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Draft ISP Methodology Consultation

Submission to AEMO, 3 April 2025

The Centre for Applied Energy Economics and Policy Research (CAEEPR) is a collaborative partnership between Griffith Business School and energy sector participants in Australia's National Electricity Market.

CAEEPR aims to maximise the energy sector's potential to achieve emission reductions and contribute to inclusive, sustainable, and prosperous businesses and communities while building capacity in electricity economics. CAEEPR uses a national electricity market model to develop and analyse different scenarios to assess different policy positions for generator dispatch and transmission efficiency.

CAEEPR's sub aims/objectives that are most relevant to this submission:

- Supporting the transition to more sustainable and less carbon-intensive power generation and transmission system and address the accompanying policy, economic, technical and political challenges within the industry.
- Provide thought leadership and industry engagement strategies that our members can design and deliver best practice energy services with reduced emissions.
- Create and uphold advanced Electricity Market models for analysing wholesale spot and future markets, power system reliability, integration of dispatchable and intermittent resources, and network capacity adequacy.

This submission has been prepared by Andrew Fletcher who is an Industry Adjunct Research Fellow at CAEEPR. The views expressed in this submission are entirely the author's and are not reflective of CAEEPR.

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1. Introduction

I welcome the opportunity to provide feedback to AEMO on the Draft ISP Methodology. This submission focuses on two topics:

1. Imperfect foresight relating to medium-term and long term weather forecasting errors.
2. The period for hydrogen production targets.

AEMO's continuing efforts to improve the modelling of hydrogen and imperfect foresight, as well as its efforts to engage with stakeholder on these matters including through the ISP Methodology Issues paper and the release of the attachment to the consultation paper focused on imperfect foresight are welcomed.

2. Period for hydrogen production targets

To ensure internal consistency, hydrogen production target periods should be consistent with what the hydrogen storage duration outputs from the final ACIL ALLEN hydrogen modelling (which is used as an input to the CSIROCC Multisectoral modelling), implies. AEMO cast doubt on the accuracy of ACIL ALLEN's hydrogen modelling on the Draft Methodology webinar and clarity is sought around what issues AEMO sees with this modelling and how this issues would preclude it from being using to inform the hydrogen production target period. Per AEMO's Draft ISP Consultation Paper:

Multi-sectoral modelling incorporates a hydrogen storage cost component within the cost of hydrogen development and production, and therefore for the ISP's modelling purposes, it is considered reasonable for the ISP modelling to be able to assume that sufficient hydrogen storage is available to enable flexible hydrogen production to meet hydrogen consumer's needs, as hydrogen storage costs have been considered in determining the hydrogen demand inputs.

On the Stage 2 IASR webinar AEMO stated that Draft ACIL ALLEN hydrogen modelling found a hydrogen storage duration of 3-6 days depending on region. These figures could change materially if recommendations in the author's 2024-25 GenCost, Draft 2025 Stage 1 IASR Consultation and Draft 2025 Stage 2 IASR consultation submissions are implemented. It is noted that ACIL ALLEN's storage duration of 3-6 days is significantly higher than other publicly available hydrogen modelling, including research which the author led (Fletcher, et al., 2023). Ultimately greater transparency of ACIL ALLEN's hydrogen modelling would provide stakeholders with greater confidence around the assumed period for hydrogen production targets.

AEMO's proposed period for hydrogen production targets is based on analysis in the author's Draft 2024 ISP Consultation submission with AEMO noting that the analysis shows that based on monthly hydrogen production targets there is only a need for 5 to 12 days of hydrogen storage or an average of approximately 8 days. The logical connection between this analysis and a weekly balancing assumption is not clear and doesn't align with the author's understanding of this analysis. Further explanation is sought.

