Short duration storage methodology

26 April 2023 FRG Meeting

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Purpose and agenda

The purpose of this presentation is to *Consult* the FRG on the methodology for including short duration storage in the 2023 Electricity Statement of Opportunities (ESOO), and other reliability forecasts.

These updates aim to reflect those in the draft ISP Methodology consultation.

Today's agenda includes:

- Forecasting challenges when modelling short duration storages
- Review of observed dispatch patterns over Summer 2022-23
- Proposed AEMO methodology to address shortcomings
- Discussion

Timing	Relevant topic	Responsible
Today	**Short duration storages reliability methodology**	**AEMO**
1 May 23	Written submissions for ISP methodology close	Stakeholders
10 May 23	Written submissions for short duration storages reliability methodology close	Stakeholders
30 June 23	Final update to ISP methodology published	AEMO
Aug 23	2023 ESOO published	AEMO

Significant short duration storage is seeking NEM connection

- 4.2 GW / 8.5 GWh of short duration storage currently meets the criteria to be considered in the 2023 ESOO*.
- Many more developments are proposed (over 35 GW) that do not yet meet the criteria to be considered but could develop quickly.
- Developments in distributed aggregated storages, such as Virtual Power Plants (VPPs) may also develop in significant proportions.

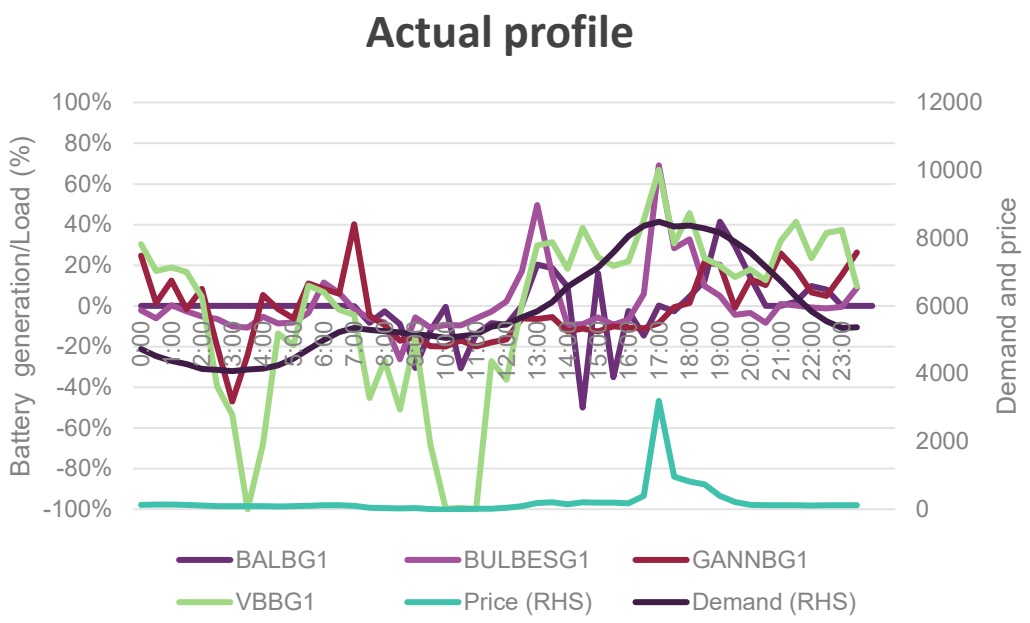
*February 2023 Generation Information Publication

