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Wholesale Demand Response team
AEMO

Submitted via email: wdr@aemo.com.au

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Dear Rosie

RE: Enel X baseline methodology proposals – Further Consultation Paper

Thank you for the opportunity to provide feedback on the *Enel X baseline methodology proposals – Further Consultation Paper*.

Enel X operates Australia's largest dispatchable virtual power plant.[1] We work with commercial and industrial energy users to activate demand-side flexibility and offer it into the National Electricity Market's (NEM's) energy and ancillary services markets, the Wholesale Demand Response Mechanism (WDRM), the Reliability and Emergency Reserve Trader (RERT) mechanism, and to network businesses. Enel X is the first Demand Response Service Provider (DRSP) for wholesale demand response.

Enel X is deeply committed to promoting a vibrant market for demand side response and have invested considerable resources in building a portfolio to support reliability and security in the NEM. Based on our experience working with customers on the ground, additional baseline methodologies that reflect the practical realities of potential sites, while appropriately managing any potential risks with these approaches, are necessary to support the continued growth and evolution of the WDRM.

Additional Baselines

Enel X appreciates AEMO's efforts in expanding eligibility criteria and baseline options to facilitate greater participation in the WDRM. The introduction of new baseline methodology options including 10 of 10 with 20-day look-back and High 5 of 10 add important diversity for fitting baseline methods to loads to improve WDRM uptake, and deliver appropriate Predictability off Load (PoL), dispatch and settlement outcomes.

RRMSE Threshold

Enel X welcome the trial of a 30% Relative Root Mean Squared Error (RRMSE) threshold. The application of this threshold will immediately unlock additional Flexible Demand resources for the WDRM, and we keenly await AEMO's implementation.

High 5 of 10 eligibility criteria

Enel X encourage AEMO to only implement 'guard rails' that are necessary to protect the integrity of the WDRM. It is important to provide the market an opportunity to establish an evidence base to inform further development. Restricting baseline application on a philosophical perspective of 'fit' rather than evidence of performance risks 'chilling' further innovation. Enel X recommend that AEMO remain open minded on application of the High 5 of 10 baseline methodology to loads that may not be weather sensitive but otherwise exhibit similar load patterns.

[1] Per AEMO Registrations

DNSP endorsement review

Enel X welcome further consideration of the Distribution Network Service Provider (DNSP) endorsement process. The current process is impractical and has biased Enel X to implementing smaller WDRM aggregations that are less efficient due to the 1MW bid/dispatch granularity and increased the risk of under delivery. Retailer implemented Demand Response programs do not face similar restrictions and co-ordinate large load aggregations.

Further consultation responses

Enel X have attached Appendix 1. including responses to:

- AEMO's further consideration of baselines better able to accommodate combined load and solar PV installations, and
- Settings for trialling the 30% RRMSE threshold.

Comments on AEMO's Final Report

Enel X has included further comments on AEMO's Final Report – Enel X Baseline Methodology Proposal in Appendix 2.

Bimodal Operation

Enel X acknowledges AEMO's position on the lower negative adjustment floor option. Enel X would appreciate the opportunity to further develop potential baseline methodologies suitable for sites with periodic drops in load associated with certain types of production schedules. Examples of these sites include industrial gases processing facilities which have successfully deployed during Reliability and Emergency Reserve Trader (RERT) activations.

Building confidence

There is a large untapped customer base seeking opportunities to utilise flexibility through the WDRM to decrease their exposure to rising energy costs and support their decarbonisation goals. AEMO's unambiguous support for the WRDM given the pending AEMC review of the WDRM is crucial. Enel X call upon AEMO to embrace the philosophy that baseline options should be available for most loads seeking to participate in the WDRM. Success in recruiting additional loads is strongly linked to confidence that the WDRM will continue to make an important contribution to the NEM. Investment confidence is essential to achieve economies of scale thereby lowering the recruitment cost to activate a demand-side contribution supporting the security and reliability of a renewables focused grid.

