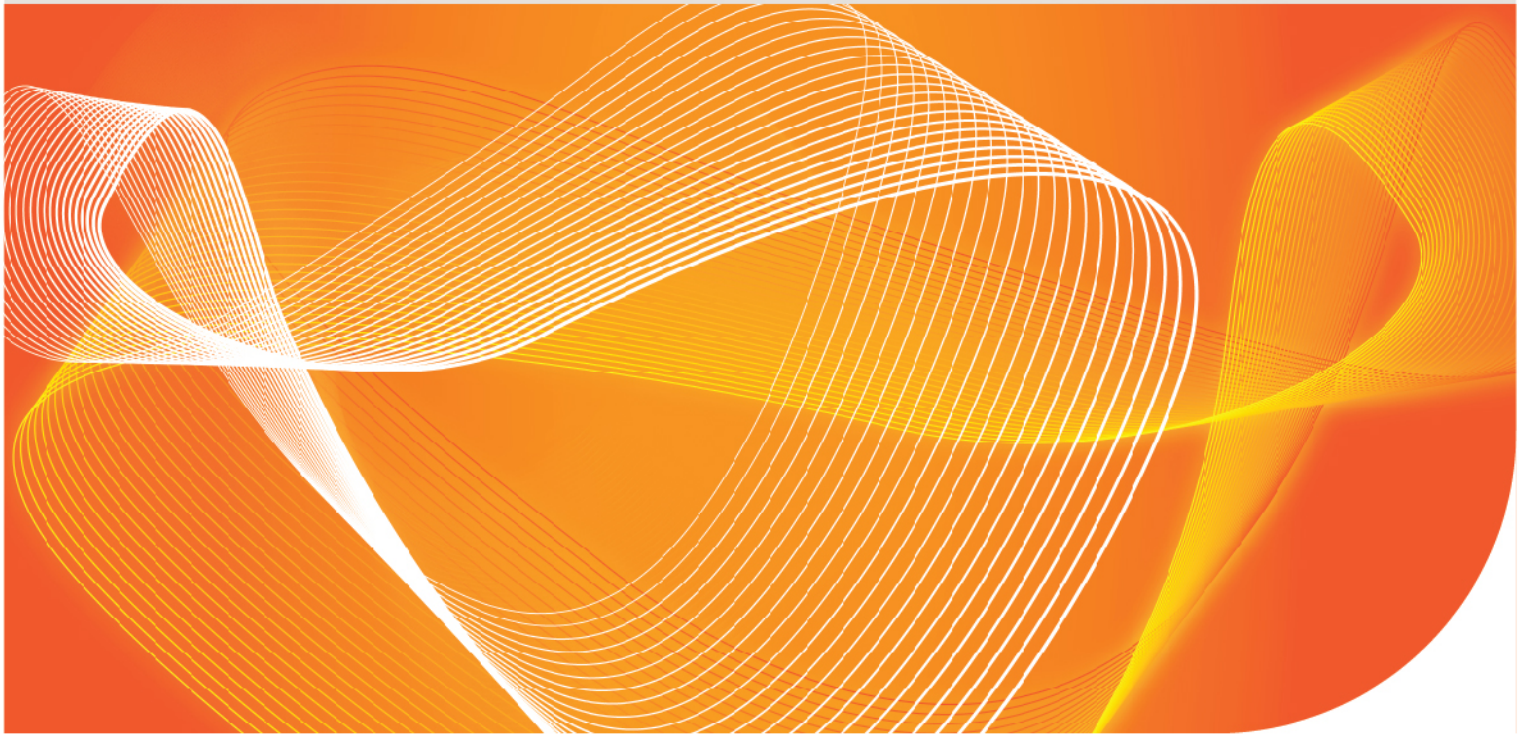
ELECTRICITY STATEMENT OF OPPORTUNITIES

FOR THE NATIONAL ELECTRICITY MARKET

Published: **August 2015**



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AUSTRALIAN ENERGY MARKET OPERATOR

	Released	Changes
Version 1	13 August 2015	
Version 2	14 August 2015	Figure 2 updated (page 18, Section 3.3) Figure 3 updated (page 19, Section 3.4)

IMPORTANT NOTICE

Purpose

AEMO has prepared this document to provide technical and market data and information which can be used to assess the future need for electricity generating or demand management capacity or augmentation of the power system in the National Electricity Market, as at the date of publication.

AEMO publishes the Electricity Statement of Opportunities in accordance with clause 3.13.3(q) of the National Electricity Rules.

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Acknowledgement

AEMO acknowledges the support, co-operation and contribution of market participants in providing data and information used in this publication.

EXECUTIVE SUMMARY

The 2014 Electricity Statement of Opportunities (ESOO) reported surplus generation capacity of 7,400 MW in the National Electricity Market (NEM) by 2023−24. The market has responded in the past year by notifying its intent to withdraw approximately 4,550 MW of capacity (about half the surplus) by 2022.

The 2015 ESOO uses information provided by industry to report on the adequacy of existing and committed electricity supply in the NEM to meet maximum demand and annual operational consumption forecasts over the period 2015–16 to 2024–25. These forecasts were published in the June 2015 National Electricity Forecasting Report (NEFR).[1]

The ESOO does not consider market prices, profitability, or other costs and incentives, such as schemes supporting renewable energy generation, that affect commercial decisions to invest in or withdraw generation capacity. Therefore, it does not forecast any market response to potential supply shortfalls or government policy, such as the Renewable Energy Target.

Proposed generation or transmission projects not yet committed are not incorporated in the supply adequacy assessment. An efficient market is expected to adjust and respond appropriately to market signals.

The 2015 ESOO highlights:

- In New South Wales (NSW) in the past year, the market has announced 2,315 MW of generation capacity withdrawal. This is in addition to 1,000 MW of withdrawal announced for this region before the 2014 ESOO publication. Assuming no market adjustments, these withdrawals may lead to a breach of the Reliability Standard in NSW by 2022–23, under the medium demand scenario.[2]
- In South Australia (SA), generation capacity reserves are reducing, with approximately 1,505 MW of withdrawals announced, placing greater reliance on imports from Victoria. The Reliability Standard may be breached in the region in 2019−20 and 2024−25, under the medium demand scenario (assuming Northern Power Station would be withdrawn by summer 2017-18[3]). In the years between, the potential uptake of rooftop photovoltaic alleviates the risk of Reliability Standard breaches.
- In Victoria, the Reliability Standard may be breached in 2024−25, under the medium demand scenario. Generation capacity in the region is increasingly required to support SA and NSW while also meeting increasing local maximum demand requirements.
- Under the high demand scenario, all regions except Tasmania could experience Reliability Standard breaches by 2024–25.

