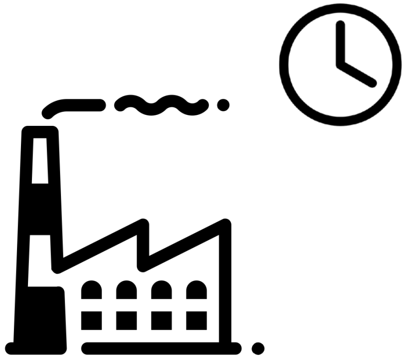
Capacity theory, issues with the current and Delta method and an alternative

Capacity valuation theory

Assessing the contribution of intermittent generators to reliability asks the question…

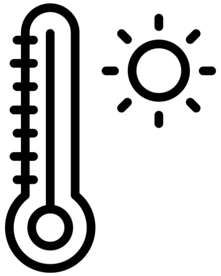
What will an intermittent generator produce when the system needs it most?

Current method



Based on intermittent generators' average output during periods where demand minus intermittent generation is highest ('peak LSG').

Discounts based on variance



Discounts based on expected decrease in IG output for high temperature (U)

Why?
Peak LSG periods approximate peak system stress periods.

Key issues with the current method

The more intermittent generation, the more undervaluation. Using peak LSG periods goal seeks for where periods where intermittent generation is lowest, ignoring their contribution to reducing system stress in shifting peak stress periods from peak demand periods. This issue has been worsening for years and was recognised by authors of underlying theory.

Past peak LSG periods may not reflect when we need capacity in future

Delta Method

Assesses how a generator reduces the expected loss of load of the system

Calculate the ‘last in ELCC’ i.e. ELCC of each generator individually, with all other intermittent generation in the mix.

Adjust Last in ELCC based on how much the generator is contributing to the fleet ELCC being less than the sum of all Last in ELCC (the ‘interaction effect’).

Why?

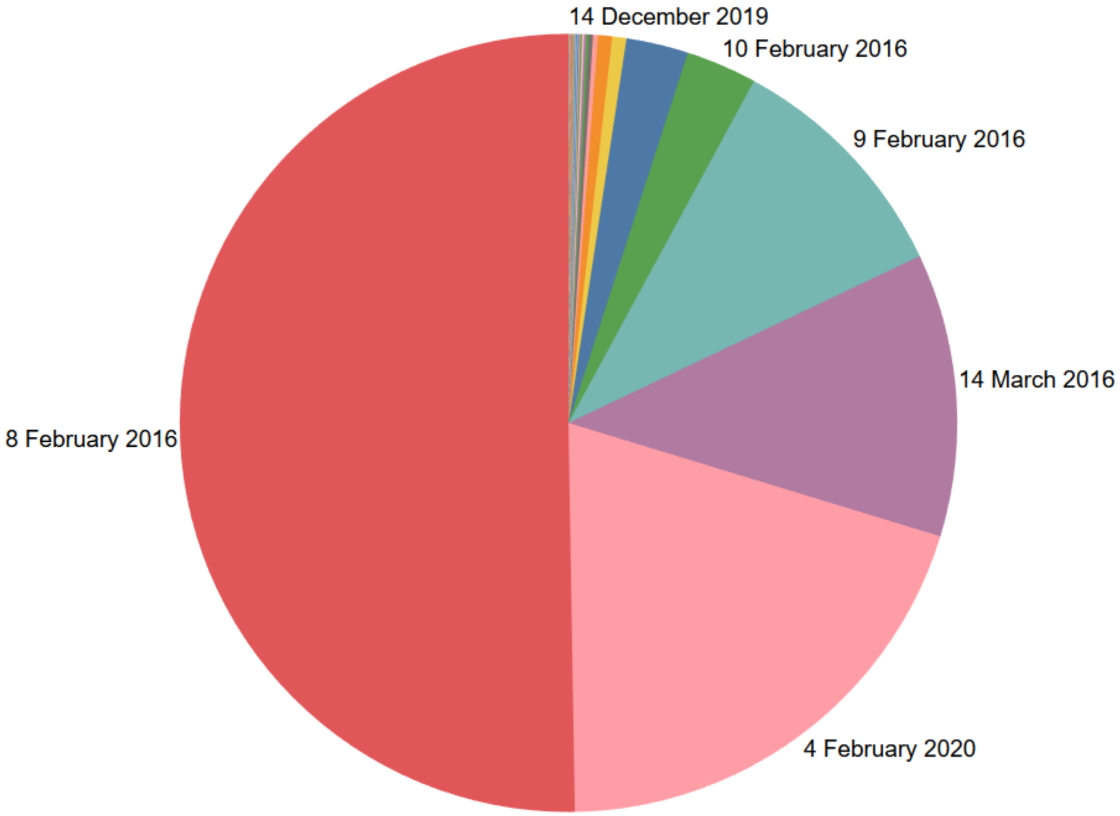
Generators reduce LOLE if they are available during periods of loss of load probability. So this means it focuses on output during system stress periods. This is consistent with capacity valuation theory that valuation should reflect capacity when the system needs it most

What's the matter then?

