Monday, 15 July 2024

Eli Pack

AEMO

Sent via email to: planning@aemo.com.au

Dear Mr Pack,

Feedback on Enhanced Location Information Report

The Clean Energy Council (CEC) is the peak body for the clean energy industry in Australia, representing nearly 1,000 of the leading businesses operating in renewable energy, energy storage, and renewable hydrogen. The CEC is committed to accelerating the decarbonisation of Australia's energy system as rapidly as possible while maintaining a secure and reliable supply of electricity for customers.

We welcome the opportunity to provide feedback on the 2024 Enhanced Locational Information (ELI) Report. We note that 2025 ELI report may add new analysis, insights, or visualisations in line with stakeholder feedback.

AEMO is seeking feedback on:

- whether the locational data presented in the 2024 ELI Report is useful for **initial** screening and early-stage analyses about where to locate projects in the NEM. If not, how could this be improved?
- the types of additional analysis or locational signals that would be useful to include in the 2025 ELI Report.
- Any other suggestions for improvements to the ELI Report or the presentation of data contained within.

Overview

We consider that the 2024 ELI Report provides useful, well presented (primarily historical) information on congestion broken down by States and within States.

We consider that this information is useful insofar as it assists developers to initially screen for opportunities (including in areas where there is high congestion levels and where storage and non-network solutions could alleviate congestion and/or increase hosting capacity). This will be particularly important for developers new to the Australian market.

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We set out below additional information which we consider could be included in future ELI reports, as well as suggestions as to the presentation of that data. This includes a more detailed breakdown of categories of information already included in the 2024 ELI Report relating to generation and storage as well as forward looking information, including headroom forecasts[1]. This will enable developers to better identify opportunities for projects which will release additional energy into the grid and increase hosting capacity.

Additional information sought in future ELI reports

1. Generation and storage outlook

The 2024 ELI Report provides the generation and storage outlook for the NEM in section 2.2 for the NEM (with historical and forecast capacity by technology) and the generation and storage outlook for each of the States in the NEM (with the projected capacity by technology). The categories of technology types reported on are broad and include hydro, wind and utility scale solar and utility scale storage.

Recommendation

We recommend that the generation and storage outlook (with historic and forecast capacity) in future ELI Reports should include data by technology which is further broken down into the categories now used in the AEMO's Connection Scorecard ie:

- Solar
- Solar+battery
- Wind
- Wind+battery
- Battery
- Pumped hydro
- Other Hybrid

2. Hybrid Projects and LDES

2.1 Preliminary comments

Hybrid projects (solar/wind integrated with energy storage) are likely to play a significant role in management of congestion and optimisation of network utilisation. Hybrid projects allow for better carrying of energy through time, reducing the effects of physical and economic curtailment and allowing for more efficient utilisation of available network.

Hybrid projects are becoming increasingly prevalent in the NEM[2] and incentivised by existing congestion and economic curtailment risks. We understand that banks are unlikely to finance single asset solar projects without storage in the majority of cases. The Connection Reform Initiative will facilitate retrofitting legacy plants with storage.

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[1] The information in paragraph 3, 4 and 6 of this submission is described in more detail in the Annexure and is based on a document prepared by members of the CEC and circulated earlier to the Energy Security Board, AEMO and other stakeholders.

[2] The IESS rule change is intended to provide a regulatory framework to better integrate storage and hybrid systems, and to encourage hybrid generation and storage projects to act in concert with a single connection point.

The trend toward construction of hybrid assets is reflected in AEMO's draft May 2024 Connection Scorecard which shows that **applications for solar and battery are up 1384%** and storage 40% since May 2023.

Large scale batteries and other forms of alternate long duration storage (such as pumped hydro and compressed air) are also playing an increasing role in minimising curtailment from congestion. For example, battery energy storage systems (**BESS**) and compressed air facility projects have been awarded Long-Term Energy Service Agreements, which will be located next to existing or proposed solar farms (some in pockets with high curtailment)[3].

2.2 Recommendation – detailed information on hybrid projects and LDES

We recommend that the ELI Reports provide the detailed information outlined below for each of:

- hybrid projects (ie wind/solar projects with storage such as BESS); and
- Long Duration Energy Storage (LDES) projects (batteries, pumped hydro).