Table 1 below summarises AEMO's supply adequacy assessment for each NEM region.

Table 1 Summary of supply adequacy shortfalls

	Low Scenario		Medium Scenario		High Scenario	
Region	Timing	Shortfall	Timing	Shortfall	Timing	Shortfall
Queensland	Beyond 2024–25	N/A	Beyond 2024–25	N/A	2021–22	0.0050%
New South Wales	Beyond 2024–25	N/A	2022–23	0.0056%	2021–22	0.0022%
Victoria	Beyond 2024–25	N/A	2024–25	0.0033%	2019–20	0.0029%
South Australia	Beyond 2024–25	N/A	2019–20	0.0022%	2019–20	0.0043%

[1] http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report. Viewed 1 July 2015.
[2] The 2015 ESOO assesses adequacy under high, medium and low demand scenarios that are summarised in Section 1.2 of this report, and correspond to the scenarios in the 2015 National Electricity Forecasting Report (NEFR). See footnote 1 for link.
[3] Since this report was prepared, Alinta Energy has announced that Northern Power Station will be withdrawn by March 2017, but this is not expected to materially impact this supply adequacy assessment.

	Low Scenario		Medium Scenario		High Scenario	
Tasmania	Beyond 2024–25	N/A	Beyond 2024–25	N/A	Beyond 2024–25	N/A

The Reliability Standard requires that a maximum of 0.002% of all operational consumption can go unserved for any region in any financial year. The table shows when the Reliability Standard may be breached for each region under each scenario, as well as the percentage of operational consumption that would be unmet.

Changed outlook since 2014 ESOO

The potential Reliability Standard breaches shown in Table 1 occur earlier than reported in the 2014 ESOO assessment. The 2014 ESOO reported that breaches of the Reliability Standard (if any) would occur beyond 2023–24.

Key supply and demand changes since 2014 are:

- Based on generation availability information provided by industry, by 2023–24 more than half the surplus generating capacity projected in the 2014 ESOO will be decommissioned or withdrawn.[4]
- Maximum demand projections (detailed in the 2015 NEFR) are higher in all regions. This has contributed to the reduction in surplus generation across all regions.

The changed outlook in capacity from the 2014 ESOO to the 2015 ESOO for each NEM region, for the 2023–24 financial year, is detailed in Table 2 below.

The recently announced withdrawals in NSW and SA exceed the 2014 ESOO's projected surpluses for these regions, increasing their reliance on imports from Victoria, Queensland and Tasmania. Both the withdrawals and maximum demand changes impact projected surpluses in all regions.

Table 2 Surplus capacity changes (MW) by region since the 2014 ESOO (all projected to 2023–24)[5]

	Queensland	New South Wales	South Australia	Victoria	Tasmania
2014 ESOO surplus capacity – medium scenario	2,000	2,100	700	2,250	350
Plant capacity withdrawal announced since 2014	0	2,315	1,505	345	386[6]
Summer maximum demand increase – medium scenario	801	613	27	476	15
2015 ESOO surplus capacity – medium scenario*	450	N/A	N/A	100[7]	50

* The data in Table 2 cannot be aggregated due to the complex nature of the network constraints, shape of demand profiles, and reliability of on-line generation which contribute to the regional assessment of surplus capacity.

A project is underway to increase the capacity of the Heywood Interconnector between Victoria and South Australia from a nominal 460 MW to 650 MW in both directions. However the realised capacity may be lower under certain operating conditions. The 2015 ESOO uses an indicative set of limits to model the post-upgrade capability of the Heywood Interconnector and implications of the intended capacity withdrawals. A final set of network limits will be available closer to completion of the upgrade. This may impact on assessing South Australia's supply adequacy and warrant publication of an ESOO update later in the year.

[4] Details of individual plant withdrawals are provided in the body of the report.
[5] Estimates of surplus capacity are rounded to the nearest 50 MW. Maximum demand comparisons in the 2015 NEFR may differ slightly from these due to minor discrepancies introduced when NEFR projections are transformed into hourly demand traces.
[6] Since this report was prepared, Hydro Tasmania has indicated it no longer intends to withdraw its 58 MW Tamar Valley peaking plant post 2017. The analysis and assessed capacity withdrawal still assumes Tamar Valley peaking plant is withdrawn indefinitely, but this change is not expected to be material to the analysis.
[7] In 2023-24, a generation surplus still exists in Victoria, but it is eroded by demand growth in the following year. By 2024-25, no generation surplus is expected in Victoria.

New classification for capacity withdrawal in the 2016 ESOO

The 2015 ESOO highlights the need for clearer classification of generating capacity marked for withdrawal. Currently only a single category of withdrawal exists, which makes no distinction about whether there are plans for a unit to ever return to service. This makes it difficult to accurately project available capacity and assess supply reliability.

When new generating capacity is proposed and developed in the NEM, it is clearly classified at each stage to enable the most accurate projections. In the lead up to the 2016 ESOO, AEMO will apply a new method of classifying withdrawn facilities, considering the timing, availability and likelihood of a unit returning to service in the future.

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CHAPTER 1. ABOUT THE ELECTRICITY STATEMENT OF OPPORTUNITIES

1.1 Purpose and scope

The Electricity Statement of Opportunities (ESOO) assesses the adequacy of existing and committed electricity supplies to meet forecast consumption across the NEM over a 10-year outlook period, under a range of demand scenarios.

The long-term outcomes modelled in this report are based on current conditions and notified capacity changes as at 1 July 2015. The ESOO does not consider market prices, profitability, or other costs and incentives, such as schemes supporting renewable energy generation, that affect commercial decisions to invest in or withdraw capacity.

1.2 Assumptions, methodology and data

The 2015 ESOO modelling methodology is consistent with that used in the 2014 ESOO. Input data has been updated to reflect the latest operational consumption and maximum demand forecasts developed for the 2015 National Electricity Forecasting Report (NEFR)[8], transmission developments, and committed and existing generator availabilities, as at 1 July 2015.

Note that the 2015 ESOO maximum demand values in the figures in Chapter 3 are not directly comparable to the 2015 NEFR maximum demand values, as the ESOO values have been adjusted for use in market modelling. These adjustments included removal of auxiliary loads, inclusion of some but not all non-scheduled generation, and transformation of maximum demand values into hourly profiles. The supply adequacy assessment may be sensitive to these hourly assumptions.

AEMO's adequacy modelling accounts for the hourly generation output of wind farms based on historical data, and includes any contributions toward avoiding unserved energy (USE). However, at times of maximum demand (when the majority of USE occurs), only a percentage of wind generation is typically available.[9]

Information about projected monthly energy, utilisation of inter-regional support to meet electricity consumption, and modelled interconnector flow, is available in the regional data files on the ESOO web page.[10]

The 2015 ESOO includes additional commentary and analysis using AEMO's latest generator survey results and electricity consumption forecasts. As part of the generator survey, participants provided comments on which previously announced projects were now unlikely to proceed.

