INTERIM RELIABILITY FORECAST GUIDELINES

PREPARED BY: AEMO Forecasting
VERSION: [1.0]
EFFECTIVE DATE: [31 December 2019]
STATUS: DRAFT FOR CONSULTATION 3 October 2019

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DATE: 3/10/2019

VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
[1.0]	3 October 2019	First Issue

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1. INTRODUCTION

1.1. Purpose and scope

These are the Interim *Reliability forecast* Guidelines (**Guidelines**) made under clause 11.116.4(a) of the National Electricity Rules (**NER**). They serve as the *Reliability Forecast Guidelines* under NER clause 4A.B.4 until final *Reliability Forecast Guidelines* are made (by 28 February 2021).

The purpose of the *Reliability Forecast* Guidelines is to:

(a) explain to *liable entities* and other interested parties how a *reliability forecast* is prepared, and the underlying procedures, information requirements and methodologies that govern its preparation and operation; and

(b) describe how AEMO will implement the Interim *Forecasting Best Practice Guidelines* produced by the Australian Energy Regulator (AER) in preparing a *reliability forecast*.

These Guidelines have effect only for the purposes set out in the NER. The NER and the National Electricity Law prevail over these Guidelines to the extent of any inconsistency.

1.2. Definitions and interpretation

1.2.1. Glossary

Terms defined in the National Electricity Law and the NER have the same meanings in these Guidelines unless otherwise specified in this clause.

Terms defined in the NER (whether in Chapter 4A or Chapter 10) are intended to be identified in these Guidelines by italicising them, but failure to italicise a defined term does not affect its meaning.

The words, phrases and abbreviations in the table below have the meanings set out opposite them when used in these Guidelines.

Term	Definition
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
DSP	Demand Side Participation
ESOO	Electricity Statement of Opportunities
FAR	Forecast Accuracy Report
FBPG	Forecasting Best Practice Guidelines (AER)
FRG	Forecasting Reference Group
NEM	National Electricity Market
NEMWCF	NEM Wholesale Consultative Forum
NER	National Electricity Rules
POE	Probability of Exceedance
POLR	Procurer of Last Resort
RERT	Reliability and Emergency Reserve Trader
RIG	Reliability Instrument Guidelines (AER)
RRO	Retailer Reliability Obligation

1.2.2. Interpretation

These Guidelines are subject to the principles of interpretation set out in Schedule 2 of the National Electricity Law.

1.3. Required content of the Guidelines

In accordance with NER clause 4A.B.4(b), these Guidelines include the components listed below, which can be found in the section(s) indicated:

(a)   the methodology for determining *actual demand* for a *trading interval* [section 6.3];

(b)   the manner in which information requests under NER clause 3.13.3A(d) can be made (which may include standing or individual requests) and the nature, scope and form of the information which can be requested [section 3.3.2];

(c)   identification by *Registered Participants* of *confidential information* provided in response to an information request [section 3.4];

(d)   the criteria for determining timeframes to respond to an information request, which must allow a reasonable time for *Registered Participants* to respond having regard to the nature of the information request [section 3.3.2];

(e)   the consultation processes with relevant stakeholders in preparing a *reliability forecast* and *indicative reliability forecast* [section 2.3];

(f)   the methodology, assumptions and inputs to be used for a *reliability forecast* and *indicative reliability forecast*, including:

    (i)   a high level description of how the modelling assumptions and inputs are derived and sourced [sections 3.2 and 3.3];

    (ii)   an explanation of how a *reliability forecast*, *indicative reliability forecast*, *forecast reliability gap* and *forecast reliability gap period* are determined [section 5.1]; and

    (iii)   explanatory material about how demand forecasts (including the *one-in-two year peak demand forecast*) are calculated and produced [section 6.2];

(g)   the supporting materials to be published for a *reliability forecast*, the form of the supporting materials and the timeframe for the publication of the supporting materials [section 3.5.2];

(h)   the process for updates to a *reliability forecast* in accordance with NER clause 3.13.3A(b) [section 5.2];

(i)   the process for AEMO preparing, reporting on and implementing its annual improvement program in accordance with its obligations under NER clause 3.13.3A(h) [sections 4.2 and 3.5.1]; and

(j)   any other matters required to be provided for under NER Chapter 4A [none identified].

1.4. Related documents

Reference	Title	Location
AER Interim FBPG	AER Interim Forecasting Best Practice Guidelines	https://www.aer.gov.au/retail-markets/retail-guidelines-reviews/retailer-reliability-obligation-interim-forecasting-best-practice-guideline

Reference	Title	Location
AER Interim RIG	AER Interim Reliability Instrument Guidelines	https://www.aer.gov.au/retail-markets/retail-guidelines-reviews/retailer-reliability-obligation-interim-reliability-instrument-guidelines
RSIG	AEMO *Reliability standard Implementation Guidelines*	https://aemo.com.au/Stakeholder-Consultation/Consultations/Reliability-Standard-Implementation-Guidelines

2.   INDUSTRY ENGAGEMENT

2.1.   Engagement cycle

AEMO will engage with industry and interested parties regularly before, during and after the determination of *reliability forecasts*. This includes review of key input drivers, interim results for component forecasts and key processes, including demand and supply forecasts.

A timeline for the different phases along with planned industry engagement will be published at the beginning at each annual cycle, typically at the end of January along with the standing information request (as discussed in Section 3.3.2).

2.2.   Types of engagement

2.2.1.   Industry forums/workshops

AEMO convenes a number of forums which meet regularly. These are particularly useful for informing participants, seeking inputs, and facilitating discussion on various topics. These forums include:

(a)   the Forecasting Reference Group (**FRG**) – meets monthly, specific to forecasting topics (both supply and demand); and

(b)   the NEM Wholesale Consultative Forum (**NEMWCF**) – meets quarterly, broad coverage of NEM-related issues.