Information should be provided for hybrid and LDES projects which is broken down to indicate:

- stage of the projects ie whether the projects are:
  - already in commercial operation, or
  - in the pipeline. This should at least capture projects that have been approved under section 5.3.4A of the NER but not yet in commercial operation, although more detailed information about the staging could be extracted from the Connection Scorecard (eg detailing if the projects is under construction, registered or undergoing commissioning).

- technology types in the projects:
  - for hybrid projects: the renewable energy source (wind and/or solar) and storage type (BESS or otherwise)
  - for LDES: battery, hydro, compressed air facility or other

- location of the projects (with geospatial coordinates)
- duration of the storage.

2.3 Map showing Hybrid Projects/LDES overlaid with map of high curtailment pockets

We recommend that the detailed information in paragraph 2.2 should be presented spatially on a map (using icons or symbols) and overlaid on maps in the ELI Report which spatially indicates where there are high pockets of curtailment (such as in figure 3 on page 6 of the 2024 ELI Report). This will help developers identify where storage is already potentially alleviating curtailment in a pocket of the NEM and if there are further opportunities for storage and non-network solutions to address 'pockets' of high levels of curtailment in other parts of the network (particularly for solar projects). We note that the 2024 ELI Report identifies the high curtailment pockets as primarily being in parts of New South Wales and Victoria.

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2 LTESAs were awarded to:

- RWE's Limondale battery energy storage system with a planned installed capacity of 50 megawatts (MW) and 400 megawatt hours (MWh). The project has now reached financial close and will be located next to RWE's existing 249 MWac Limondale Solar Farm (one of the largest solar farms which currently experiences high curtailment levels).
- Hydrostor, which is building a compressed air facility for Transgrid at Broken Hill in NSW, has also been awarded a LTESA. That project is also expected to ensure that the two local renewable generators, the 200 MW Silverton wind farm and the 53 MW Broken Hill solar farm are not so badly constrained as their output can be stored locally.

2.4 Further analysis

Similar to the section on Locational reliability factors at section 3.5.1 of the 2024 ELI Report, AEMO may consider undertaking additional modelling and include in the ELI Reports the amount of energy which could be released, or existing capacity unlocked, if storage or non-network solutions were situated at particular locations.

3. Headroom data and forecasts

The ELI Report primarily focuses on historical curtailment information with some limited information on projected congestion levels within the REZs in 2025-2027.

We recommend that future ELI reports provide the following detailed information on headroom (ie the amount in MW that a generator at a particular node could increase before the tightest constraint begins to bind). This is summarised below – however, reference should also be made to Section 1 and 2 of the attached Annexure for a fuller description of the historical data and forecasts sought and for definitions of *Headroom* and *Transmission Node*.

Please note that the Annexure is based on a document prepared by members of the CEC and circulated earlier to the Energy Security Board, the AEMC and other stakeholders.

Summary of information sought

3.1 Historical Reporting of Hosting Capacity: TNSP's data on net Headroom at each Transmission Node for the previous calendar year in MW on a half hourly basis. We note that the 2024 ELI Report has provided some historical data but we consider that the information could be expanded.

3.2 Headroom Forecasts

3.2.1 NSP/AEMO's annual forecasts for the next 2-3 years of Headroom (MW) for each Transmission Node, taking into account:

(a) existing and committed generation and transmission projects
(b) published generation plant closures within the forecast timeframe.

3.2.2 NSP/AEMO's annual forecasts for the next 3-4 years of Headroom (MW) for each Transmission Node, taking into account:

(a) existing and committed generation and transmission projects
(b) the quantum of new likely generation in a region
(c) published generation plant closures within the forecast timeframe.

3.2.3 The same forecasts as in 3.2.2 and 3.2.3, taking into account in addition *the* ***dynamic rating of transmission lines.***

Please note that AEMO may consider undertaking additional modelling and identify in the ELI Reports those parts of the transmission network whose dynamic rating could increase (and, as a result, headroom) using specified technologies (including grid enhancing technologies and services such as non-network solutions). It may be worthwhile presenting this information spatially on maps.

4. Forecast Curtailment of New Entrant Capacity

In relation to Transmission Nodes where there is low existing curtailment (ie less than 1-2%), AEMO/NSPs forecasts for the next 3-4 years of curtailment resulting from the addition of a hypothetical new, 200GW wind and solar farm at each Transmission Node, taking into account:

(a) existing and committed generation and transmission projects
(b) the quantum of new likely generation in a region
(c) published generation plant closures within the forecast timeframe.

See Section 3 of the Annexure for a fuller description of the information sought.

