

# UPDATE: ELECTRICITY STATEMENT OF OPPORTUNITIES

FOR THE NATIONAL ELECTRICITY MARKET

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## IMPORTANT NOTICE

### Purpose

AEMO publishes the Electricity Statement of Opportunities (ESOO) in accordance with clause 3.13.3(q) of the National Electricity Rules, to provide technical and market data and information which can be used to assess the future need for electricity generation or demand management capacity or augmentation of the power system in the National Electricity Market.

This ESOO Update is published in accordance with clause 3.13.3(r), to give interested stakeholders updated information about the supply demand balance in the NEM following Engie's November 2016 announcement about the retirement of the Hazelwood power station.

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### Acknowledgement

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## EXECUTIVE SUMMARY

On 3 November 2016, majority owner Engie announced that Hazelwood Power Station in Victoria would retire by 31 March 2017. The closure of this brown coal-fired power station will remove 1,600 megawatts (MW) – or 13.8% of scheduled and semi-scheduled generation capacity – from Victoria, and will reduce the surplus generation Victoria has traditionally exported.

This Update to the 2016 *Electricity Statement of Opportunities* (ESOO) assesses supply adequacy across the National Electricity Market (NEM) over the next ten years, in light of this significant new information.

The NEM reliability standard sets an expectation that demand will be met 99.998% of the time. Under a neutral economic and consumer outlook – and in the absence of any market response – the announced retirement of Hazelwood Power Station:

- May lead to reliability standard breaches in Victoria by summer 2017–18.
- May lead to reliability standard breaches in South Australia by summer 2017–18.
- Is not expected to result in any additional need for ancillary services, beyond those reported in the 2016 NEM ESOO.

**Reliability standard –** specifies that the level of expected unserved energy should not exceed 0.002% of consumption per region, in any financial year.

Under normal market conditions, short-term market responses to the withdrawal of Hazelwood, which could avoid the projected reliability standard breaches in Victoria and South Australia, could include:

- Increasing generation from existing generators in the NEM, primarily New South Wales black coal-fired and South Australia gas-fired generation, to decrease reliance on Victorian exports.
- Conservation of water storage this year for use when supply is tight next summer.
- Returning withdrawn generation plant to service in the NEM to increase generation availability.
- Demand-side participation (DSP), which can refer to a wide variety of short-term demand responses by customers to electricity price and/or reliability signals.
- Committing already-proposed generation, network, or non-network projects in the NEM, recognising that there are lead times for this response.
- Permanent demand reduction in response to anticipated increases in market prices.

Of the above possible market responses, the NEM ESOO Update has analysed the potential impact of:

- Increasing generation from existing generators in the NEM.
- Returning withdrawn generation plant to service before summer 2017–18. Information provided by industry for the 2016 NEM ESOO indicated that gas-powered generation (GPG) such as Tamar Valley combined-cycle gas turbine in Tasmania, Swanbank E in Queensland and the additional capacity at Pelican Point in South Australia could be recalled to service within three months.

The analysis indicates that, on average across a range of generator availability conditions, the return to service of a combination of generators currently on short term withdrawal would be sufficient to meet demand 99.998% of the time.

AEMO's update to its *Energy Adequacy Assessment Projection* (EAAP) has further analysed the ability for Murray hydroelectric plant in Victoria to conserve water in storage in the 2016–17 year, to allow more generation in summer 2017–18.

## CHAPTER 1. BACKGROUND

### 1.1 Purpose and scope of this report

The National Electricity Rules (NER) clause 3.13.3 (r) requires AEMO to publish updates to the ESOO for the NEM as soon as practicable when significant new information becomes available relating to supply or demand projections, including plant retirements.

Engie's recent announcement that Hazelwood Power Station in Victoria will be withdrawn by 31 March 2017 is considered significant new information, requiring a published update to the 2016 NEM ESOO, issued in August 2016.

AEMO has remodelled projected supply and demand across the NEM and in each NEM region, based on this generation being removed as announced. This report details the resulting reliability in Victoria and South Australia, and the possible impact from a market response, focusing on options to increase generation supply.

