RELIABILITY FORECAST GUIDELINES

PREPARED BY:	AEMO Forecasting
VERSION:	2.1
EFFECTIVE DATE:	~~26 February~~31 August 2021
STATUS:	Final

Approved for distribution and use by:

APPROVED BY:	Alex Wonhas
TITLE:	Chief System Design & Engineering Officer

DATE: ~~26 February~~31 August 2021

VERSION RELEASE HISTORY

Version	Effective Date	Summary of Changes
1.0	19 December 2019	First Issue of Interim Reliability Forecast Guidelines
1.1	11 November 2020	Replaces the Interim Reliablity Forecast Guidelines, taking into account the AER's Forecast Best Practice Guidelines and incorporating consultation feedback.
1.2	2 December 2020	Update for introduction of the National Electricity Amendment (Retailer Reliability Obligation trigger) Rule 2020.
1.3	20 January 2021	Issue of Draft Reliability Forecast Guidelines following first stage consultation.
2.0	26 February 2021	Replaces the Interim Reliablity Forecast Guidelines, taking into account the AER's Forecast Best Practice Guidelines and incorporating consultation feedback.
2.1	31 August 2021	Minor change to clarify application of the National Electricity Amendment (Retailer Reliability Obligation trigger) Rule 2020, and other administrative changes.

CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1. Purpose and scope

These are the ~~Draft~~ Reliability Forecast Guidelines (**Guidelines**) made under clause 4A.B.4 and amended under clause 11.132.5 of the National Electricity Rules (**NER**).

The purpose of the 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 *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
IASR	Inputs, Assumptions and Scenarios Report
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 FBPG	AER Forecasting Best Practice Guidelines	https://www.aer.gov.au/system/files/AER%20-%20Forecasting%20best%20practice%20guidelines%20-%2025%20August%202020.pdf

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
DSP forecast methodology	Demand Side Participation forecast methodology	Available at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach
Demand Forecasting Methodology Paper	Electricity Demand Forecasting Methodology	Available at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach
ESOO and Reliability Forecast Methodology document	ESOO and Reliability Forecast Methodology document	Available at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach
RSIG	AEMO Reliability standard Implementation Guidelines	Available at: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