While consistent with capacity valuation theory, in practice, in the WEM, there's only a handful of periods that drive LOLE.

Over 90 per cent of the LOLE is based on outcomes on four days

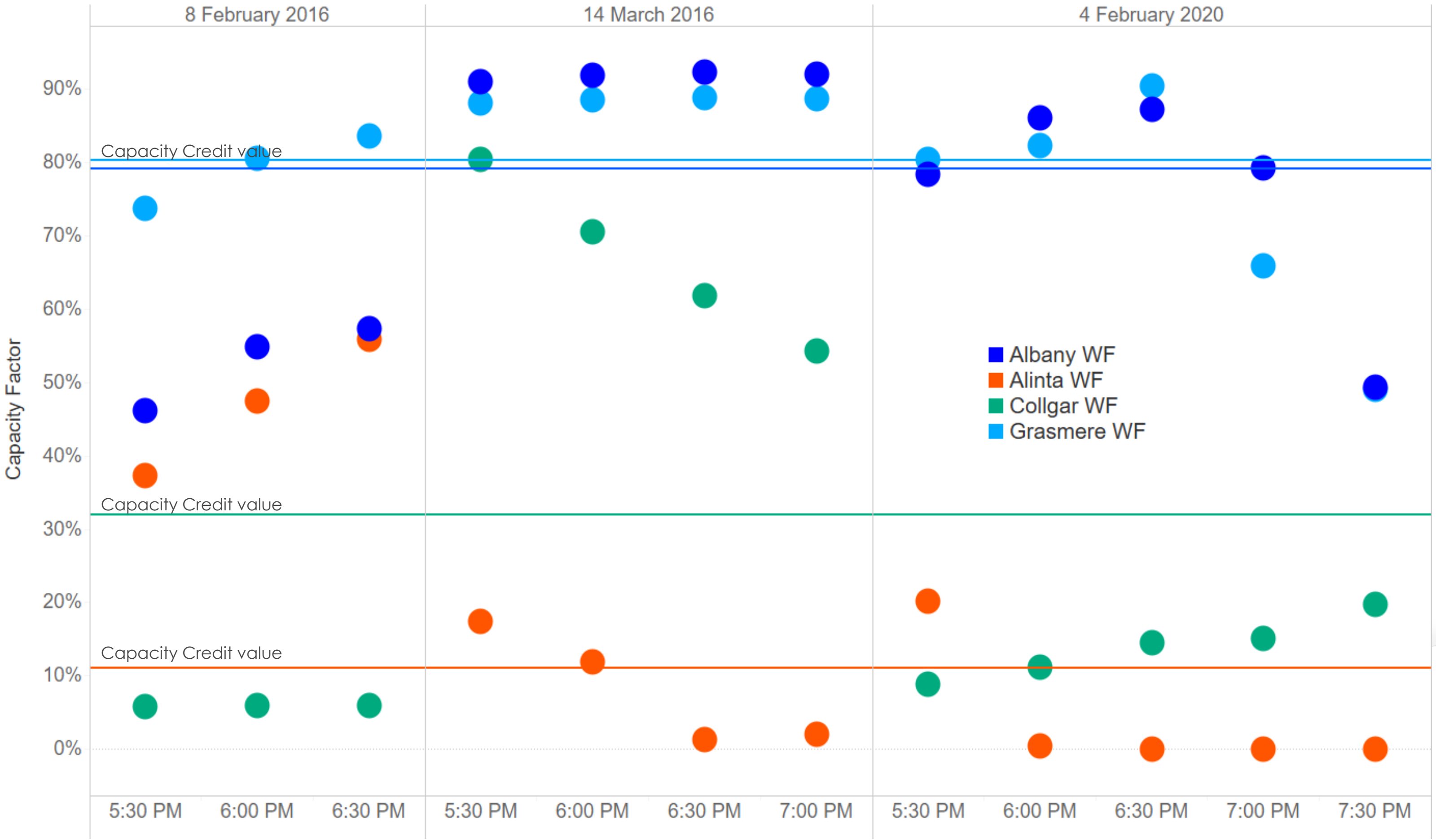
Weightings of days driving LOLE (and therefore CRC), 2014 to 2020



Consequences

Credits are based on just a few peak periods, much less than the current method.

Capacity factor and Capacity Credits for top 12 demand periods



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Issues with the Delta Method

What can an intermittent generator produce when the system needs it most?