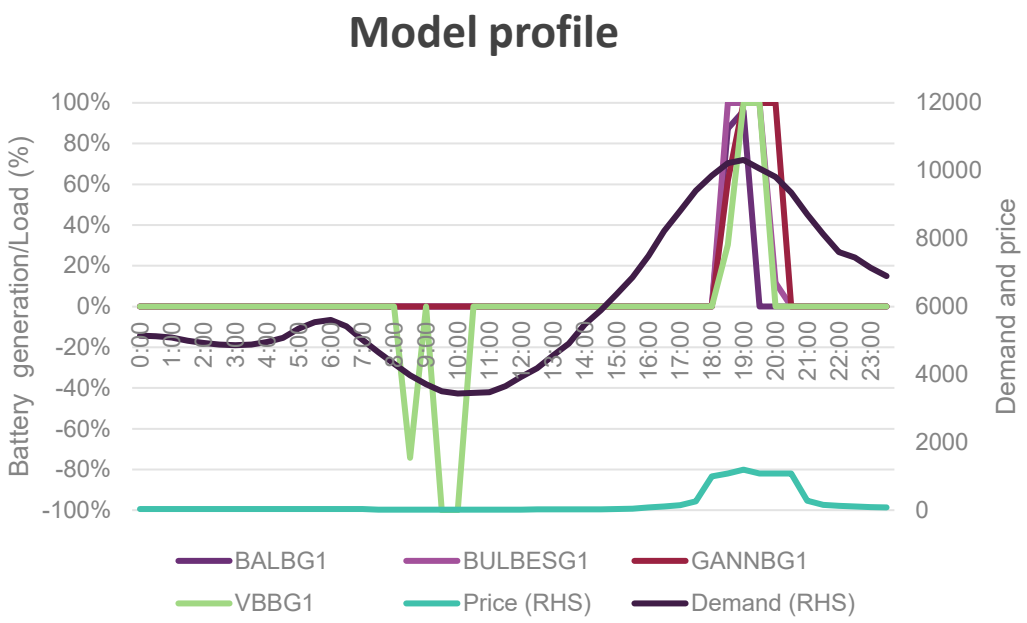
Short duration storage in reliability modelling

- Current forecasting methods make the entire battery available for dispatch within an optimised model of supply with perfect foresight.
  - These methods forecast daily battery charge and discharge profiles using the limited available storage in ways that perfectly align with power system reliability requirements.
  - Short duration storages are therefore overly effective at improving forecast reliability in reliability models.
- Actual dispatch profiles are shown to be inconsistent with those forecast.
- While incentives are likely to be different for short duration storages as more develop, actual dispatch profiles are still likely to be materially different from those forecast for a variety of reasons

Actual dispatch profiles

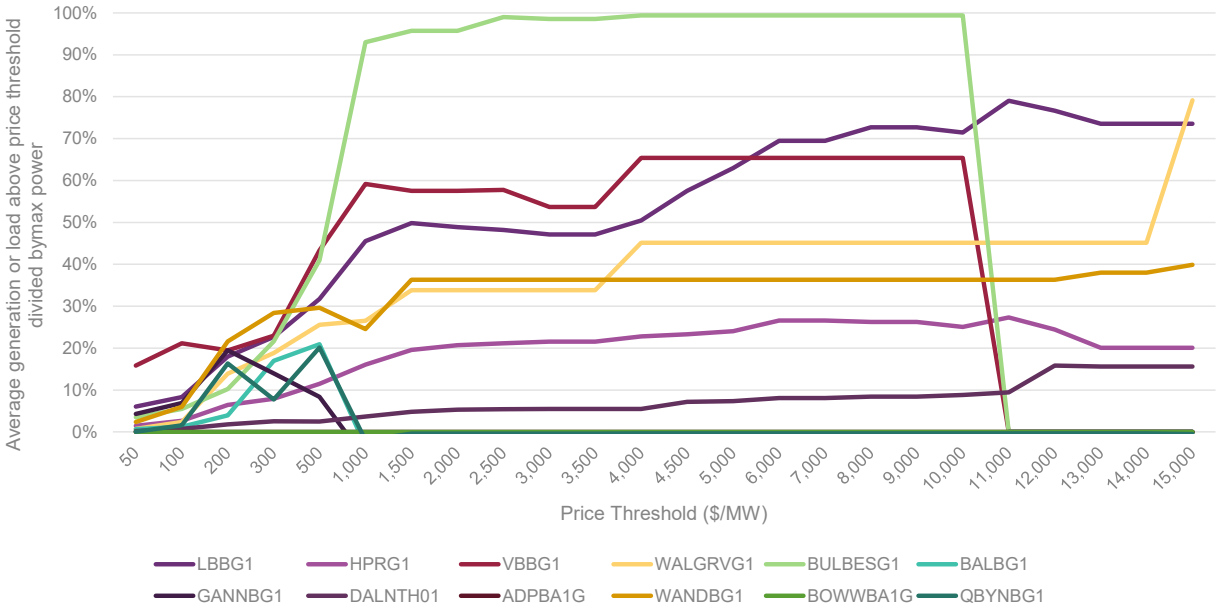
- The current methodology can lead to exaggerated outcomes of ideal dispatch of storage devices, including dispatching shallow storages at full capacity at the exact period when their output is most required.
- In actual observed dispatch only some batteries are generating during highest price/demand periods, and these are often generating below their full capacity.