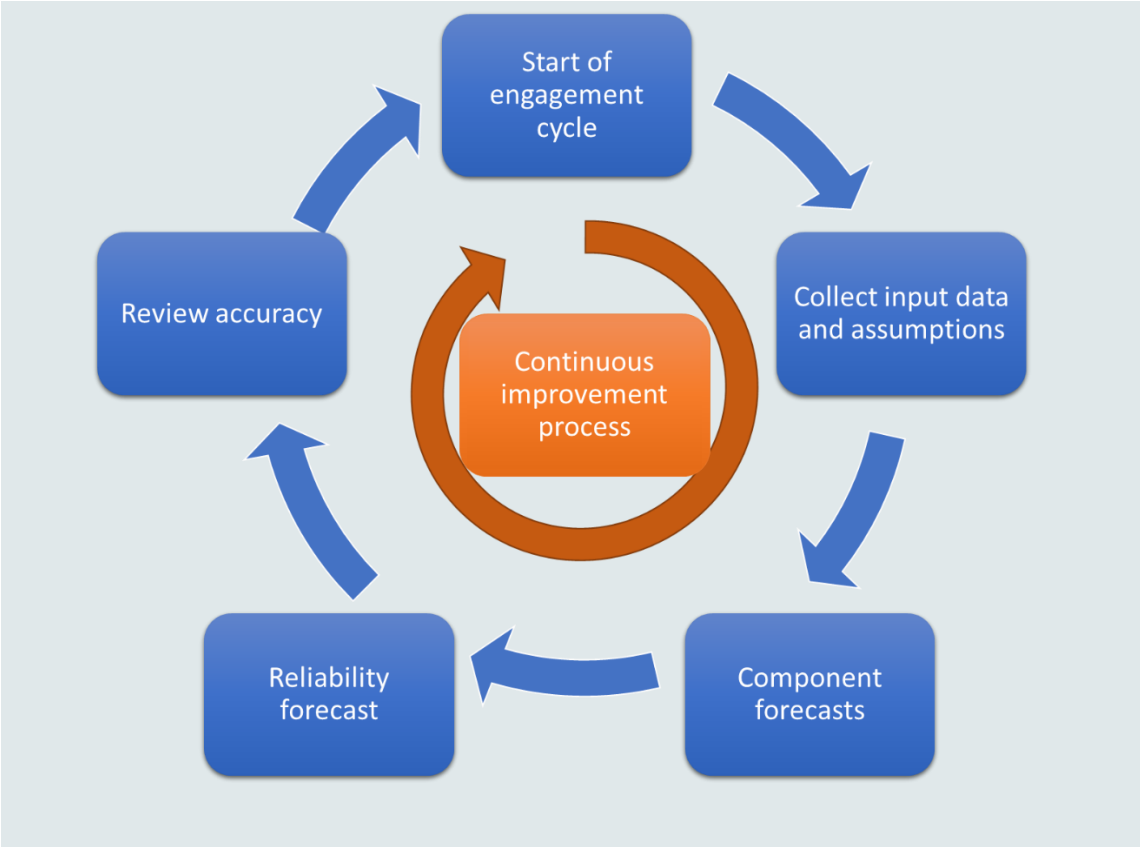
2. STAKEHOLDER ENGAGEMENT

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.

The annual engagement cycle is shown in Figure 1. It highlights the different phases of the *reliability forecast* process; some phases require industry engagement to validate inputs and assumptions, other phases are outcomes of component forecasts or the resulting *reliability* forecast. While these phases are sequential, AEMO will look for opportunities for improvements continually and engage with industry on these as early as practicable, when relevant.

Figure 1 Engagement cycle – commences fourth quarter of each calendar year



Within the development of the annual IASR, AEMO will publish a timeline for stakeholder engagement on the development of key inputs and assumptions.

2.2. The Stakeholder engagement spectrum

There are various frameworks for describing the types of stakeholder engagement, such as the five levels in the AER's Stakeholder Engagement Framework[1]. Table 1 below is based on these levels and shows how they may be used in the context of AEMO's stakeholder engagement.

Table 1 Stakeholder engagement spectrum

Type	Characteristic	Examples of likely use
Inform	One-way engagement	Website Written reports Email updates to mailing lists Certain agenda items at industry forums
Consult	Limited two-way engagement: we ask questions, stakeholders respond	Some agenda items at industry forums Surveys Some one-on-one meetings

[1] Available at: https://www.aer.gov.au/about-us/stakeholder-engagement

Type	Characteristic	Examples of likely use
Involve	Two-way or multi-way engagement: learning on all sides, stakeholders and AEMO act independently, AEMO is decision maker	Some agenda items at industry forums Advisory boards and technical working groups Written consultations Some one-on-one meetings Workshops, such as for the Inputs, Assumptions and Scenarios Report (IASR)
Collaborate	Two-way or multi-way engagement: joint decision making and actions	
Empower	Decisions delegated to stakeholders; stakeholders play a role in governance	

2.3. Forms of engagement

2.3.1. Choosing the right form of engagement

No particular form of engagement is better than another for all purposes. By considering the following factors, AEMO can choose the most effective form(s) of engagement for a given purpose. The factors include the:

- Materiality, novelty and complexity of the purpose.
- Risk to forecast accuracy
- Stakeholder objectives
- Constraints that AEMO and stakeholders face – including but not limited to; available time, funds, and access to specialist skills/knowledge/information and tools.
- Engagement effectiveness. To this end, AEMO will regularly seek input on the effectiveness of its engagement. From that feedback, AEMO will consider the benefit of further stakeholder involvement.

AEMO notes that large and complex matters, such as the ISP, are likely to require multiple forms of consultation throughout the various stages.