### 1.2 Modelling improvements to the 2016 ESOO Update

AEMO has made two refinements to the methodology used for this 2016 ESOO Update, both in the process of continuous improvement and in responding to stakeholder feedback since the 2016 NEM ESOO. These improvements are:

- Improved methodology in the development of the 10% probability of exceedance (POE)<sup>1</sup> demand trace, to reduce distortion of the shape of the load duration curve.
- Maintaining correlation of intermittent generation contribution at times of peak demand across the modelled reference years.

#### Demand shape improvement

Historically, AEMO has developed 10% and 50% POE load traces separately, based on the historical load shape of the chosen reference year and AEMO's forecast maximum demand and annual consumption in the *National Electricity Forecasting Report* (NEFR). While 10% and 50% POE load traces assume a different maximum demand, the energy consumption remains constant. Therefore, the 10% POE trace notionally reflects a heat wave, over say a period of one week, but with weather conditions similar to the 50% POE trace for the rest of the year.

Comparing the shape of the two traces, it was evident that the trace development approach needed to keep energy consumption constant and minimise distortion of the reference year trace.

AEMO's new approach to developing the 10% POE demand trace maintains demand from the 50% POE trace for most of the year, and replaces the five-day period around the annual maximum demand with a scaled up profile that meets the 10% POE forecast. This provides more intuitive differences between the two traces – driven only by hotter than average conditions for a short period of time. Further work to refine this approach will be progressed ahead of the 2017 NEM ESOO.

#### Correlation of intermittent generation

AEMO has updated its input wind and rooftop PV generation profiles to maintain correlation with demand from year to year. From a reliability perspective, it is important to preserve this correlation across the six reference years modelled, to capture the variability between intermittent generation and maximum demand periods.

<sup>1</sup> POE refers to the probability that a forecast electricity maximum demand figure will be exceeded. For example, a forecast 10% probability of exceedance (POE) maximum demand is expected, on average, to be exceeded only one year in every 10, while a 50% POE forecast is expected to be exceeded one year in two.

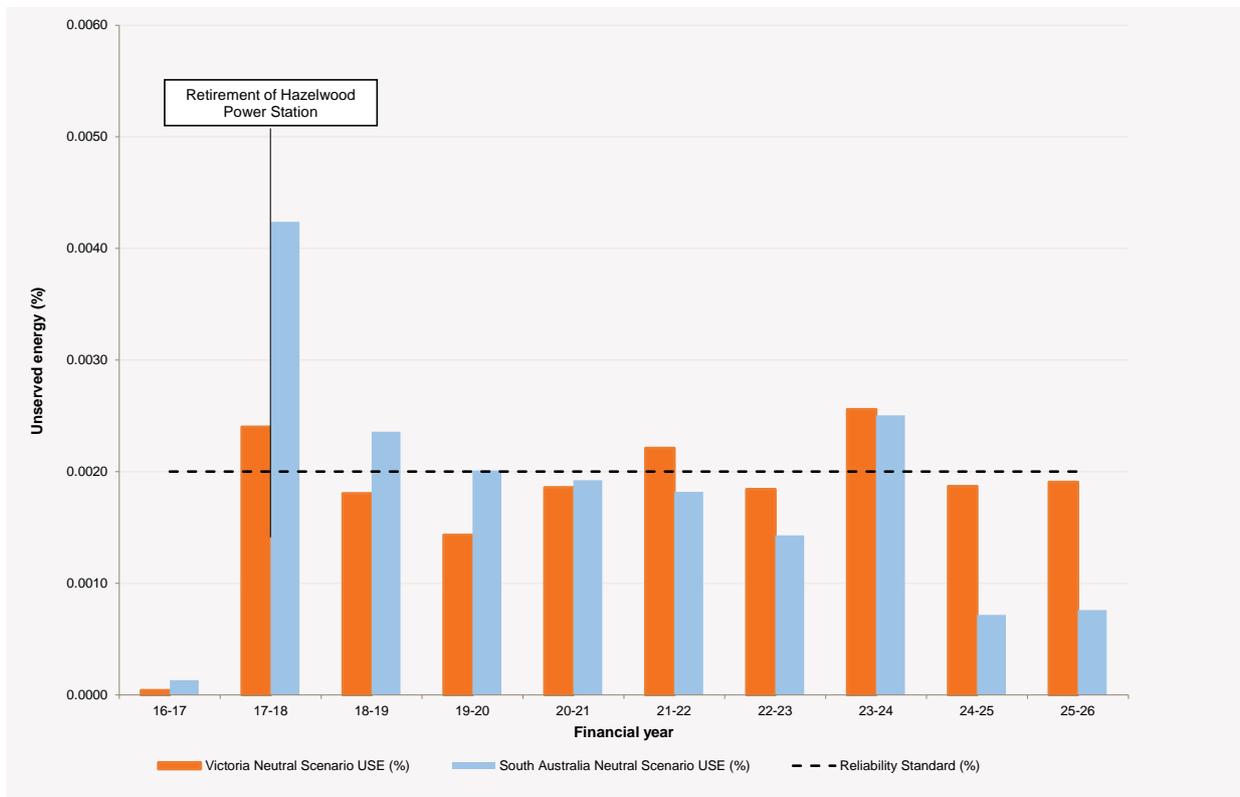
## CHAPTER 2. SUPPLY ADEQUACY ASSESSMENT

