorising DSP	Market-driven and reliability-driven drivers of DSP	Stage 1: EQ, QEUN[6]	Draft Report 4.1
2.	Categorising DSP	Inclusions and exclusions in DSP forecast methodology	Stage 1: EQ, EUAA[7], Shell Energy	Draft Report 4.1
3.	**Categorising DSP**	**Categories of DSP in the DSP Information Guidelines**	**Stage 2: Origin**	**Final Report 4.1**
4.	DSP forecasting cycle	DSP information portal submission window	Stage 1: EQ, EUAA, Shell Energy	Draft Report 4.2
5.	**Estimating current levels of DSP**	**DSP price trigger bands**	**Stage 2: Origin**	**Final Report 4.2**
6.	Estimating current levels of DSP	Analysing data over a three year time series	Stage 1: EUAA, Shell Energy	Draft Report 4.3
7.	Estimating current levels of DSP	Adopting 50th percentile response for reliability forecast	Stage 1: Shell Energy	Draft Report 4.3
8.	Estimating current levels of DSP	Duration of DSP response	Stage 1: EUAA, QEUN, Shell Energy	Draft Report 4.3
9.	Estimating current levels of DSP	AEMO's proposed methodology for wholesale demand response	Stage 1: AEMO (nil submissions)	Draft Report 4.3
10.	Estimating current levels of DSP	Other elements of AEMO's methodology	Stage 1: EUAA	Draft Report 4.3
11.	Forecasting DSP	The use of existing and committed DSP in the ESOO	Stage 1: EUAA, Shell Energy	Draft Report 4.4
12.	**Forecasting DSP**	**ESOO v. ISP DSP forecasts**	**Stage 2: EQ**	**Final Report 4.3**
13.	Forecasting DSP	The use of international studies for long term DSP forecasting	Stage 1: EUAA, Shell Energy	Draft Report 4.4
14.	**Forecasting DSP**	**Enhanced information about future DSP**	**Stage 2: Origin**	**Final Report 4.3**

[6] Queensland Energy Users Network

[7] Energy Users Association of Australia

No.	Category	Issue	Raised by	Report section
15.	**Forecasting DSP**	**Committed DSP**	**Stage 2: IEEFA**	**Final Report 4.3**
16.	Validating DSP	Adequacy of the FAR methodology for DSP	Stage 1: EUAA, Shell Energy	Draft Report 4.5

For material issues raised in the first stage of the consultation process, Table 2 contains a reference to the section of the DSP forecast methodology draft report considering the issue and explaining how AEMO addressed the issue in the draft DSP forecast methodology.

Each of the material issues raised in the second stage of the consultation process are discussed below in section 4, per the references provided in the bold rows of Table 2.

4. Discussion of material issues

4.1. Categorising DSP

4.1.1. Issue summary and submissions

In its submission on the draft report, Origin noted that "insights derived from the data requested by AEMO could be enhanced through discussions about points of interest AEMO are trying to explore" and that more descriptive categories of DSP may be beneficial to illustrate the types of DSP opportunities or likely duration of a DSP response. An example Origin provided was the potential for DSP categories to provide greater differentiation between passive/basic DSP response and more sophisticated DSP providers with stronger behavioural responses.

4.1.2. AEMO's assessment

Table 1a in the DSP Information Guidelines sets out the categories of DSP that AEMO collects data on. These categories are re-produced below.

Table 3 Categories of DSP

DSP Type	Explanation
Market exposed connections	This covers connections exposed to spot price, either directly or via pass-through contracts. This includes loads responding under the WDR rules[8] and any connections that are only spot price exposed during specific events.
Connections on fixed time-of-use tariffs	This includes connections exposed to fixed time-of-use pricing, including day/night tariffs.
Connections on dynamic event tariffs	Connections, which are subject to dynamic tariffs, which price consumption and/or connection costs differently for specific periods during the year. These periods are dynamically determined by the program operator and could relate to local or regional demand at the time.
Directly controlled connections (fixed schedule)	Connections directly controlled based on a set schedule for the year, irrespective of actual demand and/or spot prices at the time. This includes control of hot water load.
Directly controlled connections (dynamic operation)	Connections directly controlled (or manually instructed to) based on actual or forecast system conditions and/or price. This includes aggregated response of battery storage systems as a virtual power plant (VPP) and reduction in air conditioner load or controlled electric vehicle charging on extreme demand days.
Not elsewhere classified / other	This category allows for special cases that don't obviously fit into the above categories. Entries in this category will be reviewed by AEMO and reclassified into the above if possible.