2.3.2. Engagement approach for the Reliability Forecast Guidelines

For the purpose of consulting on the development of the *reliability forecast*, including the methodologies used, AEMO has defined five forms of engagement that may suit different circumstances. These are shown in Table 2. Under type, the bold text highlights the corresponding engagement spectrum as discussed in Table 1. As seen from the examples, "consult' or 'involve' is used in the the majority of the engagement.

Table 2 List of consultation forms

Type	Form of engagement	Examples of likely use
1 – Information only [INFORM]	• 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.

Type	Form of engagement	Examples of likely use
2 – FRG discussion [CONSULT]	• Topic listed on FRG meeting agenda. • Presentation should be circulated ahead of the FRG meeting as per the FRG Terms of Reference. • 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 [CONSULT]	• Topic listed on FRG meeting agenda. • Presentation should be circulated ahead of the FRG meeting as per the FRG Terms of Reference 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 prior to 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 a major update to the methodology documents.
4 – Short form written consultation [INVOLVE]	• Single round of written consultation, allowing no less than 20 business days for participants to submit their responses. Final determination published. • Single stage process, as outlined in the AER's FBPG – Appendix B	Typically used for continuous improvement initiatives, annual inputs and assumptions consultation and improvement plan (other than administrative or to correct an error). Used for updates to the methodologies between the four year consultation cycle
5 – Long form written consultation [INVOLVE]	• Forecasting best practice consultation procedures as outlined in the AER's FBPG - Appendix A	Consulting on material changes to Forecasting Approach. Must be undertaken at least every four years.
6 – Rules Consultation Procedure [INVOLVE]	• As outlined in NER clause 8.9.	*Reliability forecast guidelines*

Key forms of enagement from the above table are described further in the following sections.

2.3.3. 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 National Electricity Market (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, seek input for major reports or encourage knowledge exchange.

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 allowing for efficient discussion between AEMO and all industry groups. Depending on needs, they can be used for the both informing, consulting and involving as per the spectrum above.

2.3.4. 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 forecasting, 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 as characterised in the involvement spectrum.

2.3.5. One-on-one discussions

AEMO may 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*. One-on-one discussions may be consulting, involving or collaborating types of engagement.

2.3.6. Written consultation

Significant changes to forecasting methodologies and major reviews require more extensive consultation, in some cases as prescribed by the NER or the Forecasting Best Practice Guidelines (**FBPG**). Written consultations will generally be hosted on AEMO's Consultation web portal, and flagged with relevant stakeholders through broad communications, including in industry forums (such as the FRG or the NEMWCF). AEMO will publish consultation papers and invite written submissions from *Registered Participants* and interested parties. Consultations can be for either for consulting or involving.

2.4. Effective engagement

Effective engagement requires more than just choosing the right form of engagement.

Firstly, it is critical that stakeholders are supported with relevant information. To this end, AEMO will provide:

- Key model outputs with their drivers and background information, to build stakeholder understanding and therefore involvement.
- Relevant and timely information pertinent to the form of consultation. Where no specific rules or guidelines inform the timeframes for information provision, AEMO will consider the timeframes listed in the FRG's Terms of Reference (TOR) as relevant. The FRG TOR are discussed at least annually with stakeholders.

Secondly, to support stakeholder's participation, AEMO will clearly state the form of engagement adopted for each subject, and where it sits on the engagement spectrum.

Finally, where practical AEMO will maintain a flexible approach to each engagement, subject to cost and scheduling constraints.

2.4.1. Transparency on breadth and depth of engagement

AEMO is to provide transparency on which stakeholders participated in engagement opportunities, by listing attendance at meetings and publishing non-confidential consultation submissions. AEMO's FBPG compliance report to the AER contains some basic measures that indicate the breadth and depth of consultation, allowing the AER to assess the effectiveness of AEMO's stakeholder engagement.

2.5. Forecasting Approach register

AEMO will utilise a public Forecasting Approach register to support Stakeholder engagement. The register will document:

- Stakeholder feedback on methodologies provided outside of formal consultations. As methodologies may be reviewed as infrequently as every four years[2], it is important that feedback is documented in readiness for the next review. The register will not replicate the content of formal submissions to consultations.
- Stakeholder feedback on matters driving stakeholder engagement. Examples include:
    - The efficacy of the engagement process.
    - The timeliness and relevancy of information made available to stakeholders.
    - The information needed to understand the components driving the *reliability forecast*.
    - Transparent disclosure of all key inputs.