Chapter 4 provides links to these and other supporting information sources.

[8] http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report. Viewed 1 July 2015.
[9] For more information on the treatment of wind generation, see Section 3.1.1 of the ESOO Methodology.
[10] http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.

1.3 Scenario modelling

The 2015 ESOO considers the three demand scenarios listed in Table 3. Additional detail about each of these scenarios is available on the Planning Assumptions page on AEMO's website.[11]

Table 3 2015 ESOO scenario reference table

2015 ESOO and NEFR reference	2014 AEMO scenario name	Economic growth	Energy consumption	Carbon	Consumer engagement[b]
High scenario	High energy consumption from centralised sources[a]	High	High	Zero cost from 2014–15 Low cost from 2021–22	Low engagement
Medium scenario	Medium energy consumption from centralised sources	Medium	Medium	Zero cost from 2014–15 Medium cost from 2021–22	Highly engaged
Low scenario	Low energy consumption from centralised sources	Low	Low	Zero cost from 2014–15 High cost from 2018–19	Highly engaged

a) A centralised source for electricity refers to the national electricity transmission grid.
b) "Engagement" refers to the extent to which consumers proactively exercise choice of energy sources and usage patterns.

1.4 Improvements planned for the 2016 ESOO

The 2015 ESOO continues the historical focus of the ESOO on identifying opportunities based on large-scale energy adequacy assessments.

The 2016 ESOO will clarify the definition of withdrawal of generation units from service, to specify the amount of capacity that is permanently retiring, and the timing and likelihood of a unit returning to service in the future. Currently only a single category of withdrawal exists, which makes no distinction about whether there are plans for a unit to ever return to service. This makes it difficult to accurately project available capacity and assess supply reliability.

Additionally, AEMO will consult on the value of broadening the ESOO scope to investigate opportunities unrelated to expansion. The energy market of today is much more complex than it was historically, with:

- Rapid growth in areas such as demand side management, rooftop photovoltaic (PV), intermittent generation (such as wind and large-scale solar), and storage technologies.
- At the same time, the retirement of traditional thermal generation.

This creates opportunities for the market or policy-makers to address other issues such as the availability of system restart ancillary services (SRAS), frequency control, or ramp rate capability to meet rapidly fluctuating demand.

[11] AEMO. 2014 Scenario Descriptions. Available at: http://www.aemo.com.au/Electricity/Planning/Related-Information/Planning-Assumptions. Viewed 6 July 2015.

CHAPTER 2. NEM-WIDE OUTLOOK

The ESOO assesses the adequacy of existing and committed electricity supplies to meet projected consumption across the NEM, by identifying Low Reserve Condition (LRC) points. The LRC points indicate when the NEM Reliability Standard[12] is expected to be breached. The Reliability Standard requires that a maximum of 0.002% of all operational consumption can go unserved for any region in any financial year. These breaches signal opportunities for an efficiently operating market to adjust and respond.

2.1 NEM supply adequacy

Table 4 summarises the timing of the first LRC point for each region, as well as the unserved energy (USE) observed for that LRC point in each scenario. Under the medium scenario, New South Wales, South Australia and Victoria observe an LRC point within the 10-year outlook.

Under the high scenario, all regions except Tasmania are expected to require additional investment by 2024–25 to meet the Reliability Standard.

Table 4 Regional LRC timing and USE

	Low Scenario		Medium Scenario		High Scenario	
Region	**LRC Timing**	**USE**	**LRC Timing**	**USE**	**LRC Timing**	**USE**
Queensland	Beyond 2024–25	N/A	Beyond 2024–25	N/A	2021–22	3,393 MWh 0.0050%
New South Wales	Beyond 2024–25	N/A	2022–23	4,003 MWh 0.0056%	2021–22	1,648 MWh 0.0022%
Victoria	Beyond 2024–25	N/A	2024–25	1,502 MWh 0.0033%	2019–20	1,360 MWh 0.0029%
South Australia	Beyond 2024–25	N/A	2019–20	275 MWh 0.0022%	2019–20	587 MWh 0.0043%
Tasmania	Beyond 2024–25	N/A	Beyond 2024–25	N/A	Beyond 2024–25	N/A

Comparison with the 2014 ESOO

In contrast to the above results, the 2014 ESOO reported that any breaches of the Reliability Standard for any of the three demand scenarios would occur beyond the 10-year outlook period to 2023-24. The 2014 ESOO also reported a surplus of generation capacity across the NEM.

The 2015 ESOO reports that, by 2023–24:

- More than half the surplus capacity projected in 2014 will be decommissioned or withdrawn (see Section 2.2 for details of generation changes since the 2014 ESOO).
- Maximum demand projections, reported in the 2015 NEFR, are now higher in all regions than they were in the 2014 NEFR. This has contributed to the reduction in surpluses across all regions.

Recently-signalled withdrawals in NSW and SA exceed the 2014 ESOO's projected surpluses for these regions, increasing their reliance on imports from Victoria, Queensland and Tasmania.

The changes from the 2014 ESOO to the 2015 ESOO are set out in Table 5. All figures are for the 2023–24 financial year.

[12] AEMC. NEM Reliability Standard – Generation and Bulk Supply. Available: http://www.aemc.gov.au/getattachment/f93100d9-72d2-46fb-9c25-ac274a04ae58/Reliability-Standards-(to-apply-from-1-July-2012).aspx. Viewed 6 July 2015.

Table 5 Surplus capacity changes (MW) by region since the 2014 ESOO (all projected to 2023-24)[13]

	QLD	NSW	SA	VIC	TAS
2014 ESOO surplus capacity – medium scenario	2,000	2,100	700	2,250	350
Plant capacity withdrawn since 2014	0	2,315	1,505	345	386[14]
Summer maximum demand increase – medium scenario	801	613	27	476	15
2015 ESOO surplus capacity – medium scenario *	450	N/A	N/A	100[15]	50

* The data in Table 2 cannot be aggregated due to the complex nature of the network constraints, shape of demand profiles, and reliability of on-line generation which contribute to the regional assessment of surplus capacity.

2.2 NEM generation changes and investment trends

The NEM's current installed capacity[16] is 51,363 MW, comprising a range of technologies (54% coal, 24% gas, 6% wind, 16% water, <1% other). The following changes have occurred since the 2014 ESOO:

- 1,074 MW of generation capacity previously considered committed has been commissioned (see Table 6).
- 1,078 MW of thermal base-load generation capacity has been withdrawn (see Table 7).
- Minor revisions have been made to summer, winter, or year-round generation capacity due to plant maintenance or plant capability reassessment (see Table 8).