The withdrawal of Hazelwood by March 2017 is projected to result in potential breaches of the reliability standard<sup>2</sup> in Victoria and South Australia from 2017–18 under a Neutral Growth scenario:

The reliability standard targets no more than 0.002% of native annual consumption being unserved in any region in any financial year. Modelling projects unserved energy (USE) in 2017–18 equivalent to 0.0024% in Victoria and 0.0042% in South Australia.

To highlight Low Reserve Condition (LRC) points<sup>3</sup>, Figure 1 shows the levels of projected USE in Victoria and South Australia as a percentage of total demand, and compares these with the reliability standard.

**Figure 1 Victoria and South Australia supply adequacy (Neutral Growth scenario)**



USE is projected in both South Australia and Victoria, due to South Australia's dependence on support from Victoria and high coincidence of maximum demand between the two regions. After the withdrawal of Hazelwood Power Station, when supply is tight in Victoria there is limited support available to South Australia. Support from New South Wales to Victoria is also limited, due to constraints invoked when Murray Hydroelectric Power Station approaches maximum capacity.

After the initial projected breach in 2017–18, forecast USE is reduced in both Victoria and South Australia due to decreasing operational demand in both regions and the addition of committed plants. Nonetheless, USE levels are projected to remain close to or above the reliability standard through the 10-year period.

<sup>2</sup> See Australian Energy Market Commission (AEMC) Reliability Panel. NEM Reliability Standard – Generation and Bulk Supply. Available at: [http://www.aemc.gov.au/getattachment/f93100d9-72d2-46fb-9c25-ac274a04ae58/Reliability-Standards-\(to-apply-from-1-July-2012\).aspx](http://www.aemc.gov.au/getattachment/f93100d9-72d2-46fb-9c25-ac274a04ae58/Reliability-Standards-(to-apply-from-1-July-2012).aspx).

<sup>3</sup> LRC points are points at which unserved energy breaches the reliability standard.



## CHAPTER 3. POSSIBLE MARKET RESPONSES

The withdrawal of Hazelwood Power Station was announced in November 2016 by Engie, with the plant due to exit from the NEM by the end of March 2017. The earliest LRC points are projected in summer 2017–18. This notice period is a key opportunity for NEM participants to respond to the announcement by adjusting their gas and electricity portfolios. The notice period is also valuable from an investment perspective, as it provides an opportunity for supply-side options to emerge.

There are a range of potential market responses to the Hazelwood Power Station withdrawal, even in the short term. These responses could include:

- Increasing generation availability by returning to service withdrawn generation plant that (as indicated by plant operators) could be recalled within three months.
- Conserving water in storage this year, to allow more generation from Murray Hydroelectric Power Station in summer 2017–18.
- Committing already-proposed generation, network, or non-network projects in the NEM.
- Demand-side participation.
- Permanent demand reduction in response to anticipated increases in market prices. AEMO's current modelling assumes no demand response from major industrial, commercial, or residential loads.

This chapter focuses on the opportunity for withdrawn generation to increase supply to reduce the likelihood of reliability standard breaches.

AEMO has assessed the potential for conserving water in storage this year to allow for more generation from Murray Hydroelectric Power Station in summer 2017–18 in its November EAAP update.

