# ELECTRICITY STATEMENT OF OPPORTUNITIES

For the National Electricity Market

# 2013

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

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## Revision History

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|---|---|---|
| 1 | 13 August 2013 | First issue |
| 2 | 15 August 2013 | Committed wind generation total corrected on page 5 (848 MW to 954.4 MW) |

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# EXECUTIVE SUMMARY

Reduced growth in energy use across the National Electricity Market (NEM) compared to 2012, rising domestic rooftop photovoltaic (PV) generation, increasing consumer response to recent growth in electricity prices, and the development of new large-scale renewable generation is expected to defer new thermal electricity generation investment.

These changes result in all regions except Queensland having adequate generation capacity over the 10-year outlook period.

The 2013 Electricity Statement of Opportunities (ESOO) supports decision-making in the NEM by providing an analysis of opportunities for electricity generation and demand-side investment over a 10-year outlook period under a range of economic scenarios.[1]

ESOO supply–demand modelling assesses the adequacy of existing and committed electricity supply to meet demand in the NEM by identifying Low Reserve Condition (LRC) points. LRC points indicate when additional investment in generation or demand-side participation may be required to maintain electricity supply reliability within the NEM Reliability Standard.[2]

Under a medium economic growth scenario, the 2013 outlook for 2013–14 to 2022–23 projects:

- Reserve deficits in Queensland in 2019–20, bringing the LRC forward by one year compared to the 2012 ESOO.
- No reserve deficits in New South Wales, Victoria, South Australia, or Tasmania until after 2022–23, deferring the LRC by at least one year in those states compared to the 2012 ESOO.

Table E 1 summarises the LRC points and reserve deficits across the three scenarios modelled.

**Table E 1 — LRC points and reserve deficits in each NEM region for each scenario**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| Queensland | Beyond 2022–23 | - | 2019–20 | 159 | 2016–17 | 69 |
| New South Wales | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 53 |
| Victoria | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 123 |
| South Australia | Beyond 2022–23 | - | Beyond 2022–23 | - | 2020–21 | 36 |
| Tasmania | Beyond winter 2023 | - | Beyond winter 2023 | - | Beyond winter 2023 | - |

## Key observations for the 2013 Electricity Statement of Opportunities

The main contributor to the adequacy results shown in Table E 1 is lower projected demand growth than forecast in 2012. Details of these changes were recently published in AEMO's 2013 National Energy Forecasting Report

[1] Table 1 details which scenarios were modelled from the AEMO scenarios. AEMO. 2012 Scenario Descriptions. 4 July 2012. Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/~/media/Files/Other/planning/2012_Scenarios_Descriptions.ashx. Viewed 5 July 2013.