Table 6 summarises generation that began full commercial operation over the 2014–15 financial year.

Table 6 New generation in operation since the 2014 ESOO

Generator	Region	Capacity (MW)	Type
Large Scale Solar		**122.0**	
Nyngan	NSW	102.0	Solar
Royalla	NSW	20.0	Solar
Large Scale Wind		**946.4**	
Boco Rock Stage 1	NSW	113.0	Wind
Gullen Range	NSW	165.5	Wind
Taralga	NSW	106.7	Wind
Mt Mercer	VIC	131.2	Wind
Snowtown Stage 2	SA	270.0	Wind
Portland	VIC	47.2	Wind
Bald Hills Phase 1	VIC	106.6	Wind
Chepstowe	VIC	6.2	Wind
Gas		**6.0**	
Wilga Park B	NSW	6.0	Gas

[13] Estimates of surplus capacity are rounded to the nearest 50 MW. Maximum demand comparisons in the 2015 NEFR may differ slightly from these due to minor discrepancies introduced when NEFR projections are transformed into hourly demand traces. The maximum demand reported here is a weighted average of the 10% and 50% probability of exceedance (POE) demand traces.

[14] Since this report was prepared, Hydro Tasmania has indicated it no longer intends to withdraw its 58 MW Tamar Valley peaking plant post 2017. The analysis and assessed capacity withdrawal still assumes Tamar Valley peaking plant is withdrawn indefinitely, but this change is not expected to be material to the analysis.

[15] In 2023–24, a generation surplus still exists in Victoria, but it is eroded by demand growth in the following year. By 2024–25, no generation surplus is expected in Victoria.

[16] Including scheduled, semi-scheduled, and non-scheduled installed capacity.

The 240 MW Ararat Wind Farm project in Victoria was classified as a committed project after 2015 ESOO modelling work had begun so was not included in the 2015 ESOO analysis. This project is not expected to alter the timing of the LRC points observed under the medium scenario.

AEMO is also tracking 21,689 MW of proposed[17] new generation capacity. This includes 55.4% (12,021 MW) wind, 27.9% (6,040 MW) gas, 9.2% (2,000 MW) coal, 1.3% (287 MW) solar, 3.1% (666 MW) water and 3.1% (676 MW) other[18] generation. As these projects are as yet uncommitted, they are not incorporated in the 2015 ESOO. AEMO will continue to monitor the status of generation projects, and keep the market informed of developments through the Generator Information page on AEMO's website.[19]

Table 7 summarises capacity withdrawals announced since the 2014 ESOO (1,078 MW has been withdrawn to date, and a further 3,473 MW is planned for withdrawal by 2022).

Table 7 Announcements of generation withdrawals since the 2014 ESOO

Generator	Region	Capacity (MW)	Type
Withdrawn since 2014 ESOO		**1,077.8**	
Morwell/EnergyBrix Power Station	VIC	189.0	Coal
Pelican Point Power Station Unit 2	SA	239.0	Gas
Playford B Power Station[20]	SA	240.0	Coal
Redbank Power Station	NSW	143.8	Coal
Tamar Valley CCGT Power Station	TAS	208.0	Gas
Tamar Valley Peaking Power Station[21]	TAS	58.0	Gas
To be withdrawn		**3,472.90**	
Anglesea Power Station	VIC	156.0	Coal
Bell Bay Three Power Station	TAS	120.0	Gas
Liddell Power Station	NSW	2,000.0	Coal
Northern Power Station	SA	546.0	Coal
Smithfield Power Station	NSW	170.9	Gas
Torrens Island Power Station A	SA	480.0	Gas

These withdrawals are in addition to availability changes of the Collinsville, Daandine, Mackay GT, Mt Stuart, Munmorah, Swanbank E, Tarong and Wallerawang power stations, previously reported in the 2012, 2013 and 2014 ESOOs.

Minor revisions to summer, winter, or year-round capacity, due to plant maintenance or reassessment of plant capability, are summarised in Table 8.

[17] 'Proposed' includes publicly announced and advanced projects only.
[18] 'Other' means geological heat and biomass fuels.
[19] http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information.
[20] Playford B is currently mothballed, but has been announced for full retirement by 2017.
[21] During the 2015 ESOO modelling, Tamar Valley peaking power station was classified as withdrawn. Since the modelling completed, Tamar Valley has revised its status to be available over the 10-year outlook, but this change is not expected to be material to the analysis.

Table 8 Minor revisions to generation capacity since the 2014 ESOO

Generator		Region	Capacity change (MW)	Reason
Yallourn W		VIC	+12	Revised rating in Winter due to turbine upgrades.
Gordon		TAS	-42	Revised rating in Summer and Winter due to lower water storage level.
Loy Yang A		VIC	-30 -60	Revised rating in Summer due to change in performance re-evaluation. Revised rating in Winter due to the difficulty of producing maximum daily capacity for extended periods.
Loy Yang B		VIC	+15 +20	Revised rating in Summer due to increase in condenser vacuum limit. Revised rating in Winter due to increase in condenser vacuum limit.

CHAPTER 3. REGIONAL OUTLOOK

This section provides a supply adequacy overview for each NEM region, including supply–demand outlook and any Low Reserve Condition (LRC) points.

Supply adequacy graphs for New South Wales, Victoria and South Australia summarise AEMO's market simulation modelling results, showing the timing and quantity of any unserved energy (USE) and LRC points over the outlook period.

For other regions, the medium scenario outlook does not observe LRC points, because there is sufficient generation capacity, so graphs are not included. See the 2015 ESOO page on AEMO's website[22] for:

- Detailed modelling results for all regions and all scenarios.
- Details on the Reliability Standard, or how to interpret the supply adequacy charts (see Section 3.1.1 in the 2015 ESOO Methodology document).
- Workbooks containing each region's generation (to meet monthly energy and weighted maximum demand) and interconnector flow simulation results.

3.1 Queensland

- No LRC points occur under the medium or low scenarios.
- Under the high scenario, USE in Queensland will exceed the Reliability Standard in 2021-22 (see Table 9).
- Compared to the 2014 ESOO high scenario, this brings the LRC point forward at least three years.
- This change is attributed to a maximum demand increase in Queensland, and an increase in exported energy to support New South Wales after capacity withdrawal in that region of 2,315 MW.