The Forecasting Approach register will be available on AEMO's website[3].

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 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);

[2] AEMO must consult on each component of the forecasting approach at least once every four years, as per the FBPG section 2.1.

[3] See: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

(iii) applying continuous learning through the Forecast Accuracy Report (FAR) and associated forecast improvement plan (see Section 4); and

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

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

(i) publication and consultation of 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 mechanisms for the release of data, including processed results (see Section 3.5.2).

(f) **Engagement** will be delivered through formal and informal 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).

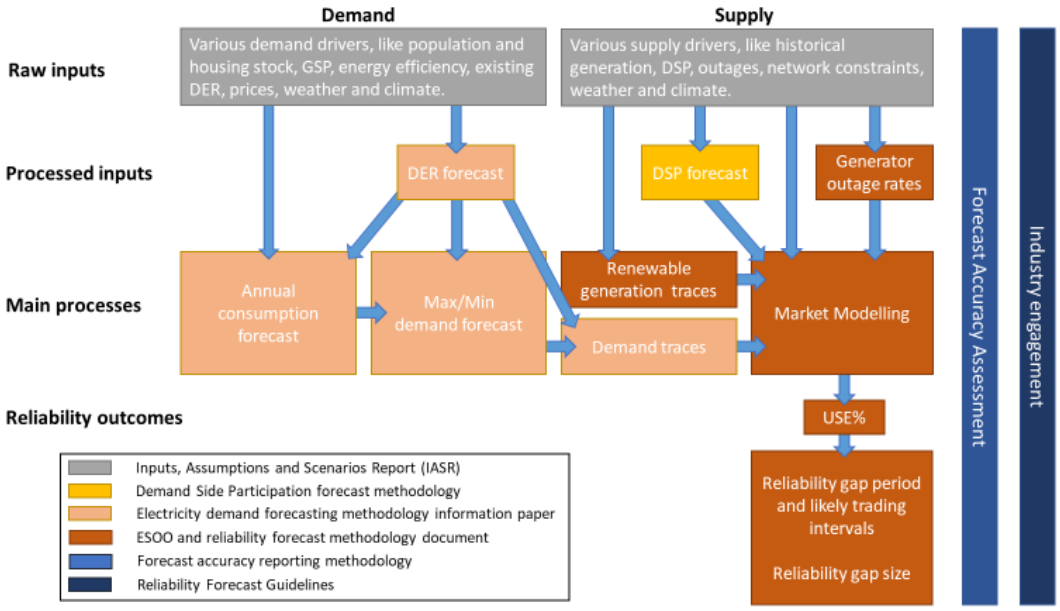
3.2. Forecasting Approach

The FBPG lists three analytical streams:

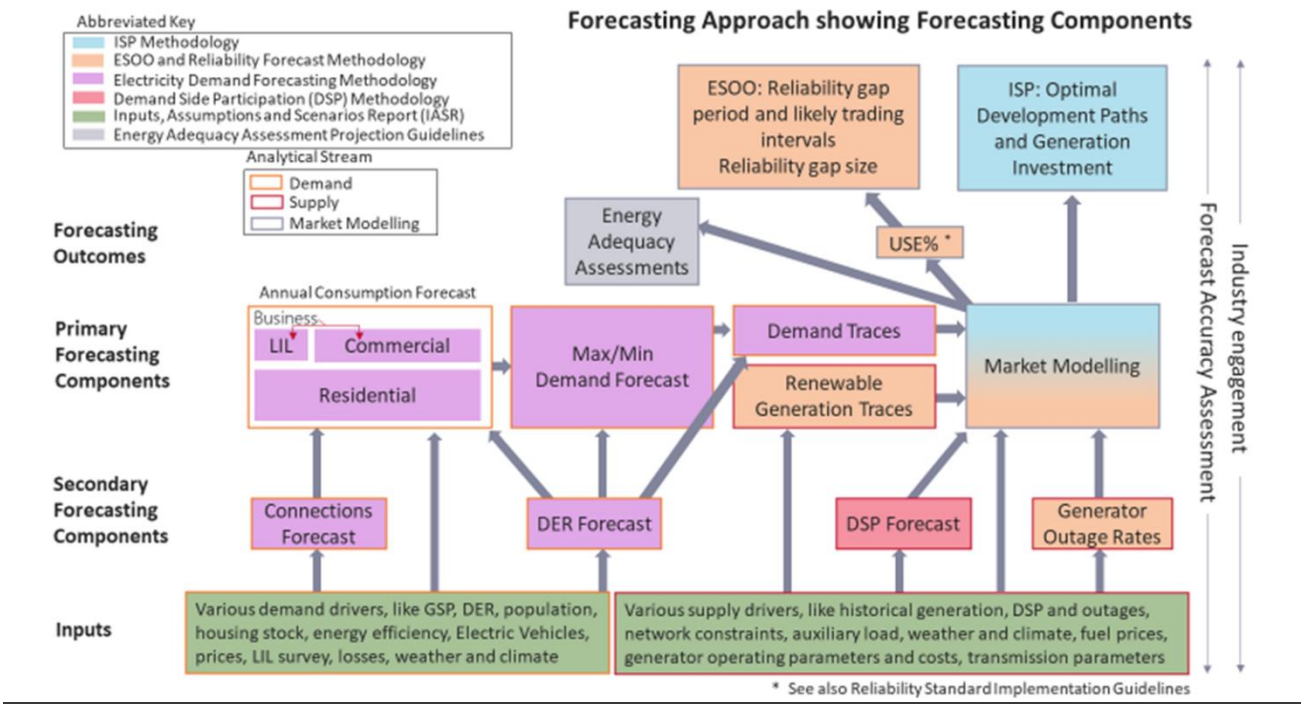
- Demand forecasts – the load for the National Electricity Market to meet.
- Supply forecasts – the operational performance parameters applied to the generators, DSP[4] and transmission elements.
- An assessment of the demand and supply balance that determines whether the *reliability standard* will be met

Each of these comprises various components and may rely on different inputs. Figure 2 provides a high-level overview of the end-to-end process.

Figure 2 End to end high-level overview of AEMO's Forecasting Approach



[4] See definition in AEMO's Demand Side Participation methodology, https://aemo.com.au/-/media/files/stakeholder_consultation/consultations/nem-consultations/2020/demand-side-participation/final/demand-side-participation-forecast-methodology.pdf



The figure also highlights the different methodology documents that explain the different processes and their inputs in more detail. Collectively, AEMO's detailed forecasting methodologies are known as the Forecasting Approach. The latest versions of these methodology documents are available on AEMO's Forecasting Approach web page[5].

As discussed in Section 4, AEMO will, at least annually, assess the forecast accuracy of its previous *reliability forecast* and forecast components. This will highlight areas 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 from a subject matter expert[6] or engagement with the FRG;

[5] Available from https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

[6] A subject matter expert may be any relevant authority, including but not limited to skilled consultants, academic body or market body.

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

(d) seek subject matter expert expertise (unless AEMO itself is the subject matter expert), such as advice on new or novel technologies, or emerging trends;

(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) summarise the broad source and validation approach for key data input components in its IASR as at the date of these Guidelines, including the role stakeholders have in the process;

(g) consult annually on inputs, assumptions and scenarios in its IASR using ~~in~~the AER's FBPG Appendix B single stage consultation process;

(h) publish the final IASR following completion of the consultation; and

(i) apply the two stage Consultation Procedures outlined in AER's FBPG Appendix A 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

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).

AEMO may request any information, including *confidential information*:

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

(b) 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.

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, AEMO may request:

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

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

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

(f) *Intending Participants* to provide current and forecast information about proposed connection projects.