In addition, AEMO holds a number of ad hoc industry workshops, typically to facilitate discussion around ongoing consultation processes or seek input for major reports.

Industry forums/workshops are expected to be AEMO's most frequent ongoing method of engagement with stakeholders on *reliability forecast issues*, being transparent, open to interested participants and usually allowing for efficient discussion between AEMO and all industry groups.

2.2.2.   Technical working groups/advisory boards

AEMO may from time to time establish technical working groups or advisory boards to assist with the development of concepts for improvements in *reliability forecast*ing, typically where the subject is complex and requires specialist knowledge. The technical working groups allow in-depth discussion and assessment of ideas for future implementation.

2.2.3. One-on-one discussions

AEMO may need to engage with stakeholders individually, for the purpose of obtaining, verifying or discussing relevant *confidential information* that is essential for the accuracy of the *reliability forecasts*.

2.2.4. Written consultation

Significant changes to forecasting methodologies and major reviews require more extensive consultation, in some cases as prescribed by the NER or the Interim Forecasting Best Practice Guidelines (**FBPG**). Written consultations will generally be flagged through the FRG or the NEMWCF. AEMO will publish consultation papers and invite written submissions from *Registered Participants* and interested parties.

2.3. Levels of engagement

For the purpose of these guidelines, AEMO has identified five different levels of consultation, to facilitate effective consultation commensurate with the materiality of the subject. These are explained in detail in Appendix A, and summarised in Figure 1.

Figure 1   Levels of engagement

Type of consultation/engagement	Level of engagement	Time/cost spend
1 – Information only	Low	Low
2 - FRG discussion		
3 - FRG consultation		
4 - Written consultation		
5 - Rules consultation procedure	High	High

The choice of the level of engagement will be guided by the risk/materiality of the issue under consideration:

(a)   Examples of high risk/materiality:

   –   New/novel technologies or trends, currently with limited experience and understanding – potential to have significant impact in a 10 year horizon.

   –   Significant changes to data, assumptions or methodologies proposed, for example in response to FAR recommendations.

(b)   Examples of medium risk/materiality:

   –   Minor updates to inputs, assumptions and methodologies that may have significant impact in *reliability forecast* outcomes, but are generally well understood, or new/novel technologies and trends, which are unlikely to have significant impact within 10 years.

(c)   Examples of low risk/ materiality:

   –   Minor updates to inputs, assumptions and methodologies that will have a negligible impact on *reliability forecast* outcomes, correction of obvious errors.

3.   DATA INPUTS, ASSUMPTIONS AND METHODOLOGY

3.1.   General principles

Producing a *reliability forecast* requires:

(a) Input data – all data that is required to calculate the *reliability forecast*, including the individual components required to produce the overall forecast.

(b) Assumptions – the assumptions made, for example which historical years of forced outage rates best represent expected future years' outage rates.

(c) Methodologies – how input data is transformed into intermediate forecasts (such as forecast demand, forecast supply availability) and how these component forecasts are used in producing the overall *reliability forecast*.

In preparing these, AEMO has regard to the principles for accuracy, transparency, and engagement in NER clause 4A.B.5(b), as reflected in the Interim FBPG.

(d) **Accuracy** will be delivered through:

    (i) following best practice methodologies and sources of data and assumptions (see Sections 3.2 and 3.3);

    (ii) ensuring thorough quality assurance processes (see Section 3.5);

    (iii) applying continuous learning through forecast accuracy report and associated forecast improvement plan (see Section 4); and

    (iv) following completion of an ESOO, reporting to the AER on how AEMO has followed the Interim FBPG in developing the *reliability forecast*.

(e) **Transparency** will be delivered through:

    (i) published and consulted on methodologies (see Section 3.2); and

    (ii) openness around inputs and assumptions, including how data is sourced, cut-off times, management of *confidential information* (see Section 3.3) and mechanism for release of data, including processed results (see Section 3.5.2).

(f) **Engagement** will be delivered through formal and information information-gathering and consultative processes before, during, and after the *reliability forecast* process using different forms and levels of engagement (see sections 2 and 3.3.2).

3.2. Forecast methodologies

The process for producing a *reliability forecast* can be split into three overall components:

(a) Demand forecasts – the forecast load to be met for the NEM.

(b) Supply forecasts – the operational parameters applied for generators, demand side participation (DSP), large-scale storage, and transmission network elements.

(c) *Reliability forecast* – the assessment of the ability of available supply to meet demand.

Each of these comprises various components and needs different inputs. Figure 2 provides an overview of the end-to-end process and highlights the different methodology documents that explain the different processes and their inputs.