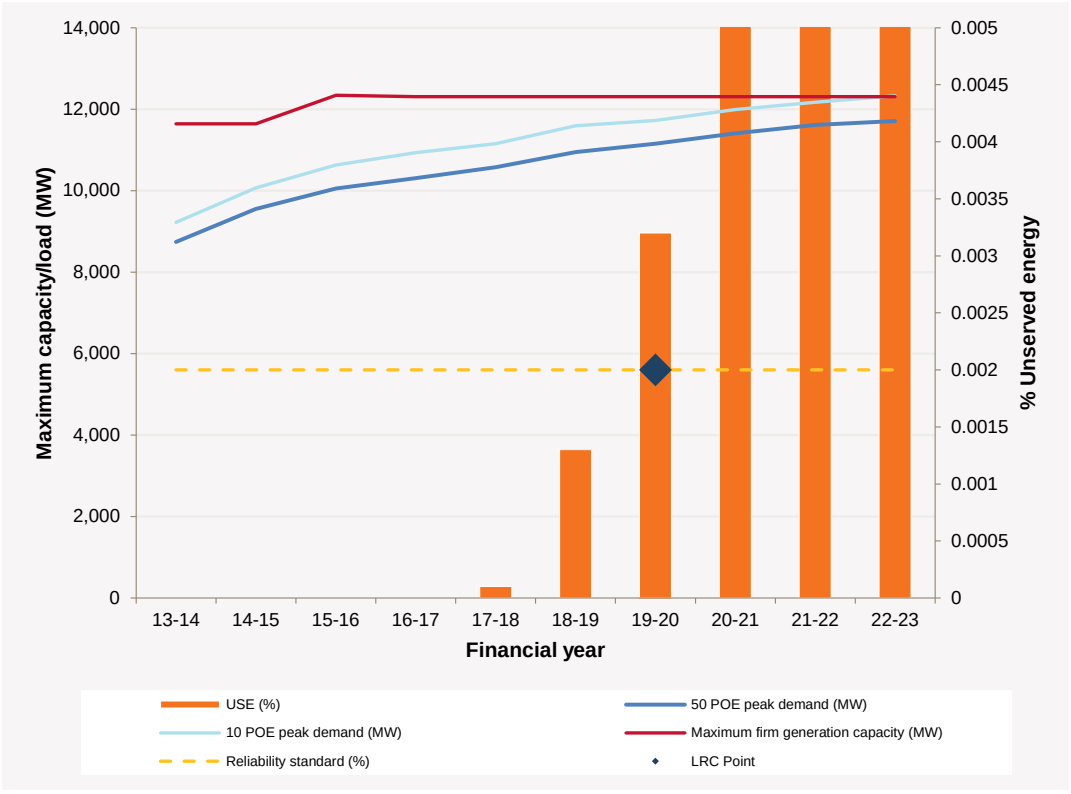
[2] AEMC. Reliability Standards. 1 July 2012. Available: http://www.aemc.gov.au/panels-and-committees/reliability-panel/guidelines-and-standards.html. Viewed 3 July 2013.

(NEFR)[3], and describe a NEM average annual growth rate of 1.3% under the medium economic growth scenario, compared to 1.5% in the 2012 NEFR. Contributing factors include:

- Continued increases in domestic rooftop PV installations incentivised through feed-in tariffs and reduced system installation prices.
- Lower-than-expected growth in most industrial sectors.
- Higher estimated impacts from energy efficiency measures through capture of changes in building standards and regulations.
- Higher estimate of customer response to high price events based on analysis of historical demand-side participation behaviour.[4]

Figure E 1 shows the Queensland supply adequacy for the medium economic growth scenario, identifying the LRC point in 2019–20 mainly due to higher forecast energy consumption in this region. The 2013 NEFR forecasts average annual growth of 3.1% over the 10-year outlook period in Queensland, higher than the 2012 forecast of 2.5%.[5] Queensland is the only region with an LRC point within the ESOO's study horizon.

**Figure E 1 — Queensland supply adequacy[6]**



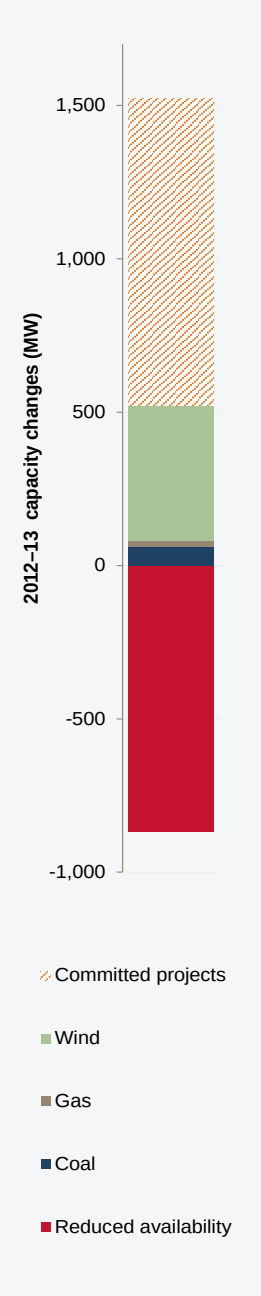

[3] A detailed analysis of demand projection is provided in the 2013 NEFR. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013. Viewed: 2 July 2013.

[4] The DSP forecast provided in the 2013 NEFR Methodology Information Paper is based on improved modelling and understanding of demand-side participation at various price levels and its expected growth over the outlook period. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013/NEFR-Supplementary-Information-2013. Viewed: 31 July 2013.