We would be happy to discuss any of these issues further with AEMO. If you have any questions or would like to discuss this submission further, please do not hesitate to contact me.

Kind Regards,

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Appendix 1 -Enel X Further Consultation Paper Responses

Alternative baseline methodology for loads with solar PV

1. Do you consider that the alternative solar PV baseline methodology option would be effective in supporting more solar PV loads to participate in the WDR Mechanism?

Based on analysis of Enel X's Australian dataset the proposed solar PV methodology lowers RRMSE scores delivering a doubling of solar site eligibility (at <30% RRMSE) without a material (within ± 4%) degradation in bias (Figure 2 and 3).

Enel X expect the proposed methodology to be simple to explain to customers and to implement in AEMO systems based on the changes to existing parameters.

Improved Day of Adjustment performance for Solar PV sites

On reviewing the adjusted baseline performance of sites with solar PV installations Enel X observed the typical 3-hour (i.e. T - 4hr to T - 1hr) Day of Adjustment correction often has an adverse impact on baseline performance. Variability in solar output, both from 'time-of-day' factors (typical diurnal pattern) and fluctuations due to cloud cover in the 3-hour averaging window created adverse Day of Adjustment outcomes.

On trialling different Day of Adjustment windows, a shorter window from T-2 to T-1 performed better on most sites due an improved estimate of the change in underly load with less impact from the time varying solar PV output.

Focused Eligibility and Compliance window

Enel X considered the impact of variable solar PV output during the conventional compliance window of 3pm-8pm. The change in PV output due to the diurnal solar PV pattern is very pronounced in this period. If the eligibility and compliance window is shifted to 4pm – 9pm the variability from solar PV production is noticeably reduced. Based on historical data, good alignment with WDRM dispatch is still maintained as approximately 77% of WDRM dispatch intervals occur between 5pm and 9pm (see Figure 1 Histogram of WDRM dispatch intervals) a small increase (approx. 1%) over the original window of 3pm-8pm.

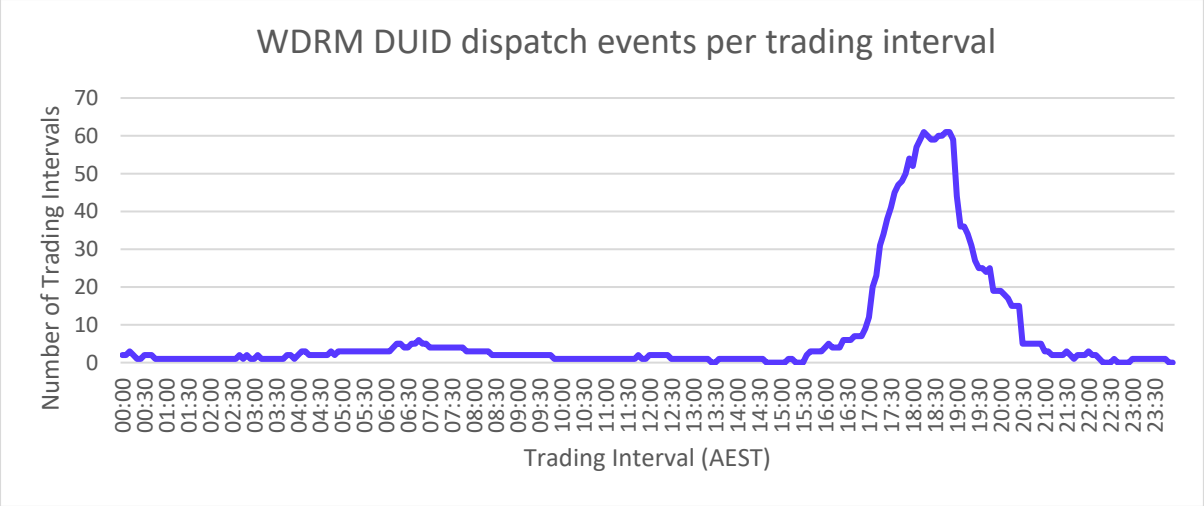

Figure 1. Histogram of WDRM dispatch intervals

<u>Testing Solar PV 10 of 10 (All Days) baseline performance</u>

Enel X has tested the proposed Solar PV 10 of 10 (All Days) baseline method against a sample set of cold storage facilities with and without solar. **The proposed solar PV baseline doubles the number of qualifying resources in the sample data set.**