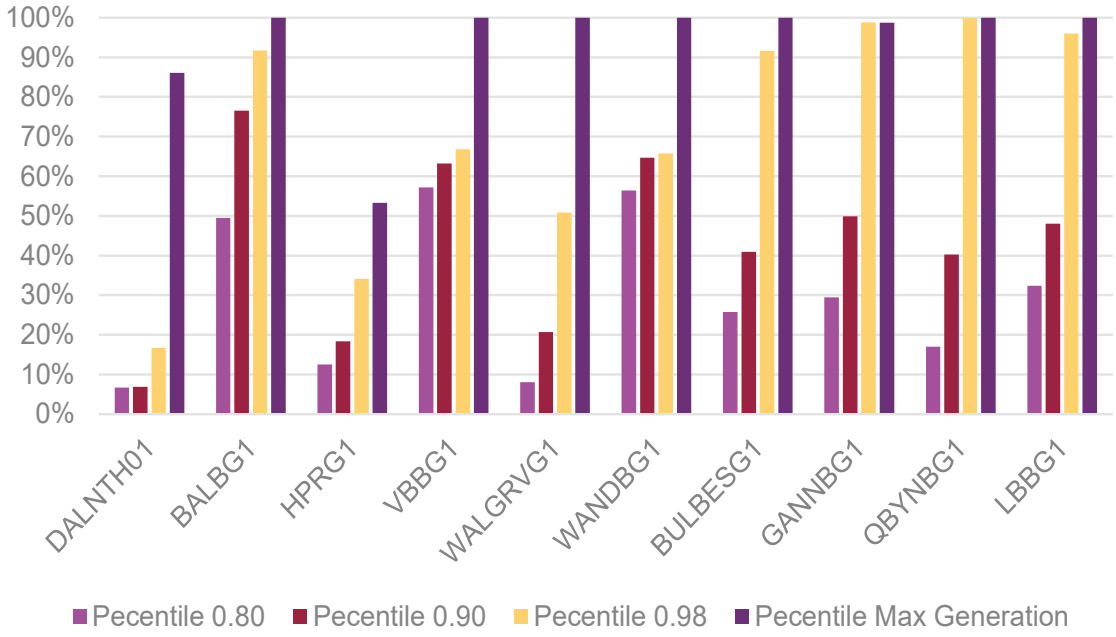


Actual battery dispatch Summer 2022-23

Many batteries are generating less than 50% of maximum power on average during highest price periods in Summer 2022-23



Batteries infrequently generate at maximum power capacity (MW)



Charts are based on 5 minute dispatch data

Possible factors driving inconsistent dispatch from forecast

1. Participants targeting FCAS revenues may optimise dispatch in ways that do not seem to match energy market incentives. This is expected to become less of an issue as further storages enter the market, diluting available FCAS revenues.

2. Short term forecast inaccuracy may result in situations where storages are not fully charged in advance of reliability requirements or are dispatched ahead or after reliability requirements.

3. Despite operating a short-duration battery, participants often dispatch only a portion of available power within any interval, perhaps more consistent with the dispatch expectations of a medium-duration storage, thereby preserving available energy for later intervals.

Proposed methodology change

- Intra-day forecast inaccuracy, and imperfect dispatch is extremely challenging to capture within models.
- Due to this, simple factors are proposed to be applied to VPP and utility scale storages based on storage capacity (MWh)

Storage duration	Storage Capacity (MWh) reduction
< 2 hours	50%
>= 2 hours < 4 hours	25%
>= 4 hours < 8 hours	10%

Storage capacity (MWh) reduction reflects that batteries will not always be able to discharge their full capacity during potential USE periods due to forecast inaccuracy and operational challenges.

An alternative methodology

- An alternative approach would be to also limit the maximum power output (in MW)
- AEMO consider that adjusting the maximum power output alone would not align as well with expected generator behaviour

Storage duration	Maximum Power (MW) reduction	Storage Capacity (MWh) reduction
< 2 hours		50%
>= 2 hours < 4 hours	20%	25%
>= 4 hours < 8 hours	10%	10%

Reduction in Maximum Power (MW): Reflects that batteries are unlikely to generate at maximum capacity during potential USE periods for risk management and energy preservation purposes.