Table 9 Queensland supply-demand outlook summary with annual USE

Region	Low Scenario		Medium Scenario		High Scenario	
	LRC Timing	USE	LRC Timing	USE	LRC Timing	USE
Queensland	Beyond 2024–25	N/A	Beyond 2024–25	N/A	2021–22	3,393 MWh 0.0050%

Generation investment interest in Queensland is focused on gas-powered generation, which includes the Braemer 3 (550 MW) and Braemar 4 (495 MW), Darling Downs 2 (500 MW), and Westlink Power proposals (up to 1,000 MW).

Queensland also has 1,328 MW of proposed wind generation in nine projects, dominated by the Coopers Gap (350 MW), Bowen (between 120 MW and 240 MW), and Crows Nest (200 MW) wind farm projects.

The Solar Boost project at Kogan Creek, contributing 44 MW toward the total generation of the existing coal-fired plant, has been deferred and is due to be completed in late 2016.

Table 10 shows the current capacity of Queensland's existing and withdrawn generation, and committed and proposed projects, by generation type.

[22] http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities

Table 10 Queensland generation and project capacity by generation type (MW)

Status/Type	Coal	CCGT[a]	OCGT[b]	Gas other	Solar	Wind	Water	Biomass	Other	Total
Existing[c]	8,406.0	1,626.5	1,857.3	167.8	0.4	12.0	663.9	350.4	1.0	13,085.3
Committed	-	-	-	-	44.0	-	-	-	-	44.0
Proposed	-	-	2,545.0	-	70.0	1,328.0	330.0	7.6	150.0	4,430.6
Withdrawn	540.0	385.0	-	-	-	-	-	-	-	925.0
Publicly announced withdrawals[d]	-	-	-	-	-	-	-	-	-	-

a. Combined-cycle gas turbine.
b. Open-cycle gas turbine.
c. Existing includes withdrawn and publicly announced withdrawals
d. These are withdrawals that have been announced to occur within the next 10 years.

3.2 New South Wales

- Since the 2014 ESOO, the market has announced 2,315 MW of generation capacity withdrawal in New South Wales. This is in addition to 1,000 MW of withdrawal announced for this region before the 2014 ESOO.
- Under the medium scenario, USE in New South Wales could exceed the Reliability Standard from 2022–23, bringing the LRC point forward by at least two years compared to the 2014 ESOO (see Table 11).
- Under the high scenario, the LRC point is observed in 2021–22, bringing the LRC point forward by at least three years compared to the 2014 ESOO.
- This increase in USE is primarily driven by the capacity withdrawal from New South Wales and an increase in maximum demand.
- No LRC point occurs under the low scenario.

Supply adequacy, as shown in Figure 1, is assessed against energy projections and maximum demand, derived from the 2015 NEFR. To show LRC points, the chart compares USE with the Reliability Standard in each region.

Table 11 New South Wales supply-demand outlook summary with annual USE

	Low Scenario		Medium Scenario		High Scenario	
Region	LRC Timing	USE	LRC Timing	USE	LRC Timing	USE
New South Wales	Beyond 2024–25	N/A	2022–23	4,003 MWh 0.0056%	2021–22	1,648 MWh 0.0022%

Generation investment interest in New South Wales is focused on 22 wind generation projects, mainly through the Liverpool Range (864 MW), Uungula (622.5 MW), Rye Park (350 MW), Yass Valley (310 MW), and Sapphire (319 MW) proposals.

Solar generation investment remains strong in New South Wales, with six projects. These include two committed projects:

- Moree (56 MW), to be completed in 2016.
- Broken Hill (53 MW), to be completed in 2015.

Table 12 shows the current capacity of New South Wales' existing and withdrawn generation, and committed and publicly announced projects, by generation type.

Figure 1 New South Wales supply adequacy (Medium scenario)

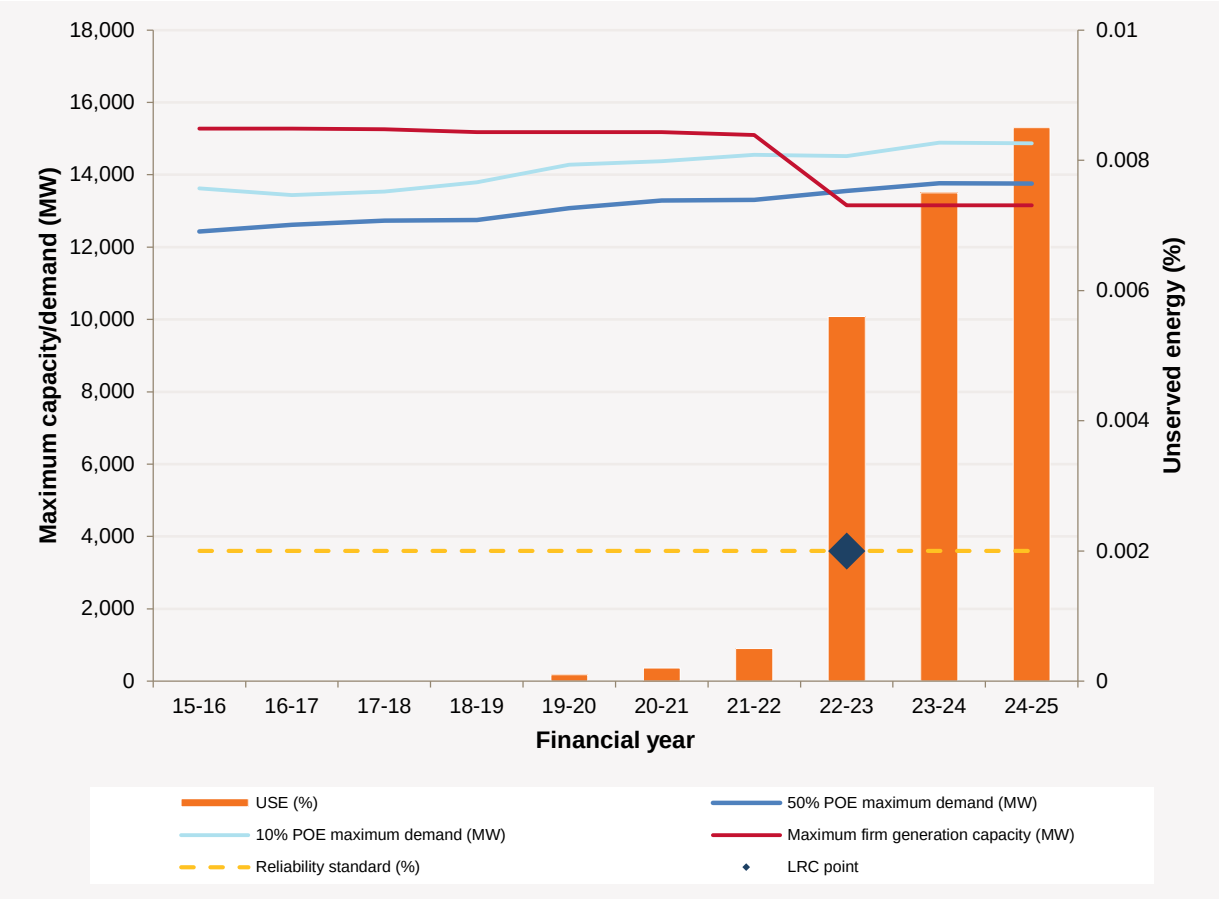


Table 12 New South Wales generation and project capacity by generation type (MW)