More sophisticated but is a step backward – like using current peak LSG method but with far less intervals, and no discount for variance.

Causes volatility, undermining investment

So few intervals won't predict when capacity will be valuable in future.

Very weak signal for when we want capacity

Exposed to new entrants

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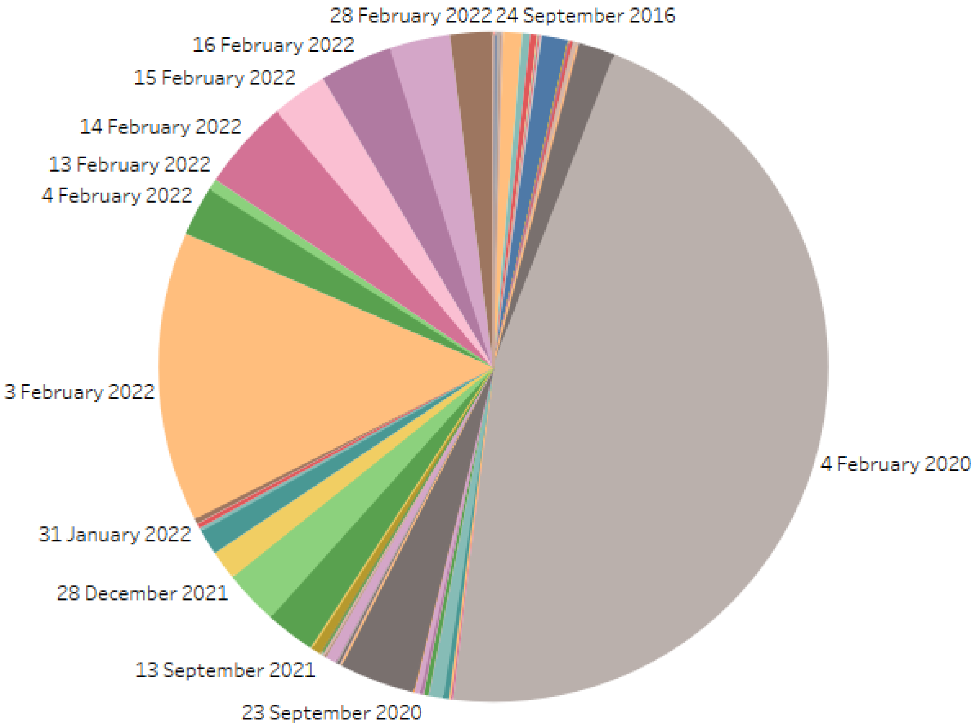
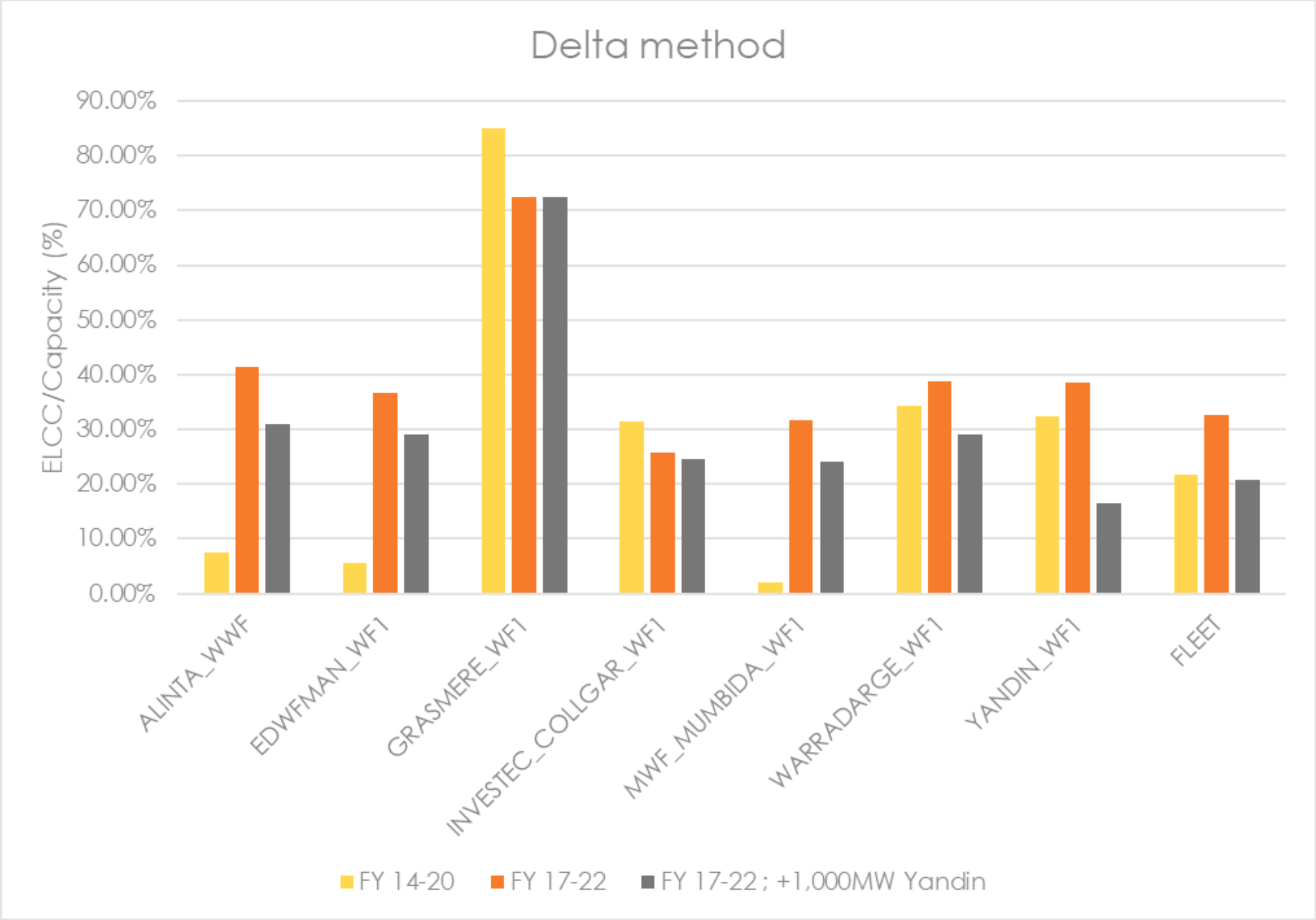
Issues analysis