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

Standing requests will be published on AEMO's ESOO website once a year, typically around the end of January for the preparation of the ESOO by the end of August, and will include:

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

(h) the *Registered Participant* categories required to provide the specified information;

(i) the rationale for needing this information to meet ESOO objectives, and

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

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.

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 outlined in Section 2 where reasonably practicable, before formally requesting the information.

Whenever reasonably practical, AEMO will:

- For requests to individual entities, discuss one-on-one ahead of the request.
- Provide at least 20 business days for *Registered Participants* to provide the data, once requested.

3.3.3. Responding to information requests

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.

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.

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 through its annual IASR consultation process[7].

(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

No later than the publication date of 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, though the level of aggregation will be limited to what is essential to maintain confidentiality).

Supporting material includes:

(a) input data series to the forecast components;

(b) component forecast outputs, including demand forecasts and generator outage rates;

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

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

Where practicable, AEMO will publish all relevant inputs and assumptions in the final IASR ahead of the ESOO. Any requests for AEMO to provide additional information in relation to inputs and assumptions should be provided by stakeholders as part of the IASR consultation process.

3.5.3. Information provided in a Reliability Instrument request

Should AEMO need to submit a *reliability instrument* request as per Section 5.1 0, it will, at a minimum, provide the information required by National Electricity Law Section 14I and any further information listed in the AER Interim RIG.

As an indication, AEMO will provide the following:

(a) The NEM *region* in which the *forecast reliability gap* is forecast to occur.

(b) The forecast reliability gap, in megawatts (MW).

[7] Available at https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/scenarios-inputs-assumptions-methodologies-and-guidelines

(c) The additional reserves required to reduce expected unserved energy (USE) to below the *interim reliability measure* or *reliability standard*[8], assuming these reserves are available in all hours of the financial year (for information purposes only).

(d) First and last days of the forecast reliability gap period.

(e) The trading intervals during the forecast reliability gap period where supply shortfalls are most likely to occur, which will consist of the specification of weekends/weekdays and the time-of-day range within the forecast reliability gap period.

(f) AEMO's one-in-two year peak demand forecast (see Section 6.2).

(g) The sensitivity of USE to additional capacity available during the forecast reliability gap period.

(h) Additional information that helps illustrate observed USE in the simulations, including but not limited to the distribution of USE across months, and the distribution of USE duration.

4. FORECAST IMPROVEMENTS

Ongoing improvements to the methodologies that generate the reliability forecast may be necessary at times to increase forecast accuracy and to increase stakeholder confidence. Key drivers of forecast improvements are the:

(a) FAR and forecast improvement plan - In accordance with 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. Typically, this report will be prepared following the end of winter, allowing the previous year's forecast to be compared against a full year of observations, including both summer and winter maximum demand. The FAR and forecast improvement plan are described in detail further below.

(b) FAR methodology - At least every four years, AEMO will consult on its FAR methodology in accordance with Section 3.3.1 (i). The consultation will consider, where warranted, variations in report structure and accuracy metrics. AEMO will consider feedback in the design of future reports and analysis.

AEMO will engage an external expert to review the FAR reporting metrics and methodology at least once every four years, prior to a full FAR methodology consultation.

(c) Review of Forecasting Approach – At least every four years, AEMO will review its Forecasting Approach using the AER's forecasting best practice consultation procedures outlined in Appendix B of the FBPG. The review schedule for various component methodologies that comprise the Forecasting Approach can be found on AEMO's website[9]. A review may be justified earlier than scheduled if there has been a material change in circumstances such as:

(i) introduction of a new and improved modelling technique,

(ii) material changes to the underlying drivers of some component of the forecast, or

(iii) evidence to suggest that an approach AEMO has been applying is no longer best practice.

[8] Clause 11.132 of the National Electricity Rules provides that, until 30 June 2025, for the purposes of sections 14G(1) and 14G(5) of the National Electricity Law, the reliability standard is prescribed to be the interim reliability measure. The measure is specified in clause 3.9.3C(a1) of the Rules.