For a full list of proposed and committed generation in the NEM, see the AEMO Generation Information Page.<sup>4</sup> AEMO assesses the long-term integration of new generation and transmission options in the NEM in the *National Transmission Network Development Plan* (NTNDP, next to be published in December 2016). The *2016 National Gas Forecasting Report* (NGFR) will further explore possible responses from exposed industry to anticipated higher electricity prices.

### 3.1 Withdrawn plants returning to service

In the 2016 NEM ESOP, AEMO sought to understand the sensitivity of its modelling results to the possible return to service of withdrawn generators. It consulted widely with generators on criteria to categorise “withdrawn” plant, and all stakeholders indicated the likely timeframe within which they would be able to recall plant to service. This enabled AEMO to identify three distinct timeframes for recall, and construct a simple matrix. Through consultation, AEMO developed the following withdrawal categories:

- Short-term withdrawal – if a plant can be recalled within three months.
- Seasonal withdrawal – if the recall time is three to six months.
- Long-term withdrawal – if the recall time is from six to 12 months.

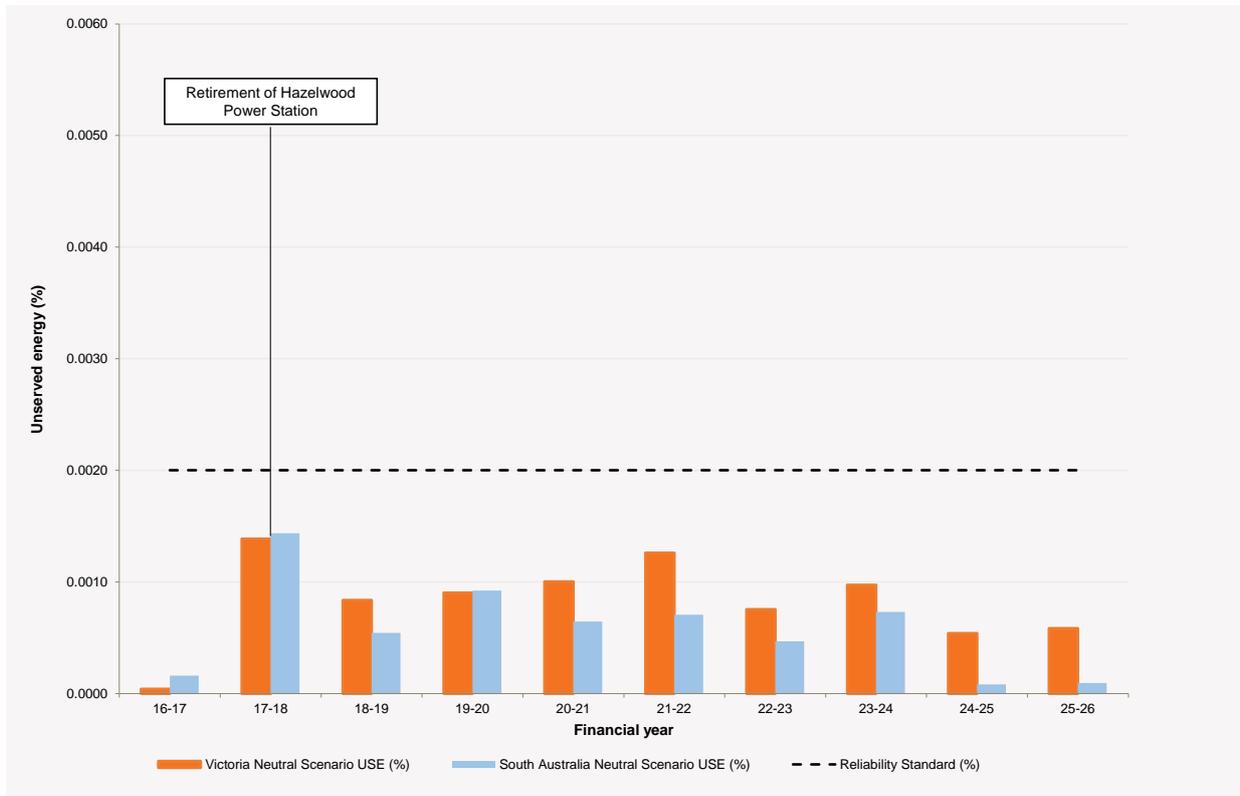
AEMO has modelled the impact of “short-term withdrawal” generators returning to service in 2017–18 to aid in reducing USE. The short-term withdrawn generation plants listed in the 2016 NEM ESOP, and modelled to return as part of a market response in this ESOP Update, were:

- Pelican Point Power Station in South Australia back to full service (239 MW).
- Tamar Valley Power Station in Tasmania (208 MW).
- Swanbank E Power Station in Queensland (365 MW).