RRMSE

Cold storage facilities whose load is predominantly refrigeration plant are a well understood class of flexible demand resources in Enel X's portfolio. Enel X's Australian datasets include 16 cold store sites with sufficient duration of data to derive robust RRMSE estimates for these facilities (Figure 2.). Rooftop mounted solar PV systems are present on 9 of the 16 sample sites.

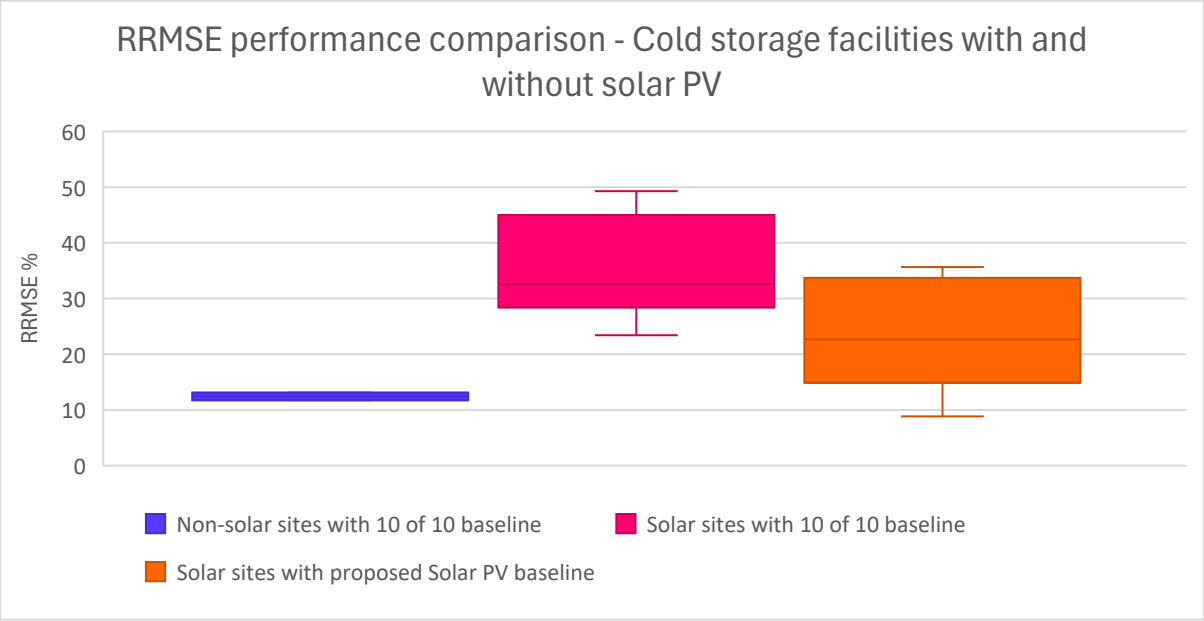

Figure 2. RRMSE performance of Cold Storage facilities with alternative baseline methods

Utilising the proposed solar PV baseline methodology two-thirds of the site became eligible (<30% RRMSE). That is, a doubling of eligible sites from 3 using the Adjusted All-Days 10 of 10 baseline method to 6 utilising the proposed solar PV baseline method.

Bias

Based on the same sample set the observed Baseline Bias results remain within the ± 4% threshold.

