CORNWALL INSIGHT
AUSTRALIA
CREATING CLARITY

Chart of the Week

Issue 47

13 August 2020

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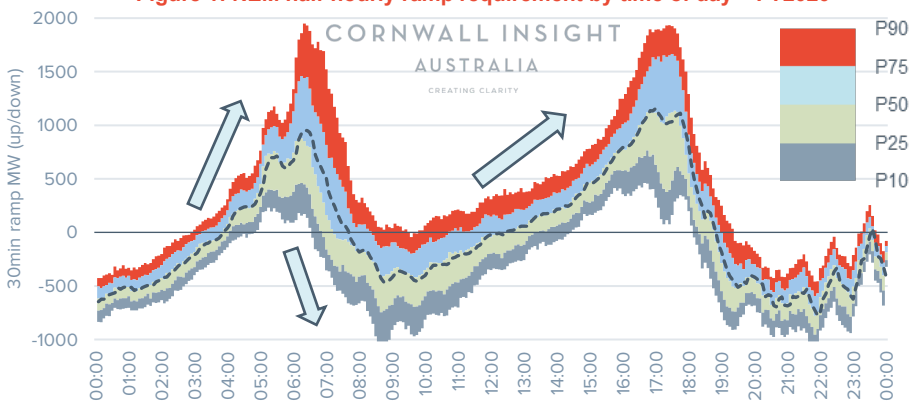
"as the sun begins to set, the ramp requirement to the evening peak is on average around 1 GW however 50% of the time the requirement can be between 500-1500 MW a half hour. Interestingly, this ramp is similar to the morning peak (if not more varied) which is a significant change from the NEM five years ago"

Ramping: Brought into focus but always in the frame

With the release of AEMO's Integrated System Plan (ISP) comes increased commentary on the need for power system services critical to ensuring the secure operation of the NEM. Of growing importance are services to provide voltage control and system strength, frequency control and inertia, ramping and dispatchability. In this week's 'Chart of the week', we will explore the issue of ramping and the associated challenges as the transition continues.

Figure 1 shows the NEM-wide ramping requirement for synchronous generation in FY2020 to meet the change in demand and VRE on a half-hourly basis. The shaded areas of the chart represent differing percentiles in the time of day variability of the required ramp.

Figure 1: NEM half-hourly ramp requirement by time of day – FY2020



When we talk about ramping, we mean the ability of generators (or users) to vary their output (up/down) as required. This is not a new concept as generators in the NEM have been responding to changes in the supply/demand balance since market inception. However, as the generation mix continues to evolve, increased variable renewable energy (VRE), the ramping requirement going forward will reflect the change in demand *and* the change in VRE. Given the formulation the changes could offset each other resulting in a lesser requirement or compounding resulting in a much larger ramp required.

The first thing that stands out is the impact that the total solar output has on ramping requirements. In the time following the morning peak, synchronous generators are on average ramping down 500MW per half hour as solar starts to come online. Then as the sun begins to set, the ramp requirement to the evening peak is on average around 1 GW however 50% of the time the requirement can be between 500-1500 MW a half hour. Interestingly, this ramp is similar to the morning peak (if not more varied) which is a significant change from the NEM five years ago when the evening ramp was about half of what it is now and more often was a ramp down for synchronous units.

Not charted, are the top (and bottom) 10% of ramps, which even in a 30-minute period can require a GW of output up or down in the middle of the day (more than the largest credible contingency for FCAS). During peak periods, this requirement can be as high as 2.5 GW in a half-hour.

Looking forward, coal will continue to be displaced in the middle of the day and forced to operate closer to their minimum loading. Provided that coal remains online, there is likely to be sufficient capacity in reserve to meet the ramping requirements of the system albeit in an incremental way (every five minutes).

There are multiple rule change requests currently with the AEMC seeking to provide increased certainty around reserves on the supply side to meet these requirements. Another key aspect will be a more active demand side and improved price signals that prompt market participants to respond. This will assist in meeting sustained ramps but also be nimble enough to address short imbalances that would otherwise exceed current FCAS contingency planning. In one form or another, increased reserves and ramp capability will be required going forward. For now, incumbent generators (like coal) will need to meet these requirements however, what technologies will meet these needs as coal retires?