[5] Queensland demand growth is due to higher large industrial demand and the ramp-up of liquefied natural gas (LNG) projects between 2014 and 2017. For further information refer to the 2013 NEFR. AEMO. 2013 National Electricity Forecasting Report. 28 June 2013. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013. Viewed 2 July 2013.

[6] From 2020–21, unserved energy continues to grow beyond the scale of the chart. The chart has been capped at 0.005% on the secondary axis to preserve the detail of the reliability standard and LRC point.

**Figure E 2 — Generation changes**




## Investment trends

In 2012–13, 522.7 MW of new large-scale generation was added to the NEM's generation capacity.[7] The majority of this new capacity, 439.5 MW, is wind generation from Macarthur Wind Farm (420 MW) and Morton's Lane Wind Farm (19.5 MW), both located in Victoria.

Other generation added to the NEM in 2012–13 includes the Qenos Cogeneration Facility (21 MW) and the Hallam Road Landfill Gas Facility (2.2 MW), both also located in Victoria.

New thermal generation in 2012-13 comprised a 60 MW capacity increase of Unit 4 at New South Wales' Eraring Power Station.

The 1,000 MW in new generation committed[8] since the 2012 ESOO comprises 95% wind generation and 5% solar generation. Six wind farms totalling 954.4 MW – Mount Mercer (Victoria), Boco Rock Stage 1, Gullen Range and Taralga (New South Wales), Snowtown Stage 2 (South Australia), and Musselroe (Tasmania) – are committed with commissioning[9] dates between July 2013 and January 2015, together with an additional 45.5 MW of solar generation at Kogan Creek[10] (Queensland) and the Mildura demonstration plant (Victoria).

Over the same period, 870 MW of Queensland coal-fired generation was placed in either seasonal dry storage or was decommissioned; comprising both Tarong Power Station Units 2 and 4 (700 MW), and Collinsville Power Station (170 MW). This is in addition to the South Australian availability changes of Playford B Power Station and Northern Power Station reported in the 2012 ESOO.

The above capacity changes since the 2012 ESOO are summarised in Figure E 2. See AEMO's generation information webpage[11] for further information.

## Future implications

The NEM generation fleet continues to evolve in response to government renewable energy policies. For example, the Large-scale Renewable Energy Target (LRET) continues to drive the entry of renewable generation capacity. However, demand-driven investment signals for new plant remain muted.

Currently, almost 30,000 MW of publicly-announced new generation capacity is on the investment horizon, including 45% wind, 37% gas and 11% coal-fired generation.

Any changes resulting from the forthcoming 2013 Federal Government election may also impact current energy policy settings and investment drivers. Potential changes may impact the future mix of generation projects, either through changed incentives for withdrawing existing plant, or a reassessment of the timing and/or technology of proposed future projects.

However, any changes are unlikely to have an immediate impact on the ESOO

[7] Rooftop solar PV generation is treated as a demand offset for supply–demand balance, and is not included in this figure. In 2012-13, it is estimated that 774 MW of rooftop PV generation capacity was installed in the NEM. AEMO. 2013 NEFR Methodology Information Paper. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013/NEFR-Supplementary-Information-2013. Viewed: 31 July 2013.

[8] A committed project represents generation that is considered to be proceeding.

[9] A commissioned project can be operated up to its installed capacity.

[10] The 44 MW Kogan Creek capacity is not additional to the 730/744 MW summer/winter capacities of Kogan Creek, rather it is a contribution towards the total generation.

[11] Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information. Viewed: 5 July 2013.

results. AEMO will continue to monitor developments and update the market through its Generator Information page and ESOO Updates.

### Improvements to the 2013 ESOO

The 2013 ESOO incorporates improved supply–demand modelling that uses simulated hourly dispatch. This results in more accurate forecast of reserve deficits, and is more consistent with AEMO's other planning studies.[12]

The 2013 ESOO is accompanied by a suite of supplementary reports and an extensive set of data supporting the 2013 supply–demand outlook, enabled by the improved modelling methodology.[13]

[12] A description of the changes to supply-demand modelling for the assessment of LRC is included in the 2013 Planning Consultation 2013 Modelling Methodology and Assumptions. 12 June 2013. Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/2013-Planning-Assumptions. Viewed: 2 July 2013.