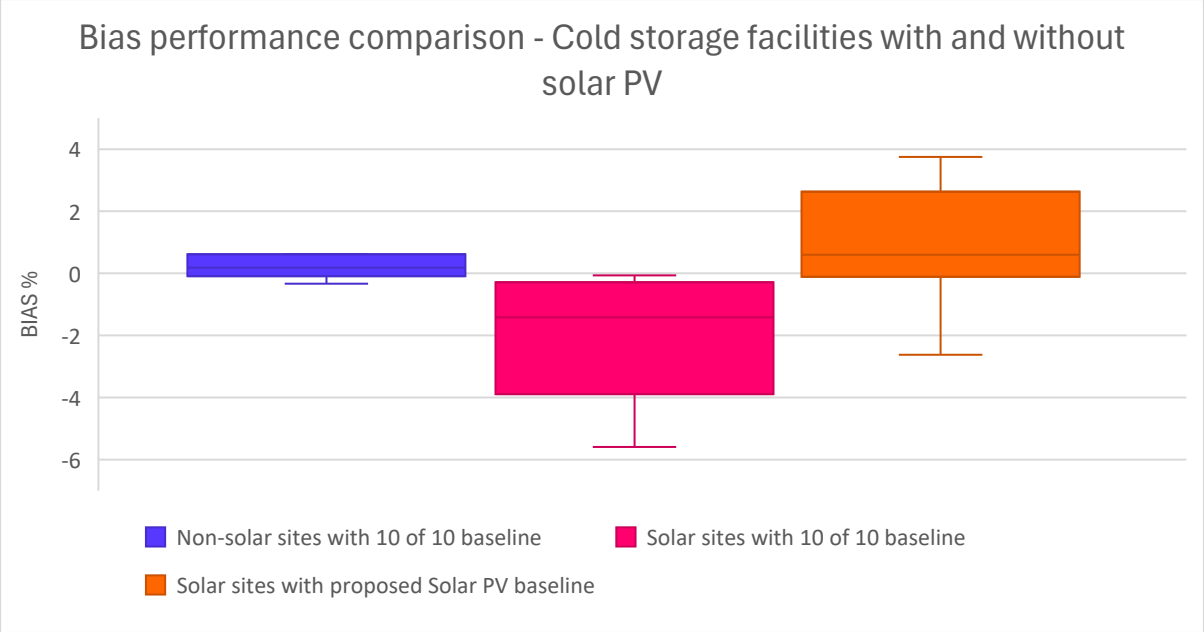

Figure 3. Bias performance of Cold Storage facilities and alternative baseline methods

Further Observations

Enel X's data sets include a Light Industrial Manufacturing facility with rooftop solar PV. Utilising the propose solar PV methodology the RRMSE score improved from 32% to 18%.

2. Do you consider there to be a material additional risk of artificial baseline inflation resulting from the shorter day-of adjustment window?

Based on Enel X's dataset, analysis of the proposed shorter day-of-adjustment window did not introduce a material (exceeding ±4%) bias to baseline calculations (Figure 3).

Enel X agree with AEMO's assessment that 20% Day of Adjustment cap is an effective setting for limiting the risk of an artificially inflated baseline. Furthermore, the required foresight and analytical sophistication required to artificially inflate the baseline in an economic manner is not materially reduced by the shorter day of adjustment window.

Enel X are concerned that a longer adjustment window for settlement purposes would re-introduce the effect of variability in solar PV into the Day of Adjustment amount. It seems unlikely that the marginal benefit gained from increased difficulty in artificially inflating the baseline would exceed the costs from deterioration in settlement accuracy.

3. Are there any other risks that AEMO has not considered in its initial assessment?

Enel X has not identified additional risks.

4. If implemented, should this baseline option only be available to solar PV loads, or should it be more broadly available?

Enel X recommend the Solar PV baseline is made generally available.

Examining the performance against our dataset we have identified some non-solar sites achieve eligibility with the Solar PV baseline. Some of these are real estate properties that are primarily used for office/educational purposes and have different activity levels during normal working hours compared to evening peak periods.