Figure 2 End to end high-level overview of reliability forecast process
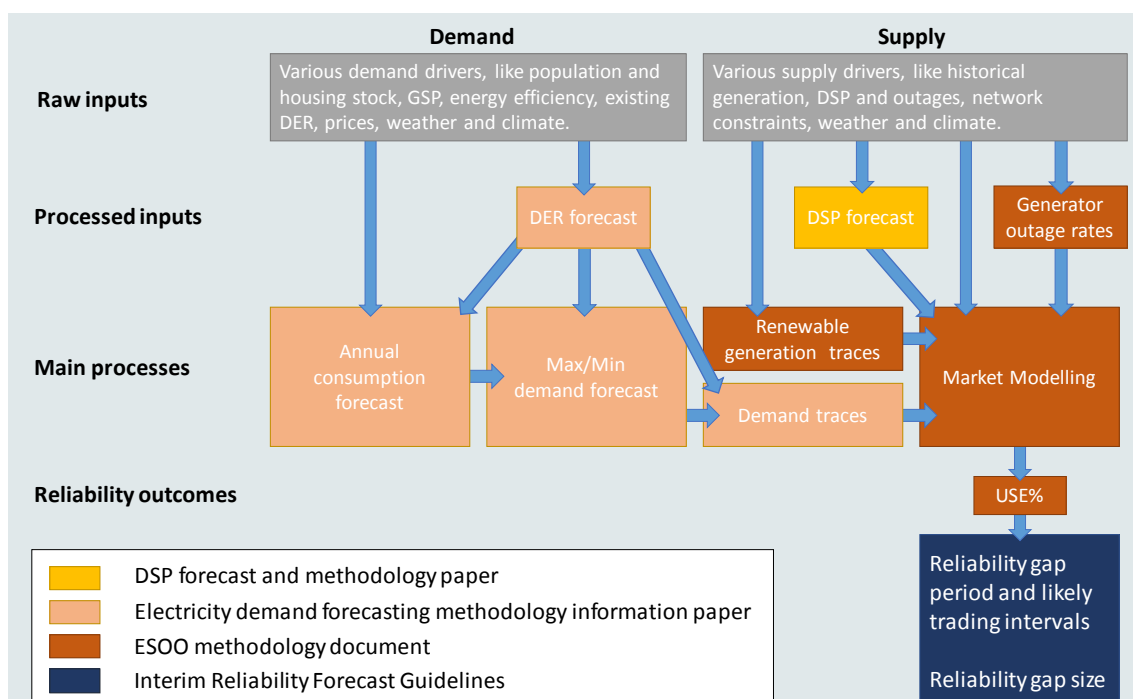
In addition to these Guidelines, the three documents listed in the Figure 2 legend describe the detailed methodologies applied by AEMO. The latest versions of these documents are available on the AEMO's NEM Electricity Statement of Opportunities (ESOO) web page[1].

As discussed in Section 4, AEMO will, at least annually, assess the forecast accuracy of previous *reliability forecast* and forecast components. This will highlight any need for improvement of data, assumption, or methodologies, which will be outlined in a forecast improvement plan, as explained further in Section 4.2.

3.3. Inputs and assumptions

3.3.1. General principles

As shown in Figure 2, AEMO needs a wide range of data inputs and assumptions in the preparation of an ESOO and the associated *reliability forecast*. In identifying the inputs and assumptions to be used in a *reliability forecast*, AEMO will:

(a) source the input data and assumptions from the most recent and accurate sources of information reasonably available, and where practicable from the *Registered Participant* or other person most closely associated with the data (see Section 3.4);

(b) validate material inputs and assumptions, where reasonably practicable, for example through a second opinion (consultant) or engagement with the FRG;

(c) include data up till at least 30 April (later if practical) for the demand components and at least 30 June for the supply components to be used for the *reliability forecast* to be produced by the end of August that year;

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[1] See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities.

(d)   unless AEMO itself is the subject matter expert, seek expert advice from consultants with recognised expertise for new or novel technologies or trends that are yet not well understood, and for subjects that require specialist expertise; and

(e)   be transparent about all inputs and assumptions sourced and the process for collecting and validating them, subject to AEMO's obligations in respect of *confidential information* under the National Electricity Law.

(f)   apply the Forecasting Best Practice Consultation Procedures outlined in AERs Interim FBPG at least once every four years to determine:

         (i)   the fundamental methodologies needed in the forecasting processes;

         (ii)   the components on which the forecasts are to be based, and the way they are to be determined and used;

         (iii)   the stakeholder engagement process for determining the forecasting methodologies, inputs and assumptions.

3.3.2. Information requests

(a)   To facilitate the accuracy of the ESOO, including the *reliability forecast*, for the benefit of stakeholders overall, AEMO will request information from *Registered Participants* in accordance with NER clause 3.13.3A(d)-(e). .

(b)   AEMO may request any information, including *confidential information*:

         (i)   that is relevant to ensure the quality of the matters required to be included in the ESOO; and

         (ii)   that is not already available to AEMO, unless AEMO considers there is a need for multiple sources to validate data, having regard to the relative reliability of sources and historical data quality.

(c)   AEMO will request information from those *Registered Participants* who are reasonably expected to hold that information, either because it relates directly to their business or because their functions or obligations are likely to require it. By way of example only, and subject to subsequent changes to the NER, AEMO may request:

         (i)   *Generators* to provide current and forecast information about the operation or alteration of their *generating systems*;

         (ii)   *Network Service Providers* to provide current and forecast information about planned *network augmentations*, upgrades and maintenance, *connection enquiries* and *connection applications*;

         (iii)   *Network Service Providers* and *Market* Customers to provide current and forecast information about changes in *load* and demand side participation; and

         (iv)   *Intending Participants* to provide current and forecast information about prposed connection projects.

(d)   Information requests can take the form of a standing request or an individual (ad hoc) request.

(e)   Standing requests will be published by AEMO once a year, typically around the end of January for the preparation of the ESOO by the end of August, and will include:

         (i)   a detailed description of the forecast information requested for that calendar year;

(ii) the *Registered Participant* categories required to provide the specified information; and .

(iii) the timeline for provision of the information to AEMO, including where applicable the grounds and deadline for requesting an extension.

(f) AEMO will consult on any changes to this list from year to year using the FRG consultation process, as outlined in Section 2. Changes may be driven by learnings from one year's ESOO process, the subsequent assessment of forecast accuracy of the previous year's forecast, or changes to legislation or rules that require AEMO to collect new data.

(g) Individual (ad hoc) requests to one or a broader group of *Registered Participants* may be necessary, for example to seek clarification of information already provided or to address an emerging issue. AEMO will use the FRG discussion process where reasonably practicable, before formally requesting the information. For requests to individual entities, AEMO will discuss one-on-one ahead of the request. In either case, whenever reasonably practical, AEMO will seek to give at least 20 business days for *Registered Participants* to provide the data, once requested.