AEMO considers that the above categories provide a sound basis for assessing the types of DSP opportunities available to participants, in that they cover instances where:

- customers are exposed to wholesale spot prices, or
- customers can respond on a fixed schedule (e.g. day/night), or
- DSP program operators can *incentivise* DSP response during specific events or periods, or

[8] Available at https://www.aemc.gov.au/rule-changes/wholesale-demand-response-mechanism.

- DSP program operators can *control* DSP responses on a fixed or dynamic basis.

In addition to the above categories, the DSP Information Guidelines[9] requests that participants complete several other data fields (mostly on an optional basis) that provide further information on the DSP programs. These optional data fields include:

- DSP type, such as load reduction, embedded generation, energy storage
- Response control, such as network, retailer, aggregator, etc.
- Control algorithms, such as 'minimise customer energy expense'
- Customer type, such as residential, commercial, industrial
- Fuel source, such as solar, biomass, hydro, etc.

These and other data fields requested by AEMO are included in Table 3 of the DSP Information Guidelines. AEMO is of the view that these additional data fields, if populated, provide the types of insights that Origin suggests would be useful. As the fields are optional, they are not always completed, however AEMO considers there is merit in highlighting the usefulness of these fields, not just for DSP forecasts, but to gain a better understanding more broadly of DSP opportunities.

AEMO notes that the ESOO contains an appendix dedicated to DSP and included within that appendix is a section on DSP statistics that utilises some of the information referred to above. Should sufficient information become available through these fields in the portal, AEMO may expand this analysis.

4.1.3. AEMO's conclusion

AEMO has elected to retain the existing DSP categories, which provide AEMO and stakeholders with useful information on the drivers of DSP and/or how the DSP is managed. Retaining these categories also has the advantage of allowing for trends over time within the categories.

Origin's feedback on the usefulness of expanding the insights from the DSP information collected is valid. AEMO intends to run workshops with providers of DSP information in early 2024 and will encourage DSP providers to complete as many fields as possible in the DSP information portal, so that AEMO has an expanded dataset on which to base (and potentially improve) its forecasts and reports in the future.

4.2. Estimating current levels of DSP

4.2.1. Issue summary and submissions

In its consultation paper, AEMO reduced the number of price triggers from six to three and from an overlapping "greater than" approach (for example, >$300/MWh, >$500/MWh) to a discrete band of prices. The new price bands proposed by AEMO were:

- ≥$300/MWh to <$1,000/MWh

[9] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2020/dspi/demand-side-participation-information-guidelines-dec-20.pdf?la=en&hash=477AE3E6687A652F63083B902A8D5A0A

- ≥$1,000/MWh to <$7,500/MWh
- ≥$7,500/MWh to the market price cap (currently $16,600/MWh).

In response to the consultation paper, AEMO received support for the proposed changes from one stakeholder (EUAA) and no submissions opposed to the changes. The updated price triggers were therefore included in the draft DSP forecast methodology.

In its submission on the draft report, Origin requested further information on how the changes were informed. Origin noted that referencing only those price bands may not address all of the motivations behind DSP, which may be acting on incentives other than the wholesale price. Origin noted that AEMO's price bands may be informed by the Australian Renewable Energy Agency's Dynamic Pricing Load Flex, EDGE and Edith projects.

4.2.2. AEMO's assessment

The changes to the price trigger bands were made in response to the University of Adelaide's draft report on AEMO's Forecasting Accuracy Report Methodology[10], which noted that the existing price bands overlapped and therefore some bands had a mix of low and high prices. The University of Adelaide noted a preference for discrete, non-overlapping price bands for DSP, but noted that a balance needed to be struck between band size and sample size, as a smaller price band comes at the expense of having a smaller sample size.

AEMO's proposed price trigger bands were selected to achieve this balance between fewer price triggers and an appropriate sample size. Given that AEMO's reliability-driven forecast starts with DSP responses observed when the price exceeds $7,500/MWh, a price trigger band greater than this price was retained. To reduce the price trigger bands further, but to retain a reasonable sample size, AEMO selected the $1,000/MWh to $7,500/MWh price band, which would allow for a minimum of around 100 observations for some regions in the three year period that AEMO assesses, up to around 1,100 observations for one region.

