AEMO INSIGHTS

Generator outage analysis for 2019 Electricity Statement of Opportunities

September 2019

Background

Victoria is currently experiencing two significant long-term generator outages that are expected to last for a period greater than six months. They are the outages affecting Loy Yang A2[1] and Mortlake Unit 12[2].

AGL and Origin have advised that these outages are expected to be complete in December 2019[3,4], and this is reflected in their return to service (RTS) expectation in the Medium Term Projected Assessment of System Adequacy (MT PASA)[5].

AEMO's Electricity Statement of Opportunities (ESOO) quantifies the probability distribution of unserved energy (USE) based on a range of weather, demand, and forced outage scenarios.

Although it is likely that both Loy Yang A1 and Mortlake 12 will return on schedule – and both AGL and Origin are taking all necessary steps to work towards this outcome – there is a risk that one or both of them could be delayed for reasons outside of the control of the owners. A substantial delay through summer would reduce supply at a time of potentially high demand and could lead to an increased amount of load shedding.

While it is very difficult to assess the probability of a delayed RTS, it is nevertheless important to include this possible outcome in AEMO's assessment. AEMO therefore estimated the probability of a delay at Loy Yang to be 30% and at Mortlake to be 60% in formulating the four sensitivities described in detail in Chapter 5 of the 2019 ESOO. The extent of the delay, should it occur, was chosen such that RTS was delayed until 1 March 2020.

The reported USE result for Victoria for 2019-20 of 0.0026% is a weighted average of the expected USE under each of the four scenarios. The 2019 ESOO also provides, for enhanced transparency, a breakdown of the underlying USE for each sensitivity, including no delayed RTS.

Modelling assumptions in the 2019 ESOO were made on the basis of empirical evidence from a study of previous long-term outages (longer than six months) in the NEM. The data shows that there is typically some delay in actual RTS date, compared to original estimates for units to return.

Methodology

The analysis period covered the past 10 years of NEM history, from 1 January 2010. This length of time was required to ensure a sufficient sample size for the relatively infrequent event of an outage lasting longer than six months.

[1] See https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2019/june/fy20-impact-of-extended-unit-outage-at-loy-yang.

[2] See https://www.originenergy.com.au/about/investors-media/media-centre/statement_on_mortlake_power_station.html.

[3] See https://www.agl.com.au/about-agl/media-centre/asx-and-media-releases/2019/june/fy20-impact-of-extended-unit-outage-at-loy-yang.

[4] See https://www.originenergy.com.au/about/investors-media/media-centre/statement_on_mortlake_power_station.html.

[5] MT PASA lists the medium-term supply/demand prospects for the period two years in advance. Each week participants must submit forecasts of availability to AEMO for the next 24 months, commencing eight days after the publication date of the Medium Term PASA report. These forecasts form the basis of the Medium Term PASA report that will be produced the following week. See https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data/Market-Management-System-MMS/Projected-Assessment-of-System-Adequacy

Eight such long-term outages were identified in this 10-year period across the existing fleet of coal generators:

- One long-term outage in Queensland.
- Six long-term outages in New South Wales.
- One long-term outage in Victoria (the Victorian outage identified was for a period of approximately four months, but was included as a representative example for the region).

Two of the six outages identified in New South Wales were initially planned to last longer than six months, but returned ahead of expectations (the only two outages identified in the 10-year period to return earlier than planned), by 10 and 23 days each. The analysis ignored plant now withdrawn from the NEM, such as Wallerawang in New South Wales, Hazelwood in Victoria, and Northern in South Australia.

Outages analysed included a mix of forced and planned outages, and MT PASA was used as the source of the initial RTS date.

AEMO conducted the analysis by comparing three dates:

1. Outage Start Date – the date the generator came out of service (OOS).
2. Expected Outage End Date – the first RTS date reported to MT PASA.
3. Actual Outage End Date – the date the generator actually returned to service.

These dates were used to calculate the following statistics:

Actual Outage Length = Actual Outage End Date – Outage Start Date

Actual Outage Delay = Actual Outage End Date – Expected Outage End Date

This approach is inherently conservative, because it assumes that once the unit has returned to service it can operate normally. In many cases, generators returning from extended outages suffered varying degrees of unreliability (for example, repeated tripping) and operational instability (limited capacity caused by physical or commissioning reasons) in the hours and days (in some case weeks) following RTS.

The following table lists the historical outages that were used for this analysis. The Actual Outage Delay is not shown, because the expected RTS is from MT PASA information, which is confidential.

Historical Outages Used

State	DUID	Fuel	Capacity	Outage Start	Actual RTS	Actual Outage Length (days)
NSW	ER02	Black Coal	750	26/02/2010	21/08/2010	176
	LD03	Black Coal	550	20/01/2011	30/08/2011	222
	ER01	Black Coal	750	1/07/2011	18/12/2011	170
	ER04	Black Coal	750	30/03/2012	3/12/2012	248
	LD04	Black Coal	550	1/03/2013	21/01/2014	326
	LD01	Black Coal	550	17/11/2014	24/08/2015	280
QLD	CALL_B_1	Black Coal	385	16/05/2014	26/11/2014	194
VIC	YWPS4	Brown Coal	405	20/06/2013	16/10/2013	118

DUID: dispatchable unit identifier

Results

The following table shows the results of the outage analysis.

Long-term outage analysis, 1 January 2010 to date (Participants de-identified)

Number of long-term outages used in analysis:	8
Average actual outage length (in days):	217
Average actual outage delay (in days):	70
Number of outages RTS ahead of initial expectations:	2
Shortest RTS delay:	23 days ahead of initial date
Longest RTS delay:	148 days delayed

The average outage delay of **70** days was selected as the basis for the modelling of the two scenarios where Loy Yang A and Mortlake 12 are subject to a delay. For simplicity, this was implemented as a return to service date of 1 March 2020 in both scenarios.

The 10-year dataset suggests that, on average, 75% of long-term outages exceeded their initially announced RTS date. The assumptions of a 60% and 30% probability of a delayed RTS for Mortlake 12 and Loy Yang A2 respectively are therefore more optimistic than the historic experience would suggest. AEMO assumed a greater risk of delay for Mortlake 12 because it involves the installation of a completely new generator, whereas for Loy Yang A2, only a component of the generator requires substantial repairs.

Next steps

AEMO will continue to work closely with both AGL and Origin to support the RTS of Loy Yang A2 and Mortlake Unit 12, ideally without delay.

AEMO is also in the process of conducting a comprehensive audit of the thermal generation fleet across the NEM, to get a more accurate understanding of the actual risk exposure. This audit will consist of a desktop review of reliability and maintenance data as well as targeted site visits of critical plants.

As new information becomes available, AEMO will update its reliability forecast to enable the market to prepare for the coming summer with the best information available.