3.3.3. Responding to information requests

(a) *Registered Participants* must respond to AEMO's information requests within the period specified in the request or as agreed and, where information is requested in a particular form, in that form.

(b) Consistent with NER clause3.13.3A(g) *Registered Participants* must take care to ensure the information they provide is not misleading and has been carefully checked for accuracy or, in the case of forecasts, represents the *Registered Participant's* current best estimate and intentions in relation to the relevant information.

(c) *Registered Participants* must specifically identify any *confidential information* provided in response to a request for information.

3.4. Incorporating confidential information

AEMO will at times ask for and receive *confidential information*. This is to improve the accuracy of the *reliability forecast*, in line with the accuracy principle, but it involves a trade-off with the transparency principle.

To ensure the forecast is accurate, AEMO will use the *confidential information* in its modelling but seek to publish sufficient aggregated information to retain a high degree of transparency of inputs.

3.5. Quality assurance

The end-to-end process in Figure 2 showed a number of inputs, and processes using those inputs, creating outputs that may be used as inputs into other processes.

3.5.1. Quality assurance processes

There are a number of quality assurance processes in place to help to ensure results are accurate and correct.

(a) **Before** the reliability forecasting process, AEMO must consult on planned changes to assumptions and methodologies (typically driven by the forecast improvement plan, as outlined in Section 4.2) using FRG consultation or written consultation.

(b)   **Throughout** the reliability forecasting process, AEMO will:

(i)   undertake validation of data and assumptions, for example through the use of reputable sources, validation against other available sources and explaining changes from previous versions;

(ii)   undertake verification of model implementations underpinning each subprocess; and

(iii) engage with industry on interim results, both by individual component and demand and supply forecasts overall, though FRG discussion and FRG consultation.

(c)   **After** the reliability forecasting process, AEMO will publish final methodology documents and supporting material as defined in Section 3.5.2.

3.5.2.   Supporting material

Within 20 business days of publishing the ESOO, AEMO must publish supporting material to allow participants to verify or use the data in their own processes, (noting that confidential data will only be available in aggregate form). Supporting material includes:

(a)   input data series to the forecast components;component forecast outputs, including demand forecasts and generator outage rates;

(b)   model files or description of model formulations in cases where model files cannot be provided; and

(c)   consultant reports, detailing inputs, assumptions, methodology, and results of any consultancy work used in the *reliability forecast*.

4.   FORECAST IMPROVEMENTS

As outlined in the NER clause 3.13.3A(h) AEMO will, no less than annually, prepare and publish on its website information related to the accuracy of its demand and supply forecasts, and any other inputs determined by AEMO to be material to its *reliability forecasts*. This requirement will be met by the publication of the forecast accuracy report (**FAR**),

4.1.   The forecast accuracy report

(a)   The FAR will include:

(i)   an examination of the performance of each forecast component, per NEM *region*, including:

(A)   input drivers of demand;

(B)   energy consumption;

(C)   maximum and minimum demand;

(D)   input drivers of supply;

(E)   supply availability; and

(F)   reliability.

(ii)   an explanation of the results and any material deviation of trend in differences; and

(iii) a list of actions undertaken, or to be undertaken, to improve the accuracy of the forecast and forecast components.

(b)   AEMO will typically publish forecast and observed values alongside forecast accuracy metrics for all forecast components. Values may be published in either graph or tabular format. Where an input is subject to confidentiality requirements, AEMO may choose to either aggregate or not publish updated data.

(c)   AEMO develops a new *reliability forecast* at least annually. Within a five-year period of consideration, there may therefore be greater than five forecasts to evaluate for each new observed year. AEMO will evaluate and examine the performance of the most recent *reliability forecast* in the most detail, typically including forecast and observed values. Less recent forecasts will be reported in less detail, such that only the most material variations and performance metrics are examined.

4.2.   Forecast improvement plan

(a)   The FAR will include all information related to proposed improvements to the forecasting processes that will apply to the next ESOO, with a particular focus on those arising from forecast deviations. Stakeholder consultation on the improvements may begin before or after the forecasting accuracy report publication. Upon implementation, improvements will be documented in methodology documents and the ESOO.

(b)   Prior to annual publication of the FAR, AEMO will engage with *Registered Participants* through FRG discussion (as per the consultation principles documented in Section 2) to explain proposed variations in report structure and accuracy metrics. AEMO will consider feedback in the design of the report and analysis.

5.   RELIABILITY FORECAST

5.1.   Reliability forecast and indicative reliability forecast

(a)   The *reliability forecast* covers the first five years of the ESOO time horizon while *the indicative reliability forecast* covers the remaining five years of the ten-year ESOO outlook.

(b)   If there is a *forecast reliability gap* (see Section 5.1.1), additional reporting must be provided as per Sections 5.1.2 and 5.1.3, meeting the requirements in NER 4A.B.2(b). AEMO will also publish the *one-in-two year peak demand forecast* for each *region* (see Section 6.2) in accordance with NER 4A.A.3(b).

5.1.1.   Existence of a reliability gap and triggering reliability instrument requests

(a)   AEMO's methodology for calculating expected *unserved energy* (**USE**) uses the ESOO framework, inputs, and assumptions specified in the *Reliability standard* Implementation Guidelines (**RSIG**)[2] and explained in detail in the ESOO Methodology Document[3].

(b)   The expected USE is compared against the *reliability standard*. As per NER clause 4A.A.2, if the expected USE exceed the *reliability standard*, the *forecast reliability gap* is material.

(c)   While AEMO may assess the *forecast reliability gap* under a range of scenarios, the *reliability gap* that triggers a reliability instrument request will be based on the scenario AEMO considers most likely to eventuate, that is, a neutral or central scenario.

