public interest
ADVOCACY CENTRE

Submission to AEMO Reliability Forecasting Methodology Issues Paper

24th May 2019

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About the Public Interest Advocacy Centre

The Public Interest Advocacy Centre (PIAC) is an independent, non-profit legal centre based in Sydney.

Established in 1982, PIAC tackles barriers to justice and fairness experienced by people who are vulnerable or facing disadvantage. We ensure basic rights are enjoyed across the community through legal assistance and strategic litigation, public policy development, communication and training.

Energy and Water Consumers' Advocacy Program

The Energy and Water Consumers' Advocacy Program (EWCAP) represents the interests of low-income and other residential consumers of electricity, gas and water in New South Wales. The program develops policy and advocates in the interests of low-income and other residential consumers in the NSW energy and water markets. PIAC receives input from a community-based reference group whose members include:

- NSW Council of Social Service;
- Combined Pensioners and Superannuants Association of NSW;
- Ethnic Communities Council NSW;
- Salvation Army;
- Physical Disability Council NSW;
- St Vincent de Paul NSW;
- Good Shepherd Microfinance;
- Affiliated Residential Park Residents Association NSW;
- Tenants Union;
- Solar Citizens; and
- The Sydney Alliance.

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1. Principles

The Retailer Reliability Obligation (RRO) is a mechanism intended to promote reliability in the NEM by imposing a contracting requirement on retailers. The goal is to create an incentive for investment in, and operation of, dispatchable energy resources to support reliability. This will have material implications for retailers' compliance obligations, which ultimately flow through to consumer costs. Forecasting the 'reliability gap' used to signal the need for a market response, and, if that fails to eventuate, a Reliability Instrument, is a key input to this process.

PIAC understands AEMO has been tasked with providing forecasts to assist implementation of the RRO. AEMO is not responsible for the existence of the RRO itself. However, we note the following:

- there has been no demonstrated problem with reliability in the NEM to date as gauged by material breaches of the reliability standard; and
- there is no direct link between increased financial contracting obligations for retailers and reliability improvements in the physical system. Energy derivatives are financial instruments with no guarantee they will lead to the construction or operation of generation infrastructure.[1]

Nonetheless PIAC acknowledges that, if the RRO is to be implemented, it is important that the 'triggering' of a reliability obligation be based on good information. We recognise and appreciate the rigorous and detailed forecasting work performed by AEMO so far, as well as AEMO's commitment to transparency as evidenced through this consultation process.

PIAC considers reliability forecasting, and forecasting more generally, should be guided by the following principles:

- Forecast methodologies and inputs should be transparent and open to scrutiny by stakeholders.
- Forecast inputs and outputs should incorporate a range of scenarios to reflect degrees of confidence and uncertainty, rather than relying single scenarios. These degrees of confidence and certainty should be expressed in associated publications and communications.
- Forecasters shoud learn from the accuracy or otherwise of past forecasts by themselves and others. In particular, forecast methodology should seek to incorporate some form of 'error correction loop' – using the convergence/ divergence of predicted and historical values in past forecasts as an input into future predictions, so that performance can improve over time.

These principles inform the content of our submission.

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[1] From the ASX: 'The Australian market is one of the few purely cash settled electricity markets (i.e. financial contracts do not involve physical delivery of electricity) which enables participants such as and banks to participate in the financial market and contribute to market liquidity without a requirement to own physical generation assets.' See https://www.asxenergy.com.au/products/overview_of_the_australian_el.

2. Questions for consultation

2.1 Transparency

Is the level of detail provided in this issues paper and refered methodology papers sufficient to allow you to constructively critique and provide feedback on the appropriateness of the methodology? If not, what additional information/explanations are required?

PIAC considers the level of detail AEMO has provided in the first Reliability Forecasting Methodology Issues Paper to be broadly constructive and appropriate. We consider it would be beneficial to supplement the information provided as described below.

Comparison between predicted and historical values for forecast inputs

Forecasts are usually 'wrong'; there is often material difference between expectation and reality. This is particularly true in a complex and evolving system such as the NEM. Divergence between forecasts made by AEMO or any other body, and the actual observed historical values, does not in and of itself indicate bias or other problems with forecast methodology and inputs, but rather the inherent uncertainty of making predictions about the future.