[13] Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities. See also supporting information in Section 5.

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# 1. PURPOSE

The Electricity Statement of Opportunities (ESOO) supports decision-making in the National Electricity Market (NEM) by providing an analysis of opportunities for efficient electricity generation and demand-side investment over a 10-year outlook period under a range of economic growth scenarios. The ESOO facilitates informed policy-making that supports the long-term interests of Australian electricity consumers.

## 1.1 Changes to the 2013 ESOO

The 2013 ESOO incorporates improved supply-demand modelling using simulated hourly dispatch. This results in more accurate forecast of reserve deficits[14] and is more consistent with AEMO's other planning studies.[15] Information is also presented in a more concise format that focuses on the key results.

The 2013 ESOO is accompanied by a suite of supplementary information, some of which was enabled by the improved modelling methodology. This suite includes:

- A data file of additional modelling results for each region.
- The constraint workbook detailing NEM constraint equations included in the modelling.
- The time-sequential model database.
- An updated Generator Information page detailing the results of the 2013 generator survey, and subsequent updates.
- The NEM Historical Market Information report, including an analysis of demand, generation, and inter-regional power flows for the 2012–13 and preceding financial years. It also presents an analysis of the impact of the carbon price on the electricity spot market.
- The ESOO Methodology report detailing the methodology, data files, and data source changes for 2013.

The 2013 National Electricity Forecasting Report (NEFR) details electricity demand forecast information used as an input to the 2013 ESOO.

The table of supporting information in Section 5 provides links to this and other related information. A summary of policy information is also available in the 2013 Power System Adequacy Report.[16]

# 2. SUPPLY ADEQUACY IN THE NEM

This section provides a brief overview of the scenarios modelled, and outlines the key 2013 ESOO supply adequacy results across the NEM.

[14] A reserve deficit is the amount of additional generation capacity required to defer an LRC point by one year.

[15] A description of the changes to supply-demand modelling for the assessment of reserve adequacy is included in the 2013 Planning Assumptions documentation. AEMO. 2013 Modelling Methodology and Assumptions. 12 June 2013. Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/2013-Planning-Assumptions. Viewed 2 July 2013.

[16] Available: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Power-System-Adequacy.

## 2.1 2013 ESOO scenario mapping

The 2013 ESOO modelled three scenarios, which are detailed in Table 1 as follows:

**Table 1 — 2013 ESOO scenario reference table**

| 2013 ESOO and NEFR[a] reference | 2012 AEMO scenario name[b] | Economic growth | Large industrial growth | Carbon emission target | Small non-scheduled generation | Rooftop PV & energy efficiency | Demand-side participation |
|---|---|---|---|---|---|---|---|
| High | Fast World Recovery | High | High | 5% | High uptake | Moderate uptake | Moderate uptake |
| Medium | Planning | Medium | Medium | 5% | Moderate uptake | Moderate uptake | Moderate uptake |
| Low | Slow Growth | Low | Low | 5% | Slow uptake | Moderate uptake | Moderate uptake |

a. See the 2013 NEFR Table 1-1 for details of the correlation between the National electricity forecasting scenarios and the related component forecasts. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013. Viewed: 9 July 2013.

b. See the 2012 Scenario Descriptions document for further information. Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/2013-Planning-Assumptions. Viewed 9 July 2013.

## 2.2 NEM supply adequacy results

Supply–demand modelling in the ESOO assesses the adequacy of existing and committed electricity supply to meet demand in the NEM by identifying Low Reserve Condition (LRC) points. LRC points indicate when additional investment in generation or demand-side response may be required to maintain electricity supply reliability within the NEM Reliability Standard.[17]

Supply adequacy is assessed against a weighted[18] 50% probability of exceedence (POE) and 10% POE maximum demand forecast developed for the 2013 NEFR.