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[2] At https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities.

[3] At https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities.

5.1.2. Reliability gap period and likely trading intervals

(a) In the event that a *reliability gap* is identified for either T-1 or T-3, AEMO determines the *reliability gap period* and likely *gap trading intervals* based on the interval USE outcomes observed in the market simulations.

(b) AEMO uses thresholds on the probability of lost load to determine the *reliability gap period* and set of likely *gap trading intervals* where a *reliability gap* has been identified. This methodology and the thresholds have been adopted to eliminate the impact of outlier events influencing simulation results, and to instead focus on likely periods which would cover the majority of load shedding events in simulations, when annual USE is forecast to exceed the *reliability standard*.

(c) To provide greater decision-making support, AEMO provides additional information that illustrates the distribution of USE events observed in the simulations with respect to month, day-of-the-week, and time-of-day, to help inform *Registered Participants* of the characteristics of the resources that could close the *reliability gap*.

(d) The following approach is applied in determining the *reliability gap period* and the likely *gap trading intervals*:

    (i) Months – a *reliability gap* is declared to exist in a month if the probability of lost load in that month exceeds 10%. The months identified are then used to determine the start and end date of the *reliability gap period*. AEMO applies a 'sense test' that could tighten the start- and end-dates of the *reliability gap periods* within each month, if all the risk in the simulations occurs in, say, the first or last week of the month.

    (ii) Day of the week – within each month that meets the lost load threshold, weekdays are declared as being within the *reliability gap period*. The weekends are declared as being within the *reliability gap period* if the probability of lost load on weekends exceeds 10%. The day-of-the-week classification will be used to describe the likely *trading intervals* of a shortfall.

    (iii) Time-of-day – a consistent time-of-day is applied across all month/day-of-the-week periods within a *reliability gap period*. The range of *trading intervals* is identified by determining the earliest and latest time-of-day where the probability of lost load exceeds 10%. All periods between these *trading intervals* are included.

    (iv) Excluded periods – consideration is given to whether there is a period of time within the reliability period that should be excluded, such as the Christmas/New Year period, or discrete months where likelihood of supply shortfalls is low, as discussed below.

(e) The *reliability gap period* may contain months which do not meet the lost load thresholds described above. AEMO applies the following treatment in issuing *reliability instrument* requests:

    (i) Where there is no consecutive two-month period that does not meet the threshold (for example, November, January, and March are above the lost load threshold but December and February are not), a single *reliability instrument* request is made which includes the month/s which did not meet the threshold.

    (ii) Where there is a consecutive period of two or more months that does not meet the threshold, two *reliability instrument* requests are submitted with different *reliability gap period* specifications. For the purpose of calculating the MW size of the *reliability gap*, the two or more *reliability gap periods* are considered together, due to the need to assess the additional MW required to meet the annual *reliability standard*.

(f)   If there is a single month or another period (for example, the weeks over the holiday period) where the risks of load shedding are observed to be low in the simulations, this period is explicitly excluded from the likely *gap trading intervals*. This removes the possible need for contracting cover during periods where the risk of load shedding is low while maintaining the administrative simplicity of a single *reliability instrument* request in most cases.

(g)   This attempts to balance the cost of contracting for longer *reliability gap periods* against the risk of confusion and administrative burden if multiple *reliability instrument* requests are requested in the same financial year.

Example

The figures below (Figure 3 to Figure 5) show probabilities of lost load for a simulation at monthly, weekday/weekend, and time-of-day level. Based on the criteria above, the *reliability gap period* and *trading intervals* for T-3 would be defined as follows:

- Start date: 1 January.
- End date: 28/29 February.
- Weekends are excluded in both months.
- *Trading intervals*: 1.00 pm – 8.00 pm.

(h)   For T-1 reliability instrument requests, the *reliability gap period* and *trading intervals* are determined using the same approach, but are further confined to being a subset of the T-3 reliability instrument request *reliability gap period* and *trading intervals*.

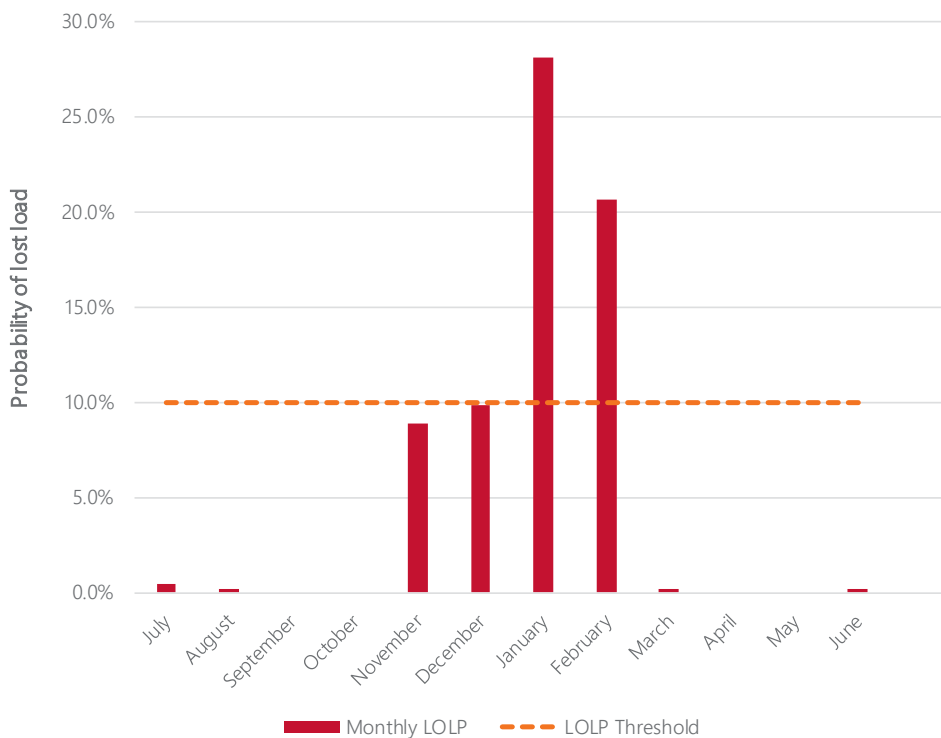**Figure 3   Monthly probability of lost load assessment**