Status/Type	Coal	CCGT[a]	OCGT[b]	Gas other	Solar	Wind	Water	Biomass	Other	Total
Existing[c]	11,383.8	598.2	1,530	193.2	122.1	666.0	2,744.7	71.9	38.1	17,348.0
Committed	-	-	-	-	109.0	-	-	-	-	109.0
Proposed	2,000.0	75.0	1,050.0	-	106.6	4,636.4	-	8.0	-	7,876.0
Withdrawn	1,144.0	-	-	-	-	-	-	-	-	1,144.0
Publicly announced withdrawals[d]	2,000.0	171.0	-	-	-	-	-	-	-	2,171.0

a. Combined-cycle gas turbine.
b. Open-cycle gas turbine.
c. Existing includes withdrawn and publicly announced withdrawals
d. These are withdrawals that have been announced to occur within the next 10 years.

3.3 South Australia

- In South Australia, generation capacity reserves are reducing, with about 1,505 MW of withdrawals announced, placing greater reliance on imports from Victoria.
- Under the medium demand scenario, the Reliability Standard may first be breached in 2019−20, at least five years earlier than in the 2014 ESOO (see Table 13).
- An LRC point occurs under the high scenario in 2019–20.
- No LRC points are observed in the outlook period under the low scenario.

A project to increase the capacity of Heywood Interconnector is currently underway. The objective of the project is to increase the capacity of the interconnector from nominal 460 MW to 650 MW in both directions, however the realised capacity may be lower under certain operating conditions.

The set of network limits that will be used to define the capacity of the Heywood Interconnector following the upgrade is currently being developed, and will be available closer to the completion of the upgrade. The 2015 ESOO uses an indicative set of limits to model the post-upgrade capability of the Heywood Interconnector. If the final set of network limits is materially different to the indicative set, then the assumed level of interconnector support Victoria may be able to provide during times of shortfall in South Australia will be affected, as will the USE projections.

Projects proposed by ElectraNet and approved by the AER under the Network Capability Incentive Parameter Action Plan (NCIPAP) have been included in the modelling. When complete, the projects are expected to alleviate constraints on both the Heywood and Murraylink interconnectors, increasing the forecast flow of energy from Victoria to South Australia. This reduces the potential impact of the withdrawal of capacity from South Australian generation.

Table 13 South Australia supply-demand outlook summary with annual USE

	Low Scenario		Medium Scenario		High Scenario	
Region	**LRC Timing**	**USE**	**LRC Timing**	**USE**	**LRC Timing**	**USE**
South Australia	Beyond 2024–25	N/A	2019–20	275 MWh 0.0022%	2019–20	587 MWh 0.0043%

Supply adequacy, as shown in Figure 2, is assessed against energy projections and maximum demand, derived from the 2015 NEFR. To show LRC points, the chart compares USE with the Reliability Standard in each region.

Under the medium demand scenario, the first breach of the Reliability Standard is observed in 2019–20 due to increasing maximum demand. After this point, increasing penetration of rooftop PV reduces the USE expected, improving supply reliability in South Australia. A second breach of the Reliability Standard is observed in 2024–25 as maximum demand continues to increase, concurrently with energy imports from Victoria reducing as that region observes a tightening of supply.

In June 2015, Alinta Energy announced that Northern Power Station would retire by March 2018 at the latest, but not before March 2016. For the ESOO modelling, Northern Power Station was considered to withdraw by summer 2017−18, to test the impact of the 2017−18 summer maximum demand. Alinta Energy's announcement in late July 2015 that Northern Power Station will now retire by March 2017 was too late for inclusion in the ESOO.

Figure 2 South Australia supply adequacy (Medium scenario)

Generation investment interest in South Australia is focused on wind generation, with 15 project proposals. These are dominated by the Ceres (up to 630 MW), Woakwine (400 MW), Palmer (up to 342 MW), and Hornsdale (270 MW) wind farm proposals.

The Port MacDonnell (1 MW) wave energy project is no longer being pursued, following damage to its wave energy converter.

Table 14 shows the current capacity of South Australia's existing and withdrawn generation, and committed and publicly announced projects, by generation type.

Table 14 South Australian generation and project capacity by generation type (MW)

Status/Type	Coal	CCGT[a]	OCGT[b]	Gas other	Solar	Wind	Water	Bio-mass	Geo-thermal	Other	Total
Existing[c]	786.0	662.4	914.8	1,293.4	-	1,472.9	2.5	-	-	133.3	5,265.3
Committed	-	-	-	-	-	-	-	-	-	-	0.0
Proposed	-	150.0	570.0	-	50.0	2,963.0	-	-	510.0	-	4,243.0
Withdrawn	240.0	239.0	-	-	-	-	-	-	-	-	479.0
Publicly announced withdrawals[d]	546.0	-	-	480.0	-	-	-	-	-	-	1,026.0

a. Combined-cycle gas turbine.
b. Open-cycle gas turbine.
c. Existing includes withdrawn and publicly announced withdrawals
d. These are withdrawals that have been announced to occur within the next 10 years.