Sites with distinct 'evening peak' load patterns could benefit from the narrow Eligibility and Compliance windows, and the short Day-of-Adjustment window close to the event time. Given the Eligibility window aligns with trading intervals with more extreme price outcomes and hence increased opportunity for market participation there is merit in making the Solar PV baseline generally available.

Settings for trialling an alternative accuracy metric

1. Do you agree with AEMO's proposals around the following settings (why or why not?):

   a. Trial duration and review.

   b. Retaining the existing bias threshold.

   c. Assessment criteria.

   d. Transition arrangements.

a) Trial Duration and review

Enel X acknowledge the important evidenced based contribution that the trail of the 30% RRMSE can make to the Australian Energy Market Commission (AEMC) 2026 WDR Annual Report. We also support the proposal that the trial should be at least 12-months in duration to provide sufficient time for AEMO to implement system changes, and for market participants to recruit flexible demand resources, register resources, and examine dispatch compliance performance.

Enel X believe there are benefits in providing early feedback on emerging trends during the trial to support the Commission's delayed Review of the 2024 Wholesale Demand Response Mechanism. This might come in the form of a progress briefing note to Commission on emerging trends with the revised settings and additional baselines. We expect market participants would be providing feedback to the Commission's review and the additional perspective of the market operator would improve the overall completeness of the data to support the Commission's work.

b) Retaining the existing bias threshold

Enel X support AEMO's proposal to retain the +/- 4% bias thresholds.

Enel X have not identified any consequences of the revised RRMSE threshold that alter the basis for AEMO's determination on a ±4% Bias tolerance. This value remains with the ±5% Average Relative Error (ARE) range considered 'good' in the 2013 DNV-KEMA study commissioned by AEMO.

c) Trial assessment criteria

a. Dispatch Conformance

Enel X support AEMO's perspective that reliable response to dispatch instructions is a key observation to verify that a higher RRMSE threshold is sustainable. However, Enel X are wary of the impacts of a small sample size. The number of WDRM DRSP's, WDRU's and total energy dispatched is currently small, and events of dispatch non-compliance may need to be carefully examined to determine if baseline performance was the root cause of non-compliance.

Enel X recommend that analysis of non-conformance events consider:

i. if the load is reliant on the expanded 30% RRMSE threshold or utilising new/amended baselines
ii. the quantity of non-compliance on an aggregate MWh basis to better represent the 'economic' impact on the market
iii. the occurrence of exceptions not related to the normal day to day facility load
iv. if maturity of DRSP systems or operational failures are a contributing factor, particularly if the increased eligibility activates new market participants. New entrants are important to the ongoing develop of the WDRM.

b. Other assessment metrics:

i. Growth in participation - Enel X acknowledge the importance of a competitive WDRM that offers end-users a choice of aggregators
ii. Degree of change in baseline accuracy - Enel X are wary of the simple averages delivering misleading population performance measures. We believe that performance measures that consider the volume weighted distribution of accuracy across the sample set can provide more robust conclusions on the potential for market distortions. Identifying how individual resources may be contributing to eligibility and compliance PoL assessments is more likely to yield actionable improvements.
iii. Changes in number of exclusion days - Enel X are less confident that the number of exclusion days (i.e. number of exclusion days per enrolled MW) is a valuable comparison metric. Ideally, exclusion events are only relevant where a Flexible Demand resource experiences an unexpected and significant impact on energy usage that would typically lead to the DRSP temporarily removing the WDRU from the market. However, exclusion event data may provide useful context to supplement analysis informed be other observations, rather than a standalone metric.
iv. Bidding behaviour and spot market distortion - Enel X support the consideration of WDRU bidding behaviour and evidence of spot market distortion to test if spot market efficiency is adversely impacted. However, the choice of metrics and market context is important. For example, more active bidding behaviour may or may not be indicative of an orderly and efficient market. Similarly, the price of dispatched demand response may be more reflective of broader market conditions. Counterfactual 'what-if' scenario analysis may yield more informative conclusions on the contribution of WDRU responses to lowering costs across the market.