5. Other comments

In relation to all information and data supporting the ELI Reports, the appendices to the ELI Reports should make available this data and information in as much granular detail as is available to the AEMO and/or the TNSP (provided that the information is not commercially sensitive).

AEMO should include in the ELI Reports information on grid black stop programs targeted at alleviating congestion in specific pockets of the NEM (including the energy in MW which would be released or the increase in hosting capacity).

The scope of the ELI should not only consider the high voltage transmission network but be expanded to consider the lower voltage distribution network.

6. Network Augmentation Constraint Equation Reporting

For completeness, we have included in section 5 of the attached Annexure, information about constraints which we consider should be published as soon as practicable (as it is relevant to locational decisions for new projects). However, we acknowledge that this information would be made available separately from the ELI reports.

As always, the CEC welcomes further engagement from AEMO on enhancements to the Enhanced Locational Information Report. Further queries can be directed to Diane Staats at the CEC on dstaats@cleanenergycouncil.org.au.

Kind regards

Christiaan Zuur
Director, Energy Transformation

Annexure - Additional Enhanced Locational Information Data

This Annexure is based on a document prepared by members of the CEC and circulated earlier to the Energy Security Board, the AEMC and other stakeholders.

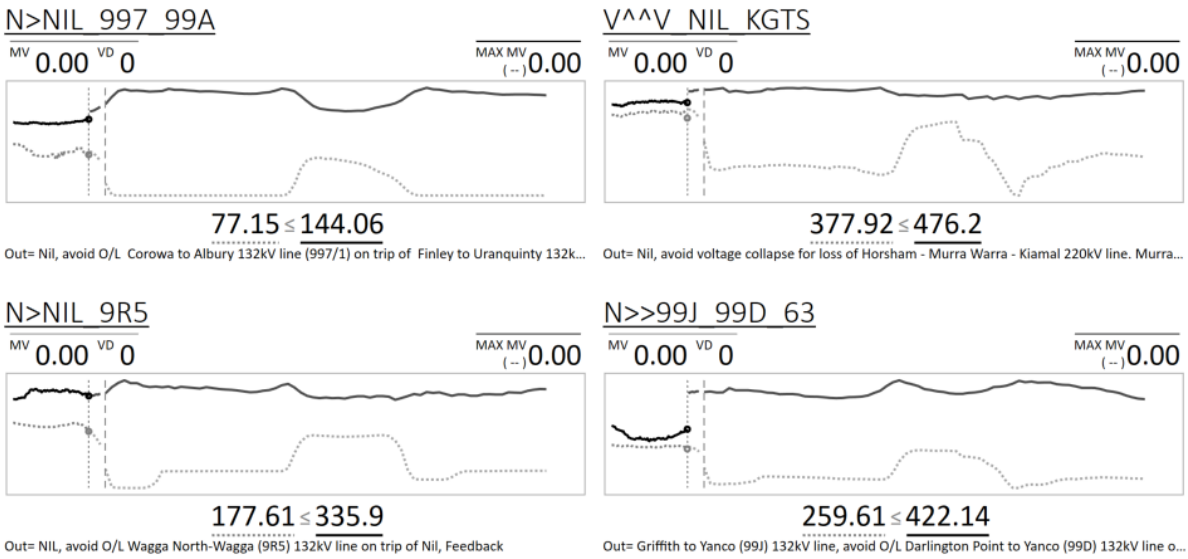
We consider the information in sections 2-4 should be included in future ELI reports. In addition, for completeness, we have included in section 5 information about constraints which we consider should be published as soon as practicable (as it is relevant to locational decisions for new projects). However, we acknowledge that the information in section 5 would be made available separately from the ELI reports.

1. Headroom data and forecasts

For the purposes of the data and forecasts set out in paragraphs 2-4 below:

Headroom means the amount in MW that a generator at a particular node could increase before the tightest constraint begins to bind. Where a constraint is already binding headroom is zero.

In the examples below, the top left constraint N>NIL_997_99A is the tightest constraint equation affecting this connection point because it only has 66.91 MW of headroom.



The headroom values need to be granularly reported, recorded, or modelled, on at least a 30 minute resolution. Lower resolution or averaging creates an underestimate of curtailment outcomes.

Transmission Nodes includes rural and peri-urban substations (including generator substations) operating at 132kV and above.

Unless otherwise specified, all curtailment should be considered (thermal, voltage stability, pre-contingent etc.) with the exception of system strength.