<sup>4</sup> <http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information>.

Figure 2 shows that if a combination of these withdrawn generators were to return to full service, USE is projected to reduce below the reliability standard in both South Australia and Victoria.

**Figure 2 Victoria and South Australia supply adequacy with market response**



### 3.2 Impact on gas supply

After the withdrawal of Hazelwood Power Station, the market may respond by increasing generation from existing plant for the 2017–18 financial year. To cover the 10,350 gigawatt hours (GWh) generated by Hazelwood Power Station in the 2015–16 financial year, AEMO’s modelling projects that black coal-fired generation and GPG would increase in almost equal shares. Much of the increased black coal-fired generation would supply demand in New South Wales and Queensland, previously supported by exports from Victoria. Victoria is projected to continue to be a net exporter of generation although volumes of export will reduce.

Although more generation capacity exists in New South Wales, during times of high demand in South Australia and Victoria, network constraints limit interregional flow south. During these high demand periods, Murray Hydroelectric Power Station is expected to generate at close to full capacity. This power station in the Victoria NEM region is located on the north side of the main transmission lines which connect Victoria to New South Wales. Consequently, when power flows towards Victoria, the total transfer is a combination of New South Wales imports and Murray generation. As the total power on these lines must remain below their transfer capacity, higher Murray generation results in lower import capability from New South Wales.

When these network constraints limit import from New South Wales during high demand periods, there is more projected reliance on GPG in Victoria and South Australia to supply demand in these regions. This, coupled with any return to service of withdrawn generation, is forecast to lead to higher demand for gas, further tightening the gas supply balance in the eastern and south-eastern gas market. AEMO will analyse the potential impact to the gas market, and its ability to support GPG growth and supply a



peak demand GPG day, in the 2017 *Gas Statement of Opportunities* and the 2017 *Victorian Gas Planning Report*.

## CHAPTER 4. LINKS TO SUPPORTING INFORMATION

Table 1 provides links to additional information provided either as part of the 2016 ESOO Update accompanying information suite, or related AEMO planning information.

**Table 1** Links to supporting information

Information Source	Website Address
Energy Adequacy Assessment Projection Update	<a href="https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Energy-Adequacy-Assessment-Projection">https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Energy-Adequacy-Assessment-Projection</a>
NEM Electricity Statement of Opportunities	<a href="http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities">http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/NEM-Electricity-Statement-of-Opportunities</a> .
National Electricity Forecasting Report	<a href="https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report">https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Electricity-Forecasting-Report</a>
AEMO Generation Information page	<a href="http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information">http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information</a>
2016 National Electricity Forecasting Report – Demand Side Participation	<a href="https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/Demand-Side-Participation---2016-National-Electricity-Forecasting-Report.pdf">https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/NEFR/2016/Demand-Side-Participation---2016-National-Electricity-Forecasting-Report.pdf</a>
National Transmission Network Development Plan	<a href="http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Transmission-Network-Development-Plan">http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/National-Transmission-Network-Development-Plan</a>
National Gas Forecasting Report	<a href="https://www.aemo.com.au/Gas/National-planning-and-forecasting/National-Gas-Forecasting-Report">https://www.aemo.com.au/Gas/National-planning-and-forecasting/National-Gas-Forecasting-Report</a>
Gas Statement of Opportunities	<a href="https://www.aemo.com.au/Gas/National-planning-and-forecasting/Gas-Statement-of-Opportunities">https://www.aemo.com.au/Gas/National-planning-and-forecasting/Gas-Statement-of-Opportunities</a>
Victorian Gas Planning Report	<a href="https://www.aemo.com.au/Gas/National-planning-and-forecasting/Victorian-Gas-Planning-Report">https://www.aemo.com.au/Gas/National-planning-and-forecasting/Victorian-Gas-Planning-Report</a>