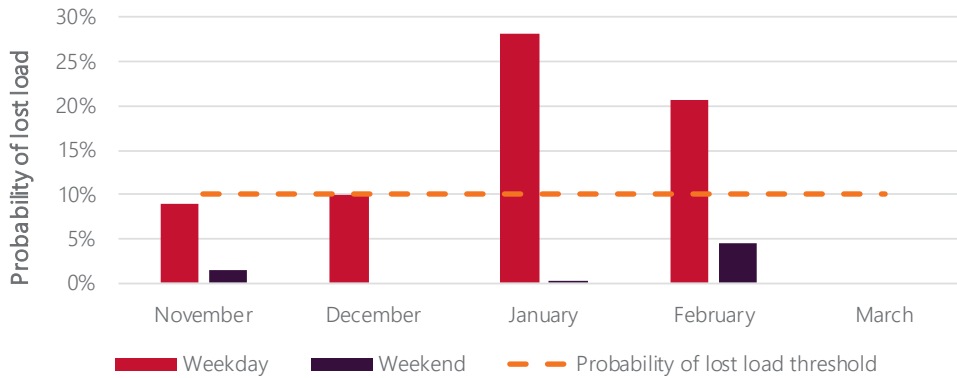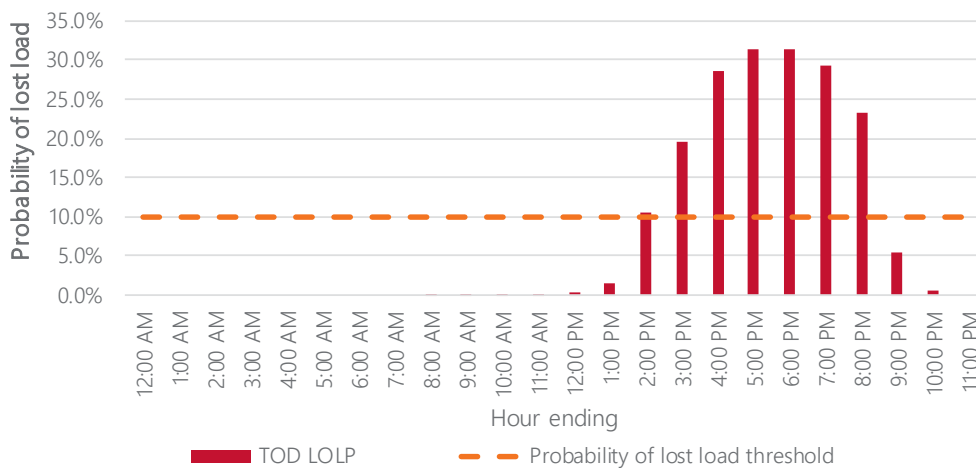**Figure 4   Weekday/weekend probability of lost load assessment**

**Figure 5   Time of day probability of lost load assessment (all months)**

5.1.3.   Size of the gap

(a)   The size of the *forecast reliability gap* , expressed in megawatts, is determined by analysing the interval level USE across all simulations in each *region* where the USE exceeds the *reliability standard*. The size of the gap is calculated as the additional megawatts of capacity, assumed to be 100% available, during all identified *trading intervals* within the *reliability gap period* only, that is required to reduce the annual expected USE to the *reliability standard*.

(b)   To better align with the actions available to liable entities under the RRO to ensure they have adequate contract coverage over the *reliability gap period*, the size of the gap is determined based on the effective response that additional reserves could provide if only procured to cover the *reliability gap period* and likely *trading intervals* identified. This means the gap (in megawatts) may be slightly larger than would otherwise be the case if those reserves were assumed to be available for the entire financial year.

(c)   The additional megawatts are assumed to be perfectly reliable and have no constraints such as a maximum hours of operation. Only a single megawatt value will be assessed per *region* for the entire *reliability gap period*. Different megawatt values may apply for multiple reliability instrument requests within a financial year, although the objective is still to assess the additional reserves required to bring expected USE below the *reliability standard*.

(d)   A conceptual example is provided below in Figure 6. In this example, some of the USE periods are specified as falling outside the *reliability gap period*. The figure shows the

impact of 200 MW of additional capacity applied to USE periods that occur during the *reliability gap period* and likely *trading intervals* identified.

Figure 6   Conceptual example of the reliability gap
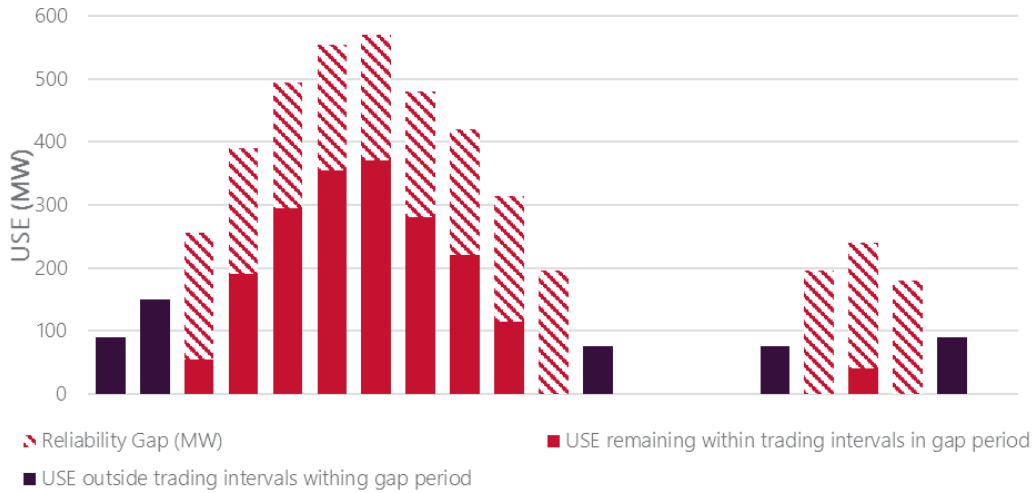
Note the x axis here represents two conceptual days (not necessarily contiguous) with the intervening time where no USE occurred being removed for the purpose of illustration.