The author suggests that it would be more appropriate to use this analysis as a source for the ratio of the period for hydrogen production target to hydrogen storage duration and then apply this ratio to ACIL ALLEN's storage duration. Using the upper bounds ratio of 30 days period for the hydrogen production target to 12 days of storage (2.5:1) and applying this to ACIL ALLEN's 3-day storage duration would result in a 6.5 days hydrogen production target period, which supports a weekly assumption. This approach would retain internal consistency with ACIL ALLEN and CSIRO MSM modelling.

AEMO are encouraged to consider whether the period for the hydrogen production should be moved from the ISP Methodology to the IASR. This would allow for the assumption to be updated on a more regular basis as new information emerges (2-year cycle rather than 4-year cycle) and for hydrogen modelling assumptions to be considered in a more efficient manner within a single AEMO consultation.

3. Imperfect foresight relating to medium-term and long-term weather forecasting errors

AEMO is encouraged to consider developing methods to assess impact of imperfect medium-and long-term weather forecasting in its time sequential modelling, such that the impact of imperfect foresight on long duration PHES and conventional hydropower can be investigated. AEMO's change in the Draft ISP methodology to incorporate a potential feedback loop from time-sequential modelling is welcomed, as well as its focus on understanding reliability in winter and low VRE conditions:

AEMO may implement a firm capacity constraint defined not on peak demand but on winter and low VRE conditions if reliability issues during those periods are found in the time-sequential modelling. AEMO will test this approach to ascertain how it impacts builds due to firm capacity requirements that account to a greater degree for low VRE conditions.

However, feedback on the Draft ISP Methodology webinar and to the author's ISP Methodology Issues Paper submission provided in the Draft ISP Methodology Paper suggests that's the impact of imperfect foresight on long duration PHES and conventional hydropower dispatch and energy system reliability in dunkelflaute will not be investigated.

Regarding Fletcher and Nguyen and Sumitomo's recommendation to reduce the modelling look-ahead period, AEMO notes that market models have look-ahead in both the MT planning phase, and the ST time-sequential phase. The look-ahead period in the ST schedule is a global setting that applies to dispatch decisions for all generators. While short-duration storages do typically target intra-day arbitrage opportunities, retaining a sufficient look-ahead period allows storage devices to maximise their charge on high VRE output days in preparation for a following period of high residual demand. The ST schedule look-ahead also informs unit commitment decisions for generators to remain online overnight during low demand levels to avoid the cost of restart to meet peak demand the next morning. Further, the MT schedule planning horizon is important in time-sequential modelling for scheduling outages and stored volumes in hydro reservoirs. These require intra-seasonal visibility to maintain energy reserves during dunkelflaute or high residual demand periods, hence time-sequential modelling needs to persist a sufficient planning horizon.

The 2024 ISP assumes that long duration PHES such as Snowy 2.0 (350GWh) and Borumba (48GWh) and conventional hydro generation provide significant volumes of generation during dunkelflaute. Whether imperfect dispatch of long duration PHES and conventional hydro, particularly having less than optimal storage prior to dunkelflaute could lead to USE is the 2026 ISP is uncertain. AEMO's feedback that there are limitations around what is achievable within the time-sequential modelling and its view that short term imperfect foresight relating to batteries is a more material issues are noted. However, AEMO has identified that winter and low VRE conditions, such as dunkelflaute represent periods of heightened reliability risk for a renewable energy dominated power system. Thus, while acknowledging limitations with the time-sequential model AEMO is encouraged to investigate potential options for assessing the impacts of imperfect foresight relating to medium- and long-term weather forecasting.

4. References

Fletcher, A., Nguyen, H., Salmon, N., Spencer, N., Wild, P., & Bañares-Alcántara, R. (2023). *Queensland green ammonia value chain - Decarbonsing hard-to-abate sectors and the NEM - Main Report.* Retrieved from https://www.griffith.edu.au/__data/assets/pdf_file/0035/1875167/No.2023-16-QLD-Green-Ammonia-Value-Chain-Main-Report.pdf