d) Transition arrangements if higher threshold is not retained

Enel X support a limited grace period for sites that are unable to comply with a lower retained threshold. A grace period of 12-months should provide sufficient time to find alternative mechanisms for customers, so the flexible demand benefits of the affected loads are not lost. A 12-month grace period is also important to recover establishment costs for loads that commit to the WDRM immediately prior to a decision to terminate the higher threshold trial. The absence of a grace period would likely have a chilling effect on new participation interest approaching the review of the trail.

2. Are there any other risks or issues that AEMO should consider in implementing a higher accuracy threshold?

Enel X has not identified additional risks.

Appendix 2 – Further comments Final Report – Enel X Baseline Methodology Proposal

High 5 of 10 implementation settings

Enel X understands that AEMO has yet to develop an implementation framework for the High 5 of 10 baseline method. Enel X co-ordinates flexible demand in markets across 19 countries including Italy, United States of America, Canada, United Kingdom, Japan, South Korea, New Zealand and Australia. Some of these markets utilise consumer baseline methods similar to AEMO's proposed High 5 of 10 baseline methodology. We have set out below some additional comments we believe are relevant to developing an implementation framework.

As guiding principles for effect demand response programs Enel X recommend that:

- it's important to strike the right balance of accuracy to ensure customers receive credit for no more and no less than the curtailment they provided,
- irregular consumption should not be encouraged so baselines have a high level of integrity,
- baseline and resulting curtailment calculations should be simple enough for all stakeholders to calculate, and
- baselines should be aligned with the goals of the demand response program.

The WDRM is an economic program responding to price signals, as such is suited to a baseline method that places greater emphasis on contemporary data that best mimics the conditions driving an event. An Adjusted High 5 of 10 baseline reasonably meets this need and has been utilised in markets including those operated by the New York Independent System Operator (NYISO). While its generally envisaged that the contemporary conditions driving an event are predominantly weather factors this may not always be the case.

Because adjustments based on weather tend to be complex and difficult establish and verify, an adjustment based on the facility load immediately preceding the event is preferable. While there is some risk that the customer may exert an influence over this calculation, the practicalities of economically doing so in the NEM which is characterised by highly variable spot price outcomes, presents a speculative challenge that in Enel X's experience Australian C&I loads don't show an interest in embracing.

Weather sensitivity validation

Enel X notes in AEMO's Final Report that as part of the implementation of the High 5 of 10 baseline AEMO anticipates the need for "*Processes for validating that loads to which the baseline is applied are suitable (e.g., their consumption systematically varies with temperature/weather factors). This may increase the amount of compliance management AEMO needs to undertake for the WDR Mechanism.''*.

As noted above, the contemporary factors driving consumption on a high demand day may not always yield a simple relationship with observed maximum temperatures. Seasonally variability (summer vs winter), relationships between temperature and humidity, and other factors such as long thermal time constants (i.e. temperature effects build over multiple days) may hinder good statistical load correlations with observed daily maximum temperatures. While regression analysis is used in some international programs and has wide application in energy efficiency certificate schemes, the complexity of this option is high, and analysis is generally performed by highly skilled Measurement and Verification (M&V) professionals with access to bespoke software solutions.

Enel X believe the cost of developing and deploying processes to validate sensitivity to temperature/weather factors during eligibility assessment may not deliver material improvements in maintaining WDRM integrity. Other markets do not place a high priority on weather sensitive eligibility criteria in the presence of otherwise suitable baseline PoL scores.

International Experience

International experience includes examples of both approaches. Regression methods stand out has having a high cost of implementation barrier which is unlikely to align with a need for a simple process in the WDRM.