(e)   Figure 7 follows from the example above, and shows the impact on annual USE from the application of the 200 MW of additional capacity. Here the *reliability gap* is calculated as 200 MW, the level of additional capacity required to bring USE to within the *reliability standard* when applied to USE in the relevant *trading intervals* within the *reliability gap period*.

Figure 7   Conceptual example of the reliability gap
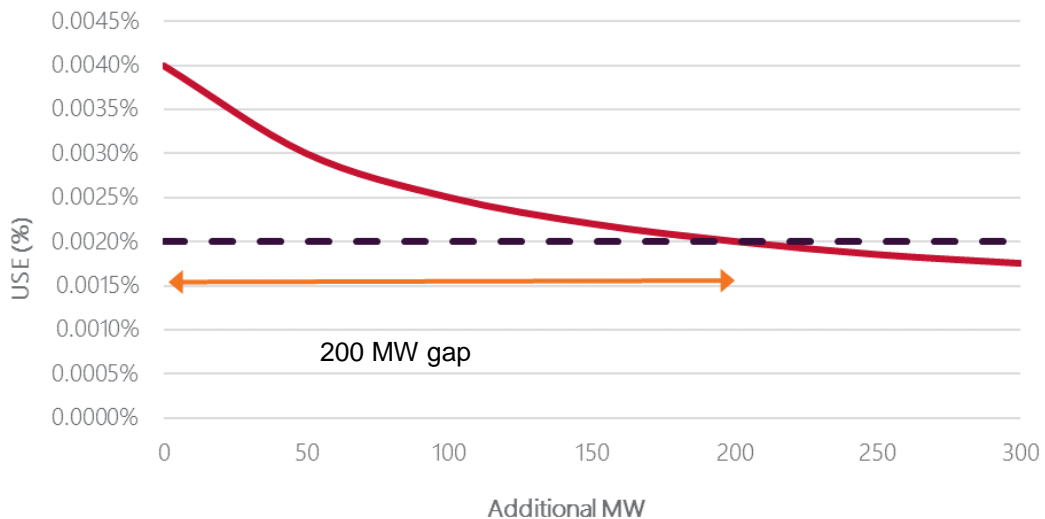
5.1.4. Sharing additional reserves

(f)   As the *reliability gap* is determined independently in each *region* where the level of USE exceeds the *reliability standard*, the methodology does not consider the impact additional resources in one *region* may have on the size or existence of a gap in another.

(g)   For example, tight supply-demand conditions in Victoria and South Australia are often highly correlated. As such, it is frequently observed that additional capacity in Victoria would reduce the level of USE in Victoria but also in South Australia, and vice versa.

(h)   By determining the size of the gap in each *region* independently, the combined gap in megawatts may be bigger than the level that would be required to have both *regions* meet the *reliability standard* when allowing for reserve sharing.

(i)   AEMO considers this is not an issue for the purpose of the *reliability gap* calculation, because the relative size of the gap is used only for the allocation of any Procurer of Last Resort (**POLR**) cost to non-compliant parties between the two (or more) *regions*. The calculation of the quantity of any Reliability and Emergency Reserve Trader (RERT) contracts procured (and therefore the total cost of RERT) will consider the effect of *inter-regional* reserve sharing.

5.2.   Updating the reliability forecast

5.2.1.   Information provided in a Reliability Forecast update

Should AEMO publish an update to a previously published *reliability forecast*, on becoming aware of new information that is material to the ESSO outcomes in accordance with NER clause 3.13.3A(b), AEMO will reassess the *reliability gap*. In the event that a *reliability gap* is identified for T-1 or T-3, AEMO will also publish the *reliability gap period* and likely *gap trading intervals* as well as the *reliability gap*.

5.2.2.   Industry engagement and timeline for publication

Where there is a need to update the *reliability forecast*, AEMO must balance the extent of the engagement with industry against the speed with which it can publish the update.

Any material change arising from updates to well understood drivers (such as announced large load or generator commitment/closure) will trigger a *reliability forecast* update simply using the existing approach. Should there be any new trends or information not well understood or consulted on AEMO will, where reasonably practical, to consult with industry before finalising any update, in particular if this could cause a reliability instrument request (see Appendix A).

6.   DEMAND

6.1.   Demand definitions

Demand can be measured at different points in the electricity network. AEMO's reliability modelling is based on operational consumption/demand. This represents demand delivered from the transmission grid as produced by all scheduled, semi-scheduled, and significant non-scheduled generators[4].

Operational demand can be defined in two different ways depending on where the generation delivered to the transmission grid is measured:

- **As generated** – this definition reflects the total generation produced by the generator before subtracting any internal consumption at that site, known as the auxiliary load or auxiliaries.
- **Sent out** – this definition reflects the generation actually delivered to the transmission grid.

This is illustrated in Figure 8.