3.4 Victoria

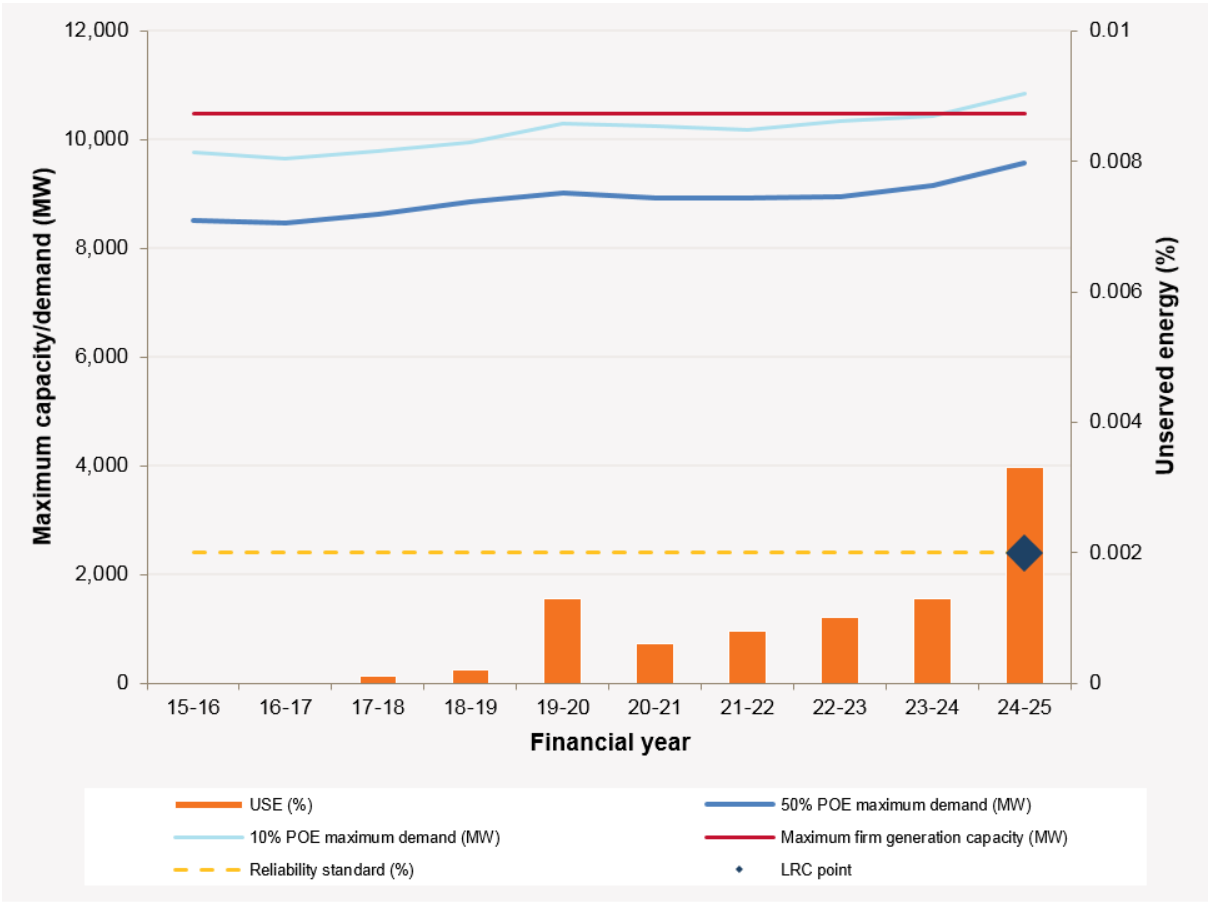
- Under the medium scenario, an LRC point occurs in Victoria in 2024–25 (see Table 15).
- An LRC point is first seen in 2019–20 under the high scenario. Compared to the 2014 ESOO high scenario, this brings the LRC point forward at least three years.
- This change is attributed to an increase in exported energy to support South Australia and New South Wales after significant capacity withdrawal in those regions, and a maximum demand increase in Victoria.
- No LRC point occurs under the low scenario.

Table 15 Victoria supply-demand outlook summary with annual USE

	Low Scenario		Medium Scenario		High Scenario	
Region	LRC Timing	USE	LRC Timing	USE	LRC Timing	USE
Victoria	Beyond 2024–25	N/A	2024–25	1,502 MWh 0.0033%	2019–20	1,360 MWh 0.0029%

Supply adequacy, as shown in Figure 3, is assessed against energy projections and maximum demand, derived from the 2015 NEFR. To show LRC points, the chart compares USE with the Reliability Standard in each region.

Figure 3 Victoria supply adequacy (medium scenario)



Generation investment interest in Victoria is focused on wind generation, with 24 project proposals. These are dominated by the Penshurst (198 MW), Darlington (350 MW), Moorabool (between 214 MW and 342 MW), Dundonnell (312 MW), Willatook (261 MW), and Ararat (240 MW) proposals. The only committed project is Ararat, which is due to be commissioned May 2017. Ararat moved to committed status after 1 July 2015, so was not included in the 2015 ESOO modelling.

Gas-powered generation proposals comprising 1,904 MW, which includes Mortlake Stage 2 (566 MW), Shaw River (500 MW), and Tarrone GT (500-600 MW), are all likely to draw gas from the Otway basin.

Table 16 shows the current capacity of Victoria's existing and withdrawn generation, and committed and publicly announced projects, by generation type.

Table 16 Victorian generation and project capacity by generation type (MW)

Status/Type	Coal	CCGT[a]	OCGT[b]	Gas other	Solar	Wind	Water	Biomass	Other	Total
Existing[c]	6,599.0	21.0	1,903.8	567.9	1.5	1,229.6	2,295.6	0.8	0.8	12,620.0
Committed	-	-	-	-	-	240.0	-	-	-	240.0
Proposed	-	500.0	1,150.0	-	60.0	2,765.2	34.0	-	-	4,509.2
Withdrawn	189.0	-	-	-	-	-	-	-	-	189.0
Publicly Announced Withdrawals[d]	156.0	-	-	-	-	-	-	-	-	156.0

a. Combined-cycle gas turbine.
b. Open-cycle gas turbine.
c. Existing includes withdrawn and publicly announced withdrawals
d. These are withdrawals that have been announced to occur within the next 10 years.

3.5 Tasmania

- Tasmania has sufficient generation capacity.
- No LRC point is observed in any scenario (see Table 17).

Table 17 Tasmania supply-demand outlook summary with annual USE

Region	Low Scenario		Medium Scenario		High Scenario	
	LRC Timing	USE	LRC Timing	USE	LRC Timing	USE
Tasmania	Beyond 2024–25	N/A	Beyond 2024–25	N/A	Beyond 2024–25	N/A

Tasmania's large fleet of hydro generation plant and modest local consumption insulate the region from short-term supply shortfalls. However, Tasmania's capacity for continuous generation may be affected under protracted drought conditions.

ESOO modelling does not account for energy limitations under such conditions. AEMO publishes a quarterly Energy Adequacy Assessment Projection (EAAP)[23] report that provides more relevant information about projected energy limitations and reliability in Tasmania and other NEM regions.

Generation investment interest in Tasmania is focused on wind generation, notably the Cattle Hill (200 MW), Granville Harbour (99 MW) and Low Head (29.7 MW) wind farm proposals. The White Rock and King Island wind farms are no longer being pursued.

Table 18 shows the current capacity of Tasmania's existing and withdrawn generation, and committed and publicly announced projects, by generation type.