One year can significantly shift intervals but sample is still small.

Weightings of days driving LOLE, 2017 to 2022.



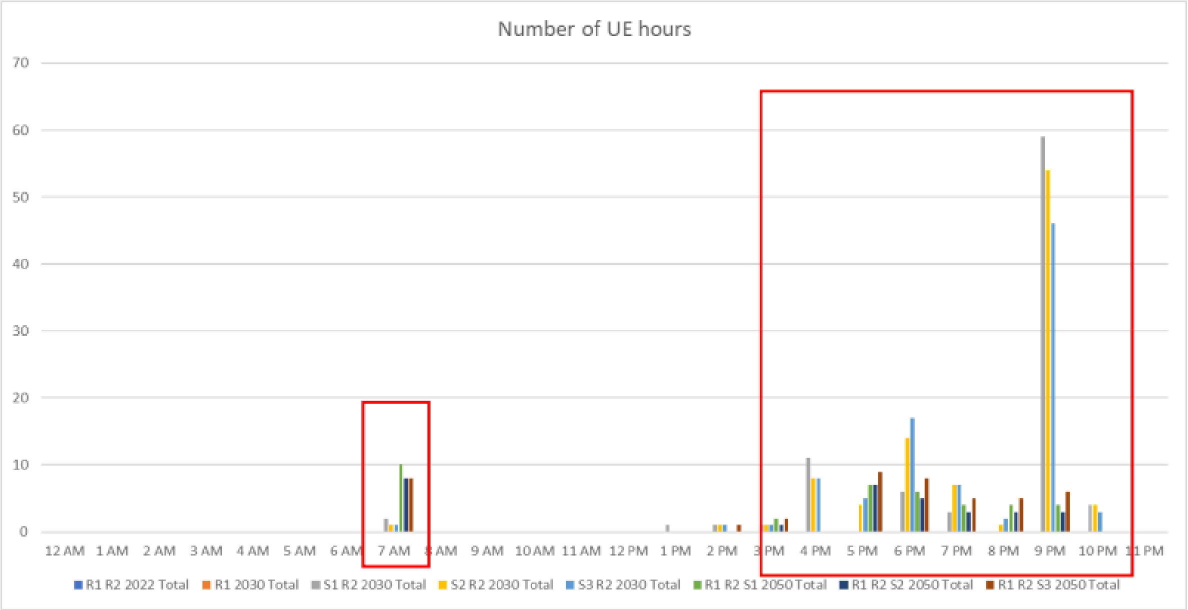
New entrants can have diminishing returns and impact existing facilities unpredictably.



Proposed solution

What can an intermittent generator produce when the system needs it most?

Classification of Facilities



Source: 2 June RCMWG papers, slide 28

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Proposed solution

- Use average output during peak demand days between 4pm - 9pm intervals, discount for variance (like under the current method).
- Remove unnecessary k and u adjustments

Why?

- Better reflects forecast capacity value
- Avoids undervaluing new entrants, and unhedgeable risks to existing plant.
- Simple, clearer investment signal and intent
- Precedent in PJM

Preliminary results and comparison with Delta Method