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[4] For a full explanation of AEMO's demand definitions, see http://www.aemo.com.au/-/media/Files/Electricity/NEM/
Security_and_Reliability/Dispatch/Policy_and_Process/Demand-terms-in-EMMS-Data-Model.pdf.

Figure 8   Operational demand definition, sent out versus as generated
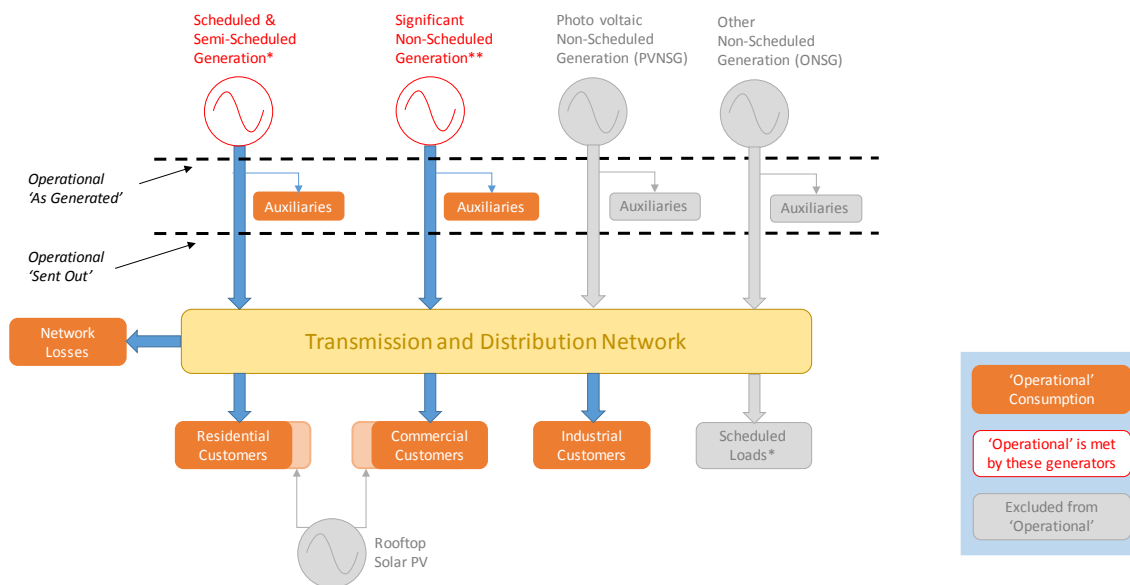
6.2.   One-in-two year peak demand forecast

For the purpose of the RRO, AEMO uses its 50% Probability of Exceedance (POE) operational 'as generated' forecast as the *one-in-two year peak demand forecast* defined in NER clause 4A.A.3. This forecast is produced following the methodology outlined in AEMO's most recent Demand Forecasting Methodology Information Paper[5].

The use of 'as generated' for the *one-in-two year peak demand forecast* allows stakeholders to readily compare against demand in real time, because actual historical demand is reported ongoing by AEMO using this point of measurement[6].

Allowing comparison of forecast against *actual demand* in near to real time should provide *liable entities* with the opportunity to take action to reduce load when *actual demand* approaches the *one-in-two year peak demand forecast*.

6.3.   Actual demand

The AER only assesses RRO *liable entities'* compliance in *trading intervals* in which *actual demand* exceeds the *one-in-two year peak demand forecast* during the published *reliability gap period* and likely *gap trading intervals* for a declared *T-1 reliability instrument*.

The *actual demand* is the measured operational demand as generated for the *trading interval* adjusted only for the impact of the actions specified in NER clause 4A.A.4(b), namely:

- *directions* by AEMO;
- RERT contracts activated/dispatched by AEMO; or
- *load shedding* directed by AEMO.

AEMO must, as soon as practical after a *trading interval*, publish the *actual demand* for that *trading interval* for all *regions* on its website.

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[5] See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities.

[6] See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data-dashboard#operational-demand.

APPENDIX A.   MEANS OF CONSULTATION

For the purpose of consulting on the development of the *reliability forecast*, including the methodologies used, AEMO has defined five types of engagement that balance the need for engagement with the cost and speed of undertaking the engagement. These are shown in Table 1, ordered from the least to most engagement.

Table 1   List of consultation types

Type	Process	Examples of likely use
1 – Information only	• AEMO will advise industry of the change, e.g. through FRG meetings, and update documentation when reissued.	Minor administrative updates to methodology descriptions, use of more recent data from existing data sources.
2 – FRG discussion	• Topic listed on FRG meeting agenda. • Presentation (if practically possible) should be circulated at least 3 business days ahead of the FRG meeting. • Presentation and discussion at FRG meeting. • Outcomes and actions arising to be listed in FRG meeting minutes.	Discussion of ideas to be implemented seeking suggestions for improvements or presentation of draft results of component forecasts of lesser importance.
3 – FRG consultation	• Topic listed on FRG meeting agenda. • Presentation (if practically possible) should be circulated at least 3 business days ahead of the FRG meeting and include background, proposed change and justification. • Presentation and discussion at FRG meeting. • Opportunity for verbal/written feedback for two weeks following the FRG meeting. • Conclusion summarised at the following FRG meeting. • Conclusion and submissions received to be published on AEMO's website.	Discussion of draft component forecasts with significant implications to the *reliability forecast* or changes to data source/methodology changes that do not require an update to the methodology documents.
4 – Written consultation (Forecasting Best Practice Consultation Procedures)	• As outlined in AER Interim FBPG - Appendix A, where practical, and in no case less than a single round of consultation, allowing no less than 20 business days for participants to submit their responses.	Consulting on material changes to methodology documents or forecasting framework (other than administrative or to correct an error).
5 – Rules Consultation Procedure	• As outlined in NER clause 8.9.	*Reliability forecast guidelines*