However, if forecast errors consistently tend in a particular direction, or if they tend to increase rather than decreasing or remaining stable over time, this may indicate bias in the methodology or other problems that need to be explored and rectified. For example, if a forecasting process consistently underforecasts uptake of distributed energy resources, this indicates an underestimation bias. Adjusting this bias could take the form of amending the forecast methodology or seeking inputs from alternative sources.

The reliability forecast relies on a number of inputs which themselves are forecasts. These include consumption and demand, demand side participation, generation and storage, and transmission modelling. Some of these inputs are generated 'in house' by AEMO while others are provided by external entities. For example, AEMO often seeks input from consultants in developing scenarios of uptake for new generating technologies.

PIAC considers these inputs and supporting information should be open to scrutiny by consumer advocates, market bodies and other stakeholders. Comparison of existing predicted and actual historical values should be presented - ideally in both numeric and graphical form - and any assumptions made in the application of input data should be stated. This will support accountability in the forecasting process and give guidance on how much confidence should be attached to the reliability forecast and its underlying components.

We acknowledge some of this information is already available via AEMO's Forecast Accuracy Report (for example, historical versus predicted values for operational demand by jurisdiction). We consider this an important mechanism for transparency, and support both the commitment to accountability embedded in this approach and its extension to other forecasting processes.

Recommendation 1

That in future iterations of the issues paper and associated publications, AEMO provide access to data enabling stakeholders to compare forecast values for market variables with actual historical values, along with any assumptions made in the application of input data.

Comparison between predicted and historical values for the reliability forecast

We acknowledge there are complications in comparing forecast and historical values in the specific case of reliability forecasts. The purpose of declaring a reliability gap is to stimulate a market response (and/ or interventions) which prevent the predicted 'shortage' in reliability from occurring. Thus if the policy is working, by accurately predicting the gap that 'would have' occurred, AEMO will in effect have prevented the forecast outcome from occuring.

However, this should not mean that the reliability forecast is effectively unfalsifiable. At a high level, we understand that AEMO uses 'what if' methodologies to generate counterfactuals in other processes, such as when implementing intervention pricing.[2] Similar methods on a conceptual level could be used to compare predictions made in the reliability forecast with the actual values that eventuate. We encourage AEMO to explore this issue.

Recommendation 2

That AEMO explore methodologies to compare predicted reliability forecast values with the historical values that eventuate, and provide access to this information in future iterations of the Reliability Forecasting Issues paper and/ or associated publications.

Transparency in use of consultants

PIAC understands that AEMO hires sometimes engages consultants for additional input in the forecasting process. We appreciate the value of this and the importance of incorporating a broad range of expertise and perspectives.

Given that consultant methodology and inputs may include commercial-in-confidence material, and that consultants' obligations more broadly often end with the expiration of the contract, there may be difficulty in obtaining access to this information at a later date for the purpose of accountability and improving future forecasts.

From the Reliability Forecasting workshop, we understand that AEMO is currently developing its response to these issues. It includes bringing consultants into the formal public consultation process through the Forecasting Reference Group, potentially imposing parallel obligations with respect to responding to submissions, and on occasion directly observing consultants' models and methodologies.

PIAC broadly supports these measures. We see merit in further discussing the issue and in potentially developing explicit guidelines with respect to transparency and consultants' obligations. We would welcome the opportunity to continue to work with AEMO on this issue.

[2] See for example AEMO, *Intervention Pricing Methodology: Final Report and Determination*, September 2018.

Recommendation 3

That AEMO, with input from consumer advocates and other stakeholders, develop explicit guidelines to ensure transparency with respect to the role of consultants in generating the reliability forecast.

2.2 Open processes

In addition to this consultation and associated workshop, what other means of engagement could be considered for this year's ESOO, taking into account the time available and balancing timeliness and relevancy of information with need for consultation?

As stated in our response to the previous question, PIAC considers there would be value in bringing consultants and other entities into formal consultation procedures, so that consumer advocates, market bodies and other stakeholders can engage with all contributors to the forecasting process.

PIAC has extensive experience supporting industry and agencies (including AEMO) to undertake effective, fit-for-purpose engagement while being cognizant of time and other resource limitiations, and would welcome a conversation with AEMO about further engagement for this process.