Table 2 summarises the LRC points and reserve deficits across the three scenarios modelled. Under the medium economic growth scenario, the outlook for 2013–14 to 2022–23 projects:

- A reserve deficit of 159 MW in Queensland in 2019–20, bringing the LRC point forward by one year compared to the 2012 ESOO. The change is due to increased forecasts for large industrial demand and improved modelling resolution.[19]
- No reserve deficits in New South Wales, Victoria, South Australia, or Tasmania until after 2022–23. This defers the LRCs in those states compared to the 2012 ESOO.

The delayed need for additional investment to ensure system reliability continues a trend seen in the 2012 ESOO.

[17] AEMC. Reliability Standards. 1 July 2012. Available: http://www.aemc.gov.au/panels-and-committees/reliability-panel/guidelines-and-standards.html. Viewed 3 July 2013.

[18] See the ESOO Methodology document for the weightings used and more information on the modelling detail. Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.

[19] For further information refer to the 2013 NEFR. See footnote 3.

**Table 2 — LRC points and reserve deficits in each NEM region for each scenario**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| Queensland | Beyond 2022–23 | - | 2019–20 | 159 | 2016–17 | 69 |
| New South Wales | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 53 |
| Victoria | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 123 |
| South Australia | Beyond 2022–23 | - | Beyond 2022–23 | - | 2020–21 | 36 |
| Tasmania | Beyond winter 2023 | - | Beyond winter 2023 | - | Beyond winter 2023 | - |

The supply changes detailed in Section 3 had a limited impact on the adequacy calculations. This is because most newly commissioned or committed generation is wind. Wind's intermittent output means that it does not consistently contribute its full capacity towards meeting demand.

The adequacy modelling accounts for the hourly generation output of wind farms, and includes any contributions towards avoiding unserved energy (USE). However, at times of peak demand (when the majority of USE occurs), only a percentage of wind generation is usually available.[20]

Information on projected monthly energy, utilisation of inter-regional support to meet demand, and modelled interconnector flow is available in the regional data files on the ESOO webpage.[21]

Energy industry policy changes resulting from the forthcoming 2013 Federal Government election are unlikely to have an immediate impact on the ESOO's results. AEMO will continue to monitor developments and update the market through its Generator Information page and ESOO Updates.

The following section provides an overview of the impact from demand on the 2013 ESOO adequacy results.

### 2.2.1 Demand drivers

The key driver for deferred reserve deficits in NEM regions other than Queensland is lower projected demand growth than forecast in 2012. Details of these changes were recently published in AEMO's 2013 NEFR, which identifies factors such as:

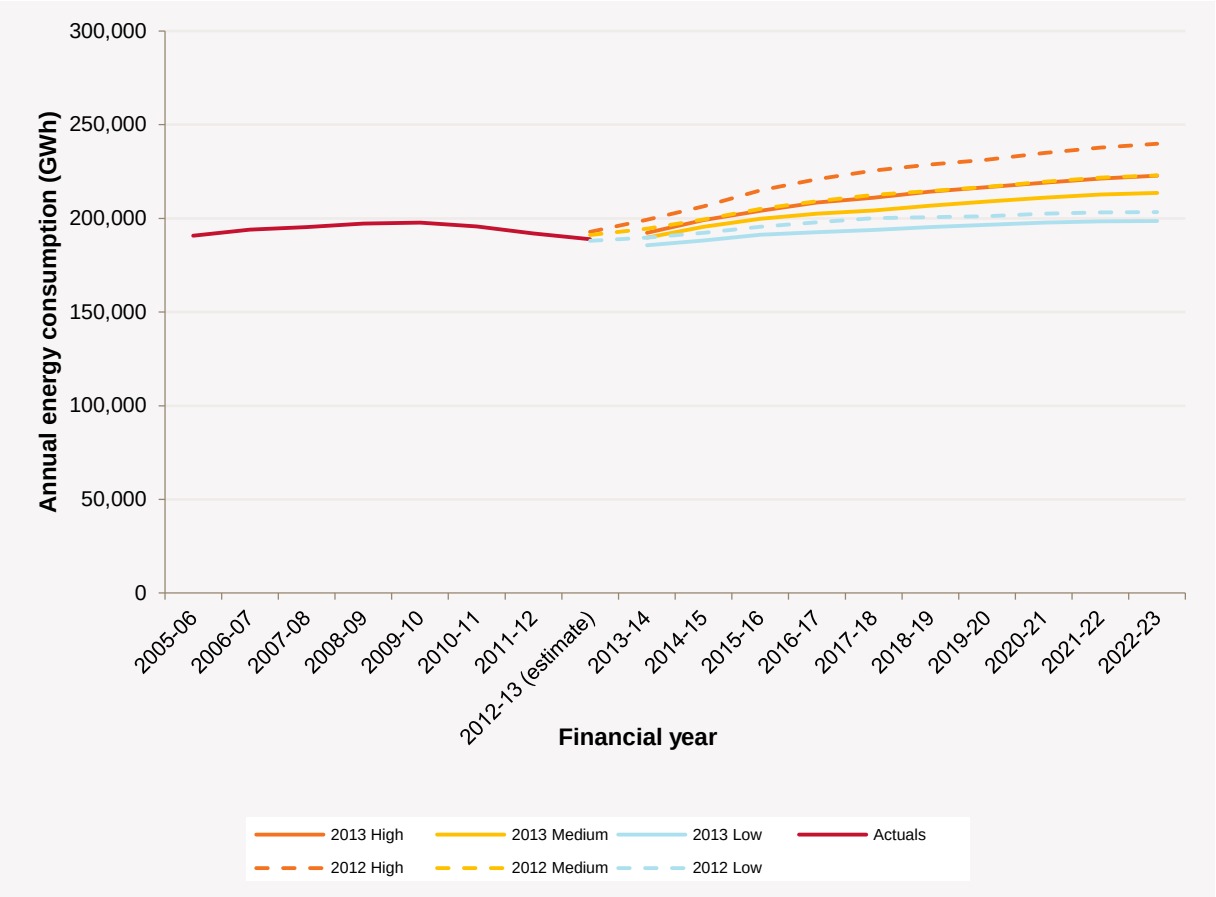
- Continued increases in domestic rooftop PV installations incentivised through feed-in tariffs and reduced system installation prices.
- Lower-than-expected growth in most industrial sectors.
- Higher estimated impact from energy efficiency measures through capture of changes in building standards and regulations.
- Higher estimate of customer response to extreme price events based on analysis of historical demand-side participation behaviour.[22]

In 2012–13, it is estimated that 774 MW of rooftop PV generation capacity was installed in the NEM.[23] Rooftop PV generation is treated as a demand offset for the ESOO's supply adequacy assessment, contributing to the reduction in forecast demand.

[20] For further information on the treatment of wind generation, see Section 3.1.1 of the ESOO Methodology document.
[21] Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.
[22] The DSP forecast provided in the 2013 NEFR Methodology Information Paper is based on improved modelling and understanding of demand-side participation at various price levels and its expected growth over the outlook period. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013/NEFR-Supplementary-Information-2013. Viewed: 31 July 2013.

Figure 1 shows the lower growth projected in the 2013 NEFR annual energy forecasts[24] for the NEM. The average annual growth rate for the 2013 NEFR medium scenario is 1.3% over the 10-year outlook period, compared to 1.5% in the 2012 NEFR.

**Figure 1 — 2013 NEFR annual NEM energy forecast**



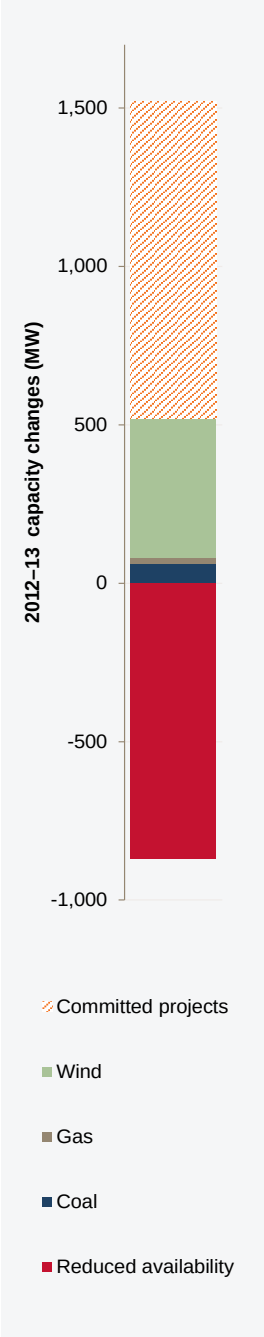

# 3. GENERATION INVESTMENT

Installed capacity[25] in the National Electricity Market (NEM) totals 50,032 MW, and comprises a range of technologies (54% coal, 23% gas, 5% wind, 16% water, 1% other). This total includes the following changes since the 2012 ESOO as shown in Figure 2:

- 522.7 MW of new capacity that has been commissioned.
- 870 MW of coal capacity that has been either placed in seasonal dry storage or decommissioned.
- Smaller revisions to summer, winter, or year-round capacity due to plant maintenance or reassessment of plant capability.

[23] AEMO. 2013 NEFR Methodology Information Paper. Available: http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013/NEFR-Supplementary-Information-2013. Viewed: 31 July 2013.
[24] A detailed analysis of demand projection is provided in the 2013 NEFR. See footnote 3.
[25] Including scheduled, semi-scheduled, and non-scheduled installed capacity.

**Figure 2 — Generation changes**




With the exception of Eraring Power Station's Unit 4 capacity increase (60 MW) in New South Wales, newly commissioned and upgraded generation capacity is composed of renewable and gas generation in Victoria, as follows:

- Macarthur (420 MW) and Morton's Lane wind farms (19.5 MW).
- Qenos Cogeneration Facility (21 MW).
- Addition of two units to the Hallam Road Landfill Gas Facility (2.2 MW).

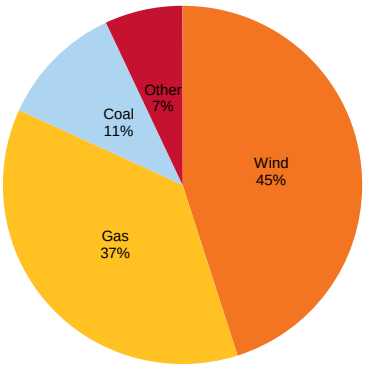
In addition to these changes in existing capacity, 1,000 MW became committed, with expected commissioning dates between July 2013 and January 2015. This capacity includes:

- 45.5 MW of solar generation comprising
  - Kogan Creek in Queensland (44 MW[26]).
  - Mildura demonstration plant in Victoria (1.5 MW).
- 954.4 MW of wind generation comprising:
  - Gullen Range Wind Farm in New South Wales (165.5 MW).
  - Mt Mercer Wind Farm in Victoria (131.2 MW).
  - Snowtown Stage 2 in South Australia (270 MW).
  - Musselroe Wind Farm in Tasmania (168 MW).
  - Stage 1 of Boco Rock Wind Farm[27] in New South Wales (113 MW).
  - Taralga Wind Farm in New South Wales (106.7 MW).

The NEM generation fleet continues to evolve in light of government renewable energy policies, including the LRET, which continues to drive the entry of renewable generation capacity.

AEMO is tracking 29,521 MW of proposed new generation capacity. As shown in Figure 3, this includes 45% (13,430 MW) of wind, 37% (10,815 MW) gas and 11% (3,270 MW) coal. Any changes resulting from the forthcoming 2013 Federal Government election may impact current energy policy settings and investment drivers. Potential changes may impact the future mix of generation projects, either through changed incentives for withdrawing existing plant, or a reassessment of the timing and/or technology of proposed future projects.

**Figure 3 — Proposed generation**




Any changes to the carbon policy are not expected to affect the adequacy results for the 2013 ESOO. Changes to generation capacity that might affect the results will be addressed through an ESOO Update if necessary.

[26] The 44 MW Kogan Creek capacity is not additional to the 730/744 MW summer/winter capacities of Kogan Creek, rather it is a contribution towards the total generation.

[27] This wind farm was committed after finalisation of the generation information pages released in June 2013 and prior to commencement of the ESOO modelling. AEMO has used the revised capacity advised by Continental Wind Partners (113 MW) in the ESOO adequacy modelling, with the previously advised commissioning and energisation dates, which have since been updated in the August Generation Information page updates.