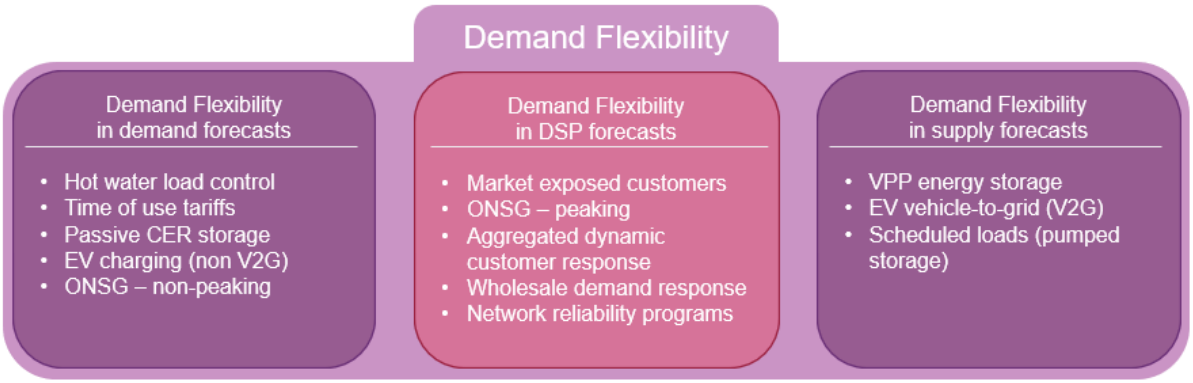
Having further considered the data, AEMO considers there is merit in expanding the middle price band to $500/MWh to $7,500/MWh, which would provide for well over one thousand observations for all regions except Tasmania (based on the same three year time series). The consequential impact on the lower price band would be to reduce it to $300/MWh to $500/MWh, but this would still have by far the most observations than any other price band.

Regarding Origin's broader point about DSP acting on incentives other than wholesale prices, AEMO agrees with this and notes that the reliability driven category of DSP exists, which takes account of, for example, network reliability DSP programs which may or may not always correlate with high wholesale prices.

Reliability drivers aside, the DSP forecast produced by the DSP forecast methodology is focused on a subset of a broader 'demand flexibility' category, as noted in the draft DSP forecast methodology:

[10] Presented at the August 2023 Forecasting Reference Group. Available at https://aemo.com.au/consultations/industry-forums-and-working-groups/list-of-industry-forums-and-working-groups/forecasting-reference-group-frg

Figure 1 DSP and demand flexibility



Within the demand and supply forecasts, there are numerous demand flexibility programs which may not have wholesale prices as their driver. These include, for example, Virtual Power Plants (VPPs) as contemplated by Project EDGE and Project Edith. Similarly, customers who time their energy consumption to take advantage of special hot water tariffs, or peak/off-peak time of use retail tariffs, have their consumption trends accounted for within AEMO's demand forecasts. That is, these types of demand flexibility which are not driven by wholesale prices are still captured in AEMO's forecasts.

Finally, a benefit of AEMO's market driven responses being categorised with reference to wholesale prices is the availability of wholesale price data at the same temporal resolution as the demand data. This same dataset does not exist for other prices, such as the retail prices paid by customers. To the extent that retail price signals faced by customers during DSP events are structured to broadly pass through wholesale price signals, the wholesale price will remain a valid way of assessing market-driven DSP response.

Notwithstanding the above, as more DSP trials and programs are implemented, AEMO will engage with industry to inform whether its price trigger bands could be revised. Such a revision may, for example, be the subject of a Forecasting Reference Group consultation process.

4.2.3. AEMO's conclusion

AEMO considers that the use of wholesale prices as a way of modelling and forecasting DSP responses remains valid. In the final DSP forecast methodology, it has updated the price bands to:

- ≥$300/MWh to <$500/MWh
- ≥$500/MWh to <$7,500/MWh
- ≥$7,500/MWh to the market price cap (currently $16,600/MWh).

These price bands, in AEMO's view, strike the appropriate balance between the number (and size) of price bands and the sample sizes within each, as proposed by the University of Adelaide.

4.3. Forecasting DSP

4.3.1. Issue summary and submissions

AEMO received three submissions on the draft report regarding how it forecasts DSP.

Origin mentioned the rapid evolution of DSP and argued that historical data may not be an appropriate proxy for future DSP. Origin supported a submission by Shell Energy in the first stage of the consultation to survey large electricity customers about their future DSP opportunities, including a confidence level (e.g. in percentage terms). Whilst the possibility of a confidence level was raised by Shell in relation to the DSP Information Guidelines consultation and presented in the draft report for that consultation, Origin referred to it in its response to AEMO's DSP forecast methodology, hence its inclusion in this report.

EQ noted that the long term DSP forecasts in the ISP are prepared on a different basis to those in the ESOO. EQ suggested alignment between the ESOO and the central (most likely) scenario in the ISP to improve the comparability of the documents.