Data should be provided in spreadsheets and included in the appendices to the ELI Report.

Forecasts should be published in a tabular format with relevant commentary on assumptions, inputs, limitations etc. We note that AEMO may not be able to publish information about specific

projects which are likely to proceed and we have therefore recommended commentary on assumptions about projects likely to proceed in a region.

2. Headroom data and forecasts in Future ELI Reports

Future ELI reports should provide the headroom data and forecasts set out below.

2.1. Historical Reporting of Hosting Capacity

TNSP's data on net headroom at each Transmission Node for the previous calendar year in MW on a half hourly basis.

We note that the 2024 ELI Report has provided some historical data but we consider that the information could be expanded.

2.2 Forecast Headroom with Existing/Committed Generation & Network Closures

NSP/AEMO's annual forecasts for the next 2-3 years of headroom (MW) for each Transmission Node, taking into account:

(a) existing and committed generation and transmission projects
(b) published generation plant closures within the forecast timeframe.

2.3 Forecast Headroom with Existing/Committed and Likely Generation & Network closures

NSP/AEMO's annual forecasts for the next 3-4 years of headroom (MW) for each Transmission Node taking into account:

(a) existing and committed generation and transmission projects
(b) the quantum of new likely generation in a region
(c) published generation plant closures within the forecast timeframe.

Note:

1. The NSPs/AEMO are in a unique position to assess the likelihood of generation and transmission projects proceeding to construction.
2. As a sensitivity, the impact of the cycling of coal generation (as in the ISP central scenario) should also be modelled. In the forward looking dispatch, all coal generators would be bid at their short-run marginal cost without regard to minimum operating levels. This sensitivity would highlight the availability of transmission capacity subsequent to coal cycling behaviour and hence identify opportunities for developers to build in the local area.

2.4 Dynamic rating of transmission lines

The same forecasts as in 2.2 and 2.3 taking into account in addition the **dynamic rating of transmission lines.**

AEMO may consider undertaking additional modelling and identify in the ELI Reports those parts of the transmission network whose dynamic rating could increase (and, as a result, headroom) using specified technologies and services (such as non-network solutions). It may be worthwhile presenting this information spatially on maps. This would be helpful for developers as well as TNSPs in their planning,

3. Forecast Curtailment of New Entrant Capacity

In relation to Transmission Nodes where there is low existing curtailment (ie less than 1-2%), AEMO/NSPs forecasts for the next 3-4 years of curtailment resulting from the addition of a hypothetical new, 200GW wind and solar farm at each Transmission Node, taking into account:

(a) existing and committed generation and transmission projects
(b) the quantum of new likely generation in a region
(c) published generation plant closures within the forecast timeframe.

Note:

1. Additional curtailment of thermal generation should not be included.
2. The forecast curtailment in GWh should include the curtailment of the hypothetical new entrant plus the additional curtailment of new likely generation contemplated in (b) above. This avoids the need to model bidding strategies or which specific project (new or old) would be curtailed.
3. Curtailment would be reported as a percentage of the theoretical output of the new 200 MW generator, therefore highlighting the net impact of a new project in the area on total energy delivered to the grid.
4. Any locations where new entrant projects would exceed a specified threshold of curtailment (e.g., 5-7%) would be highlighted for consideration by NSP/AEMO when developing network augmentation options.

5. Network Augmentation Constraint Equation Reporting

For completeness, we have included in this section information about constraints which we consider should be published as soon as practicable (as it is relevant to locational decisions for new projects). However, we acknowledge that this information would be made available separately from the ELI reports.

The following information should be published as soon as practicable after a NSP achieves FID for a major transmission project and/or augmentation: NSP's best estimate of:

(a) all applicable constraint equations for the major transmission project
(b) material changes to any other constraint equations caused by the major transmission project, taking into account two scenarios:
    - Scenario 1 - all existing and committed generation and transmission projects.
    - Scenario 2 - all existing and committed generation and transmission projects as well as generation projects 'likely' to connect to the major transmission project.

Note:

1. A major transmission project and/or augmentation includes:
   (a) Any new interconnectors
   (b) Any new transmission lines at voltages 132kV or higher
   (c) Additional/Upgraded transformers at a Terminal Station with a rating of 220kV or higher.
2. The constraint equations should be updated each year if there have been any material changes to any inputs, assumptions and thereby the resulting constraint equations.