Recommendation 4

That AEMO consider further opportunities for consumer advocates, market bodies and other stakeholders to engage with consultants and other non-AEMO entities with input in the forecasting process, and that AEMO discusses enagagement approaches with PIAC.

2.3 Accuracy and lack of bias

Are the proposed assumptions and methodologies for calculating supply and transmission inputs to the Reliability Forecast (e.g. forced outage rates and auxiliary loads) reasonable for the purpose of assessing unserved energy? If not, what refinements should be considered?

Access to information as a forecasting input

PIAC considers there is merit in further exploring AEMO's access to information as an input to the forecasting process. In particular there may be value in considering whether the current framework can be improved to support AEMO in obtaining data to generate rigorous, accurate and unbiased forecasts.

At the Reliability Forecasting Methodology workshop, several stakeholders raised the issue of forced outage rates and the data used to predict them as a component of the reliability forecast.

It was asserted that when predicting outage rates for a given generator, longer historical time series are preferable to shorter as they better correct for 'noise' in the dataset. Relying on data from shorter intervals risks 'overweighting' outages in a particular year which may be unrepresentative of the plant's long term availability. Representatives from AEMO commented

that the forecasting team is restricted in its access to historical data as it ultimately relies on information voluntarily provided by market participants.

PIAC does not have access to the data or direct involvement in the processes underlying these statements, and does not wish to comment on this specific technical question. However, we consider this example raises questions with respect to the framework governing AEMO's access to information more generally:

- Under the current framework, do generators and other market participants have adequate incentives to provide AEMO with sufficient quality and quantity of information as an input to forecasts?
- Is there a role for AEMO to have compulsory information-gathering powers (for example, analogous to those currently held by the ACCC)?
- Are there opportunities for improved data sharing between AEMO and other market bodies?

We welcome further consideration of these issues.

Recommendation 5

That AEMO and other market bodies, in consultation with stakeholders including consumer advocates, consider whether AEMO has access to adequate information as an input to forecasting.

Recommendation 6

That AEMO and other market bodies consider mechanisms to improve access to data as an input to forecasting.

2.4 Methodology

Are the outlined assumptions and approaches to calculate the reliability gap size, reliability gap period and likely trading intervals reasonable?

Incorporating an 'error correction loop' into the forecast methodology

At this stage PIAC considers the outlined assumptions and approaches to be reasonable at a high level.

In terms of the broader methodological approach, PIAC considers that in addition to evaluating the reasonability or otherwise of forecasts in their development (ex ante), it is important to evaluate their accuracy after the fact (ex post). Ideally the methodology will include some mechanism for incorporating this information to improve future forecasts.

As previously stated, forecasts always contain some degree of 'error' when compared to the historical values which actually eventuate. This reflects no necessary failing on the part of the forecaster, but rather the inherent challenge of the forecasting process. If the size and direction of the error can be incorporated as an input into future predictions, this can create a feedback loop which supports process-improvement over time.

PIAC considers AEMO should explore using these and/ or other methods to incorporate mechanisms for 'error correction' into future iterations of the reliability forecast. We acknowledge this is the first iteration of the new reliability forecasting process, and that AEMO is likely already working on measures along these lines. As acknowledged in our reponse to the question on transparency, there are also particular challenges applying this concept to the reliability forecast, since the purpose of declaring a reliability gap is to prevent the predicted breach of the reliability standard from occurring.

Nonetheless, we consider the principle that predictions should be *falsifiable* – that is, it should be possible to evaluate their 'correctness' or otherwise after the fact – applies to reliability forecasting as it does to all forecasting processes. This process of confirming the extent to which forecasts were accurate is vital to any rigorous forecasting methodology, and should form a key input into process-improvement over time.

PIAC welcomes opportunities for further discussion of how these principles can be implemented in the context of reliability forecasting.

Recommendation 7

That AEMO, in consultation with other stakeholders, explore methods for explicitly incorporating 'error correction' mechanisms into future iterations of the reliability forecast.

Is the proposed demand definition to be used for the 1-in-2 year peak demand forecast reasonable? If not, what alternative definition should be considered and why?

PIAC supports further consideration of this issue.