IEEFA pointed to section 4.1 of the DSP forecast methodology which sets out how AEMO treats future DSP programs as committed and noted it regarded the final bullet point "other initiatives providing a similar level of certainty of the DSP progressing" as vague. IEEFA suggested that this bullet point should be refined and, by way of example, posed the question of whether companies' commitments to shareholders to expand demand responses are included in this commitment criteria.

IEEFA also made a general comment, taken from its *Growing the sharing energy economy* report[11], that AEMO's DSP forecasts in the ESOO were conservative and did not, for example, account for the future possibility of demand responsive electric appliances. In its submission, it also called for AEMO to publish a standalone DSP report, taking information and insights from the DSP information portal and other sources.

4.3.2. AEMO's assessment

Regarding Origin's view that AEMO should survey large users about future DSP opportunities, AEMO notes that some large customers are already using the DSP information portal and are able to provide information on future DSP through this process. In its consultation paper which commenced the DSP Information Guidelines consultation[12], AEMO noted the lack of participants providing data on future programs and suggested that a confidence percentage might encourage more data being submitted.

In response to this suggestion, AEMO received mixed feedback in the first stage of the consultation. For the reasons outlined in the DSP Information Guidelines draft report[13], AEMO proposed in the draft Information Guidelines to retain the existing questions on future DSP, rather than include a change to the DSP information portal requiring (or asking) participants to provide a confidence level of future DSP programs. These reasons included the difficulty (as

[11] https://ieefa.org/resources/growing-sharing-energy-economy

[12] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/dsp-forecasting-methodology-and-dsp-information-guidelines-consultation/dspi-guidelines-consultation-paper.pdf

[13] https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2023/dsp-forecasting-methodology-and-dsp-information-guidelines-consultation/second-stage/dsp-information-guidelines-draft-report.pdf

noted by EQ in its first stage submission) of providing a confidence level of future DSP, as well as the risk of double counting DSP, if those future programs replace existing programs, but do not account for such in the DSP information portal.

On EQ's call for harmonisation of the DSP forecasts in the ESOO and the ISP, AEMO notes that DSP is modelled on the supply side of the ESOO. Therefore, it is appropriate to align the DSP forecast in the ESOO's reliability forecast with the ESOO's commitment criteria for supply. The DSP forecast in the ISP, on the other hand, reflects the scenarios developed during the preparation every two years of the Inputs, Assumptions and Scenario Report (IASR).

Whilst the ESOO and ISP forecasts may differ, both forecasts are published and consulted on, and therefore stakeholders have the level of transparency they need to compare the forecasts and take these into account for their own purposes.

Regarding IEEFA's comment about the broad nature of the criteria for committed DSP, AEMO accepts that "other initiatives providing a similar level of certainty of the DSP progressing" is somewhat opaque. On the other hand, a highly prescriptive methodology might result in AEMO being unable to include an unforeseen development in DSP without re-opening the consultation on its DSP forecast methodology to specifically include the new development.

AEMO's preferred approach is to retain the existing description of the criteria, but to be transparent about the additional programs it includes in its committed DSP. For example, in the 2023 ESOO, AEMO noted that it had included the New South Wales Peak Demand Reduction Scheme (PDRS) in its ESOO forecasts, despite the PDRS not aligning with the other committed DSP criteria in the DSP forecast methodology.

Finally, AEMO notes IEEFA's commentary on its DSP forecast and its suggestion of a standalone DSP report. Regarding the DSP forecasts in the ESOO, AEMO reiterates its view that the criteria for inclusion in the ESOO is appropriate and consistent with the ESOO's criteria for supply side options.

Whilst the preparation of a holistic DSP report is beyond the scope of this consultation, AEMO refers back to the DSP statistics provided as part of the ESOO (refer to the above discussion in section 4.1.2) which do provide some level of insight into the DSP information provided to AEMO. AEMO accepts that the type of report IEEFA is proposing is a much broader report, encompassing all types of demand flexibility and the costs of producing such a report and the availability of the data would need to be assessed before committing to its development.

4.3.3. AEMO's conclusion

AEMO has refined the bullet point raised by IEEFA in section 4.1 of the DSP forecast methodology, but beyond that, has retained the changes included in the draft DSP forecast methodology.

5. Final determination on proposal

AEMO has prepared a final version of the DSP forecast methodology, which reflects the above conclusions and the changes proposed in the draft DSP forecast methodology where these were not raised in submissions during the second stage of the consultation process. The DSP forecast methodology has been published alongside this final report, together with a marked-up version which clearly presents the changes from the current methodology.