Storage capacity (MWh) reduction reflects that batteries will not always be able to discharge their full capacity during potential USE periods due to forecast inaccuracy and operational challenges.

Impact on reliability outcomes

AEMO has performed preliminary assessments of the potential impact on expected USE under two sensitivities based on a 50% reduction in maximum power (MW) and a 50% reduction in storage capacity (MWh).

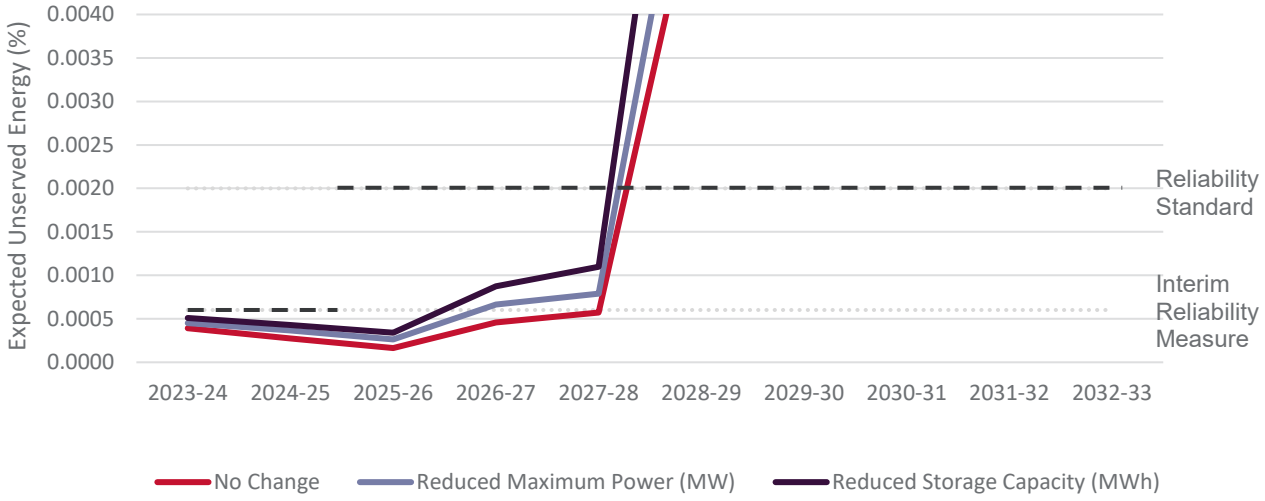
These sensitivities demonstrate a larger increase in forecast reliability than the proposed methodology. They demonstrate a moderate impact on reliability outcomes, and that reducing storage capacity has a larger impact on outcomes than maximum power capacity.

No Change – Results from the February 2023 Update to the 2022 ESOO, with Anticipated generation projects added.

Reduced Maximum Power (MW) – All storages less than 8 hours are subject to a 50% MW reduction.

Reduced Storage Capacity (MWh) – All storages less than 8 hours are subject to a 50% MWh reduction.

Expected USE, Victoria, 2023-24 to 2032-33.
(February 2023 *Update to the 2022 ESOO with Anticipated Projects*)



Questions and Next steps

- Do you consider it reasonable for AEMO's reliability models to reduce the reliable contribution from storage devices (particularly shallow storage devices) to reflect imperfect foresight? If not, why not?
- Do you consider a limit on the storage capacity of storage devices, particularly on short-duration devices, to be the most appropriate way to restrict the performance of energy storage to approximate limited foresight and reservation of energy?
- In what other ways could AEMO reduce the 'perfection' of foresight in its time-sequential model to improve model accuracy?
- Do you agree that an 'up to 50%' limit on storage capacity is an appropriate limit value? If not, what should the limit be, and what evidence can be used to support an alternative limit?

- **Consultation submissions to energy.forecasting@aemo.com.au close on 10 May 2023**
- **Apply consulted on changes to ESOO 2023 forecast**

Discussion

What do you think about the questions raised?

AEMO

AUSTRALIAN ENERGY MARKET OPERATOR

For more information visit

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