[23] AEMO. Energy Adequacy Assessment Projection (EAAP). Available at: http://www.aemo.com.au/AEMO%20Home/Electricity/Resources/Reports%20and%20Documents/EAAP. Viewed 17 June 2014.

Table 18 Tasmanian generation and project capacity by generation type (MW)

Status/Type	Coal	CCGT[a]	OCGT[b]	Gas other	Solar	Wind	Water	Biomass	Other	Total
Existing[c]	-	208.0	178.0	4.9	-	372.8	2,280.8	-	-	3,044.5
Committed	-	-	-	-	-	-	-	-	-	-
Proposed	-	-	-	-	-	328.7	302.0	-	-	630.7
Withdrawn	-	208.0	58.0	-	-	-	-	-	-	266.0
Publicly Announced Withdrawals[d]	-	-	120.0	-	-	-	-	-	-	120.0

a. Combined-cycle gas turbine.
b. Open-cycle gas turbine.
c. Existing includes withdrawn and publicly announced withdrawals
d. These are withdrawals that have been announced to occur within the next 10 years.

CHAPTER 4. LINKS TO SUPPORTING INFORMATION

Table 19 provides links to additional information provided either as part of the 2015 ESOO accompanying information suite, or related AEMO planning information.

Table 19 Links to supporting information

Information Source	Website Address
2015 ESOO Constraints Workbook (Prophet version)	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
2015 ESOO Constraints Workbook (PLEXOS version)	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
2015 ESOO Methodology	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
2015 ESOO supplementary results and data files	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
2015 ESOO time-sequential modelling (Prophet) database	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
2015 National Electricity Forecasting Report	http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report
Archive of previous ESOO reports	http://www.aemo.com.au/Electricity/Planning/Archive-of-previous-Planning-reports
Assessing Reserve Adequacy in the NEM	http://www.aemo.com.au/Electricity/Planning/Related-Information/Assessing-Reserve-Adequacy
Energy Adequacy Assessment Projection (EAAP)	http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/EAAP
Generator Information page	http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information
Historical Market Information page	http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities
Joining the NEM Guide	http://www.aemo.com.au/Electricity/Planning/Archive-of-previous-Planning-reports/Electricity-Statement-of-Opportunities-2011/2011-ESOO-Electronic-Information/~/media/Files/Other/planning/esoo/ESOO2011_CD/documents/Attachment_2%20pdf.ashx
MT PASA	http://www.aemo.com.au/Electricity/Data/Forecast-Supply-and-Demand/Medium-Term-Outlook
Maps and network diagrams	http://www.aemo.com.au/Electricity/Planning/Related-Information/Maps-and-Diagrams
New Investors Guide	http://www.aemo.com.au/Electricity/Planning/Archive-of-previous-Planning-reports/2011-Victorian-Annual-Planning-Report/Appendices

MEASURES AND ABBREVIATIONS

Units of measure

Abbreviation	Unit of measure
GWh	Gigawatt hours
MW	Megawatts
MWh	Megawatt hours

Abbreviations

Abbreviation	Expanded name
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
ESOO	Electricity Statement of Opportunities
LRC	Low Reserve Condition
MD	Maximum Demand
NCIPAP	National Capability Incentive Parameter Action Plan
NEFR	National Electricity Forecasting Report
NEM	National Electricity Market
NSW	New South Wales
POE	Probability of Exceedance
PV	Photovoltaic
QLD	Queensland
Rooftop PV	Rooftop photovoltaic
SA	South Australia
TAS	Tasmania
USE	Unserved energy
VIC	Victoria

GLOSSARY

The 2015 ESOO uses many terms that have meanings defined in the National Electricity Rules (NER). The NER meanings are adopted unless otherwise specified.

Term	Definition
committed projects	Generation that is considered to be proceeding under AEMO's commitment criteria (see Generation Information Page, Table 19).
electrical energy	Average electrical power over a time period, multiplied by the length of the time period.
electrical power	Instantaneous rate at which electrical energy is consumed, generated or transmitted.
generating capacity	Amount of capacity (in megawatts (MW)) available for generation.
generation surplus	When there is more generating capacity than is required to meet the Reliability Standard.
generation unit	Power stations may be broken down into separate components known as generation units, and may be considered separately in terms (for example) of dispatch, withdrawal, and maintenance.
installed capacity	The generating capacity (in megawatts (MW)) of the following (for example): • A single generating unit. • A number of generating units of a particular type or in a particular area. • All of the generating units in a region. Rooftop PV installed capacity is the total amount of cumulative rooftop PV capacity installed at any given time.
Low Reserve Condition (LRC)	When AEMO considers that a region's reserve margin (calculated under 10% Probability of Exceedance (POE) scheduled and semi-scheduled maximum demand (MD) conditions) for the period being assessed is below the Reliability Standard.
maximum demand (MD)	Highest amount of electrical power delivered, or forecast to be delivered, over a defined period (day, week, month, season, or year) either at a connection point, or simultaneously at a defined set of connection points.
mothballed	A generation unit that has been withdrawn from operation but may return to service at some point in the future.
non-scheduled generation	Generation by a generating unit that is not scheduled by AEMO as part of the central dispatch process, and which has been classified as a non-scheduled generating unit in accordance with Chapter 2 of the NER.
operational electrical consumption	The electrical energy supplied by scheduled, semi-scheduled, and significant non-scheduled generating units, less the electrical energy supplied by small non-scheduled generation.
Probability of Exceedance (POE) maximum demand	The probability, as a percentage, that a maximum demand (MD) level will be met or exceeded (for example, due to weather conditions) in a particular period of time. For example, a 10% POE MD for a given season means a 10% probability that the projected MD level will be met or exceeded – in other words, projected MD levels are expected to be met or exceeded, on average, only one year in 10.
Proposed projects	Includes both advanced proposals at an intermediate stage of development, and publicly announced proposals at an early stage of development.
Reliability Standard	The power system reliability benchmark set by the Reliability Panel. The maximum permissible unserved energy (USE), or the maximum allowable level of electricity at risk of not being supplied to consumers, due to insufficient generation, bulk transmission or demand-side participation (DSP) capacity, is 0.002% of the annual energy consumption for the associated region, or regions, per financial year.
scenario	A consistent set of assumptions used to develop forecasts of demand, transmission, and supply.
scheduled generation	Generation by any generating unit that is classified as a scheduled generating unit in accordance with Chapter 2 of the NER.
semi-scheduled generation	Generation by any generating unit that is classified as a semi-scheduled generating unit in accordance with Chapter 2 of the NER.
summer	Unless otherwise specified, refers to the period 1 November – 31 March (for all regions except Tasmania), and 1 December – 28 February (for Tasmania only).
winter	Unless otherwise specified, refers to the period 1 June – 31 August (for all regions).