[9] See: https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

4.1. The forecast accuracy report

The FAR will include:

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

(b) input drivers of demand;

(ii) energy consumption;

(iii) maximum and minimum demand;

(iv) input drivers of supply;

(v) supply availability; and

(vi) reliability.

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

(d) a list of actions undertaken, or to be undertaken, to improve the accuracy of the forecast and forecast components as part of AEMO's forecast improvement plan.

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.

4.2. Forecast improvement plan

The FAR will include information related to proposed continuous improvements to the forecasting processes that may apply to the next ESOO, with a particular focus on those most likely to address observed forecast deviations.

Stakeholder consultation on the continuous improvement initiatives will follow the single stage process outlined in Appendix B of the AER's FBPG. Consultation may begin before or after the FAR publication, with AEMO seeking to engage with stakeholders as early as possible rather than wait for actual publication schedules.

Upon implementation, relevant methodology documents will be updated to reflect changes to inputs and methods arising from these continuous improvement initiatives.

4.3. Assessing performance of improvements

AEMO will consider how new methodologies or inputs would have performed if they had been executed over the previous five years of forecasting based on materiality of the change:

- Where a change to inputs or forecast is considered a "continuous improvement" it in general would not warrant a forecast of historical periods as part of the assessment unless simple to do so. All such continuous improvements will be consulted on via the forecast improvement plan, which will follow the single stage consultation process outlined in Appendix B of the FBPG, as well as FRG discussion. To some extent, progressive improvements in FAR reporting metrics could be used as a measure of success of these continuous improvements.
- For more fundamental changes made through consultation on the Forecasting Approach, AEMO will consider how new methodologies or inputs would have performed if they had been executed over the previous five years of forecasting, provided it is practicable to do so. In assessing practicability and feasibility, AEMO will consider both the availability of historical input data at the spatial and temporal resolution needed to train the models,

and the scale of any system change that would be necessary to undertake the performance review. Any obstacles limiting AEMO's ability to conduct a performance review against the previous five years of corresponding data will be clearly communicated to stakeholders as part of the Forecasting Approach consultation, and other measures of performance will be proposed.

5. RELIABILITY FORECAST

5.1. Reliability forecast and indicative reliability forecast

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.

The expected USE is calculated in accordance with the RSIG and as explained in the ESOO and Reliability Forecast Methodology Document[10]. It is compared against the *interim reliability measure*[11]. or *reliability standard*[12]. As per NER clause 11.132.2(b), if the expected USE exceeds the *interim reliability measure* until 30 June 2025, the *forecast reliability gap* is material. If the expected USE exceeds the *reliability standard* after 30 June 2025, the *forecast reliability gap* is material.

If there is a *forecast reliability gap:*

(a) Additional reporting of the *forecast reliability gap* (size in MW), *forecast reliability gap period* and likely *gap trading intervals* must be provided to meet the requirements in NER 4A.B.2(b) and (c). The calculation of those are explained in the ESOO and Reliability Forecast Methodology Document[13].

(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).

(c) Following the publication of the ESOO, AEMO will submit a *reliability instrument* request to the AER. Section 3.5.3 outlines the information AEMO will publish as part of a *reliability instrument* request.

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

5.2. Updating the reliability forecast

5.2.1. Circumstances for providing a Reliability Forecast update

Should AEMO become aware of new information that is material to the ESOO outcomes in accordance with NER clause 3.13.3A(b), AEMO will reassess the *reliability gap*.

[10] Available from https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

[11] ~~Clause 11.132 of the National Electricity Rules provides that, until 30 June 2025, for the purposes of sections 14G(1) and 14G(5) of the National Electricity Law, the reliability standard is prescribed to be the interim reliability measure. The measure is specified in clause 3.9.3C(a1) of the Rules.~~

[12] Clause 11.132 of the National Electricity Rules provides that, until 30 June 2025, for the purposes of sections 14G(1) and 14G(5) of the National Electricity Law, the reliability standard is prescribed to be the interim reliability measure. The measure is specified in clause 3.9.3C(a1) of the Rules.