Does the set of result visualisations provided in the conceptual example provide information that assists participants in responding to any reliability instrument? What additional information would support decision-making in response to any reliability instrument?

Visualisation of conceptual examples in the Issues Paper

PIAC appreciates AEMO's efforts to provide information assisting market participants and other stakeholders in responding to any reliability instrument. We recognise the inherent challenge in communicating technical detail to a broad audience, and commend AEMO's endeavours to date on this front.

We consider there is value in further exploring how AEMO's communications can assist consumer advocates, market bodies and other stakeholders in making decisions with respect to the reliability forecast and the system more generally.

Specific comments on the result visualisations provided in the conceptual example are below.

While we understand the purpose of the figures is to provide conceptual illustration, not precise representation, we consider this information would provide stakeholders with high level guidance as to the types of scenarios AEMO considers broadly representative of a potential reliability gap, and may be viewed separately to associated background information.

Figure 6

- Guidance for interpreting variables – we suggest considering the inclusion of an additional label or key to guide interpretation of cumulative values on the Y axis. In our understanding, these represent the total unserved energy (USE) in each period for which USE is greater than zero, disaggregated into 'portions' which do and do not represent a breach of the reliabiliity standard. Clarification of this point within the figure may be of value.

- Guidance for interpreting axes – we suggest labelling the X axis to indicate that each bar of the chart represents one trading interval, and to clarify whether these intervals are continguous or separated in time (as distinct from the two days represented in the chart, which we understand from the figure notes to be non-continguous).

- Indicating maximum USE under the reliability standard – we suggest including some indication/ visual representation of the 0.002% USE threshold for each time interval. This would assist stakeholders in understanding the forecast USE within the context of the reliability standard, under which only USE exceeding the threshold should ever be considered a 'breach'.

Communicating the probabilistic nature of forecasts

Forecasting is inherently a probabilistic process. Very rarely can any method produce a single 'correct' answer in predicting the future evolution of a complex system like the NEM, and its components such as reliability. Rather, forecasters will develop a range or distribution of potential outcomes, and develop measures of confidence attached to each of those outcomes. We consider this probabilistic approach, which incorporates uncertainty into forecasting processes and their outputs, should typically be preferred to a 'deterministic' approach which yields only one predicted outcome and does not capture the spread of potential scenarios.

PIAC understands that AEMO largely already takes this approach - for example, using Monte Carlo methods to simulate values such as USE levels in each region a large number of times, then examining the distribution of these simulated values to gauge the likelihood of a 'reliability gap' occurring.[3] We consider there is value in further considering how confidence and uncertainty can be visually represented and otherwise communicated in a way that supports understanding by stakeholders.

In general, where a particular forecast result or input comprises a range of values rather than a single value (for example, the USE simulations described above), visual representation and commentary on that information should seek to depict the distribution of that range rather than (or at least in addition to) extracting a single instance. Depicting a single case risks conveying the erroneous impression that a one definitive outcome has been predicted, as opposed to a distribution of potential outcomes. This may cause stakeholders to over or underestimate the probability of particular scenarios, with negative consequences for decision-making.

[3] AEMO, Reliability Forecasting Methodology Issues Paper, April 2019, 27.

Where for brevity or illustrative purposes a single number is provided or case depicted, we consider information should be provided as to how the range was 'collapsed' to that single value. For example, the issues paper states that the size of the reliability gap is determined 'by analysing the interval level USE across all simulations in each region where the USE exceeds the reliability standard'.[4] However, the gap is expressed as a single value in MW for each trading interval, and is depicted as such in Figure 6. Clarification on how results from many simulations were 'condensed' to one value should be provided.

More broadly PIAC considers AEMO should continue seeking means to convey the uncertain nature of its forecasts in communications. Ideally measures of confidence and certainty would be incorporated into the 'headline' messaging, as well as in more technical documents. As well as better guiding market and policy responses, this would provide greater defensibility to forecasting approaches after the fact of any unforeseen event that attracts public attention.

We appreciate the challenge of conveying such complex information to a broad audience, support AEMO's existing efforts, and welcome opportunities to further explore how this might be achieved.

Recommendation 8

That AEMO explore methods of incorporating measures of confidence and uncertainty into its public communications with respect to reliability and other forecasts.

4 Ibid.