New York Independent System Operator (NYISO)[2] - In the NYISO demand response mechanism it is the responsibility of the Curtailment Services Providers (CSP) to provide the Customer Baseline Load (CBL) calculation to the NYISO and ensure that calculations are complete and accurate. CSP's elect the CBL method from the approved methods in the Emergency Demand Response Manual. The High 5 of 10 baseline method used in the NYSIO does not include a weather sensitivity eligibility restriction. Rather the nomination of the weather-sensitive calculation option triggers the application of a Day-of-Adjustment scaling. RRMSE and Bias thresholds remain consistent across baseline options.

PJM Interconnection Regional Transmission Organization (PJM)[3] - PJM economic demand response program aims to accommodate a broad range of loads. If the RRMSE score for a site is >20% using the available baseline methods the CSP may request to use an Alternative Baseline methodology that gets their RRMSE score under 20%. Weather sensitivity of load is addressed by the application of a Weather Sensitive Adjustment (WSA) Factor which represents the kW change in demand for each temperature change within a specified temperature range. The WSA Factor is derived by performing linear or piecewise linear regression analysis on the load and temperature data from the customer site. Regression analysis is robust but is not simple to implement.

Predictability of Load metrics

In the context of the WDRM, with its high barriers to operationalization of irregular consumption benefits, it seems reasonable to retain a focus on broad Predictability of Load measures (eligibility and compliance) for the implementation of new baseline methods.

Enel X remain wary of focusing on specific artificial scenarios ('corner cases') as the basis for establishing eligibility requirements unless data can be presented to demonstrate that there's a

[2] New York Independent System Operator (NYISO) Manual 7. Emergency Demand Response Program Manual – April 2024
[3] PJM Manual 11: Energy & Ancillary Services Market Operations, December 17,2024

practical and material risk to WDRM integrity. The PoL regime established in the WDRM establishes a load agnostic eligibility framework that is readily deployed with low costs.

Ultimately, the utility of a baseline is defined by its 'forecasting skill/robustness', cost of implementation, and the costs of inefficiencies arising from lost opportunities to enrol low-cost resources and adverse impacts from irregular consumption. Based on this reasoning, particularly for cost constrained implementations, biasing compliance framework design towards detecting 'irregular consumption' may provide a better balance.

Baselines for Bimodal Loads

Enel X has noted AEMO's concerns with a lower negative adjustment floor and the expectation of eligibility improvements from the trial of a higher accuracy threshold. However, even with the higher accuracy threshold more than 30MW of flexible large industrial load in Enel X's dataset is unlikely to be eligible for the WDRM due to periodic drops in load associated with production schedules impacting baseline performance.

Much of this load is characterised by a 'bimodal' load distribution. That is, site demand is clustered around two distinct 'modes' typically associated with a standby state and processing state. For example, an industrial gases liquefaction facility consumes a steady high load when the liquefaction train is operating but drops to a low load when additional production is not required.

A negative adjustment floor option was proposed to broadly improve eligibility of sites with more load variability, including but not limited to bimodal sites.

An alternative solution to activate bimodal loads is to capture the low load state as an exclusion. Given the 'standby' state is not able to provide a flexible demand drop and would not be offered into the spot market these standby events could reasonably be excluded from baseline calculations.

The concept of 'low usage exclusions' is included in the NYISO[4] Average Day CBL for Weekdays. Low usage days are eliminated from the calculation of Average Daily consumption for the relevant interval, thus removing the low usage days (nominally <25% of the average event period usage level) from influencing the counterfactual prediction under conditions a demand response would be typically provided. A similar concept is also implemented in the PJM[5].

This approach has the benefits of only relying fixed parameters and historical data leading to a simple implementation in both eligibility, compliance and settlement systems.

[4] Paragraph I.A.3, New York Independent System Operator (NYISO) Manual 7. Emergency Demand Response Program Manual – April 2024

[5] 10.4.2 Customer Baseline Load (CBL), PJM Manual 11: Energy & Ancillary Services Market Operations, December 17,2024