[13] Available from https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

In its assessment of materiality to the ESOO outcomes, AEMO will have regard to the regulatory consequence of the new information, including whether the new information would result in a new *forecast reliability gap* being identified, or would close an existing *forecast reliability gap*.

5.2.2. 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 ESOO outcomes in accordance with NER clause 3.13.3A(b), AEMO will reassess the *reliability gap*.

In the event that a *forecast reliability gap* is identified for T-1 or T-3, AEMO will also publish the *forecast reliability gap period* and likely *gap trading intervals* as well as the *forecast reliability gap* in a form that is consistent with that presented in the ESOO.

5.2.3. Industry engagement and timeline for publication

Where there is a need to update the *reliability forecast*, AEMO will balance the extent of the engagement with industry against the complexity of the change as well as the speed with which it can publish the update. Specifically:

(a) 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.

(b) For a material change in trends or information not well understood or previously consulted on, AEMO will, where reasonably practical, consult with industry before finalising any update (preferably running a single stage consultation process as per Appendix B of the FBPG), in particular if this could trigger a *reliability instrument* request.

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 network* as produced by all *scheduled generating units*, *semi-scheduled generating units*, and significant *non-scheduled generating units*[14].

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

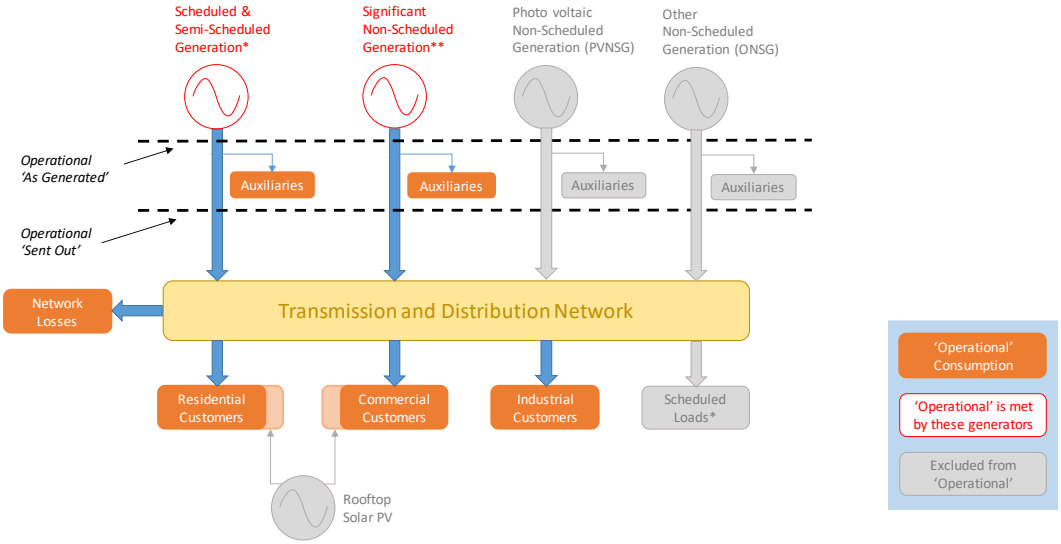
(a) As generated – this definition reflects the total generation produced by the *generating system* before subtracting any internal consumption at that site, known as the auxiliary load or auxiliaries.

(b) Sent out – this definition reflects the *generation* actually delivered to the *transmission network*.

This is illustrated in Figure 3.

[14] 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 3 Operational demand definition, sent out versus as generated



The customer segment definitions are contained within AEMO's Electricity Demand Forecasting Methodology[15].

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 Electricity Demand Forecasting Methodology[16].

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[17].

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:

(a) directions by AEMO;

(b) RERT contracts activated/dispatched by AEMO; or

(c) load shedding directed by AEMO.

[15] Available from https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

[16] Available from https://aemo.com.au/en/energy-systems/electricity/national-electricity-market-nem/nem-forecasting-and-planning/forecasting-approach

[17] See: https://www.aemo.com.au/energy-systems/electricity/national-electricity-market-nem/data-nem/operational-demand-data.

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