The following section provides a detailed list of generation changes in the NEM.

## 3.1 List of NEM generation capacity changes

This section provides further detail on capacity changes resulting from mothballing and other capacity re-assessments.

In 2012–13, 870 MW of coal-fired generation was either placed in seasonal dry storage or decommissioned including:

- Tarong Power Station in Queensland reduced its available capacity from 1,400 MW to 700 MW in summer and winter due to the withdrawal from service of Unit 2 in October 2012 and Unit 4 in December 2012, both for a period of at least two years or until wholesale electricity demand improves.
- Collinsville Power Station (170 MW) has withdrawn all generation units from 31 December 2012. The plant was deregistered on 1 January 2013.

This adds to South Australian availability changes of Playford B Power Station and Northern Power Station reported in the 2012 ESOO.

Revisions to summer, winter, or year-round capacity due to plant maintenance or reassessment of plant capability are detailed in Table 3.

**Table 3 — Minor revisions to generation capacity since the 2012 ESOO**

| Generator | Region | Capacity change (MW) | Reason |
|---|---|---|---|
| Hallet 4 North Brown Hill Wind Farm | South Australia | +17.3 | Revised rating of generation units. |
| Hallet Stage 1 Brown Hill Wind Farm | South Australia | +12.4 | Revised rating of generation units. |
| Braemar Power Station | Queensland | +30 | Use of evaporative cooling and peak firing of the units. |
| Darling Downs Power Station | Queensland | -25 | Reflecting capability at higher temperatures. |
| Milmerran Power Station | Queensland | -96 | Operating experience on higher temperature days. |
| Liddell Power Station | New South Wales | -40 | Reassessment of plant capacity. |
| Poatina Power Station | Tasmania | +42 | Consistency with Medium-term Projected Assessment of System Adequacy (MT PASA) values rather than registered nameplate capacity. |
| Morwell Power Station | Victoria | -29 | Unit operation and maintenance. Unit 3 is available on a 30-day recall. |

# 4. REGIONAL OUTLOOK

This section provides a supply adequacy overview for each NEM region. Each region's supply–demand outlook and any low reserve condition (LRC) points are represented as a graph of supply adequacy trends. The supply adequacy graphs summarise AEMO's market simulation modelling results, showing the timing and quantity of any unserved energy (USE) over the outlook period.

Supply adequacy is assessed against energy projections and weighted[28] 50% probability of exceedance (POE) and 10% POE maximum demand, derived from the 2013 National Electricity Forecasting Report (NEFR). To show LRC points, the charts compare simulated USE with the Reliability Standard[29] in each region.

Many of the charts in the 2013 ESOO do not show an LRC point as there is enough surplus generation capacity in the NEM and only modest projected demand growth under the medium economic growth scenario.

For details on the Reliability Standard, or how to interpret the ESOO adequacy chart, see Section 1.5.1 in the 2013 ESOO Methodology document.[30] Workbooks containing each region's generation (to meet monthly energy and weighted maximum demand) and interconnector flow simulation results are available from AEMO's website.[31]

## 4.1 Queensland

As shown in Table 4, under the medium economic growth scenario, USE in Queensland exceeds the Reliability Standard from 2019–20, bringing the LRC point forward by one year compared to the 2012 ESOO. This change can be attributed to:

- Higher resolution modelling used in 2013 that has enabled consideration of a larger range of system conditions and network limitations compared to the 2012 ESOO, which only considered periods of maximum demand.
- Increased large industrial demand forecasts in Queensland from liquefied natural gas (LNG) projects, smelters, and mining loads.

The shortfall may be deferred for one year with an additional 159 MW of scheduled generation capacity or demand-side investment. USE grows quickly towards the end of the simulation horizon as maximum demand approaches available generation capacity. Simulated interconnector flows show Queensland becoming increasingly reliant on generation in New South Wales, and it is expected to become a net energy importer over the 10-year outlook period.[32] The 2013 Power Systems Adequacy report summarises the high-level trends of interconnector constraint equation behaviour in the last two years.

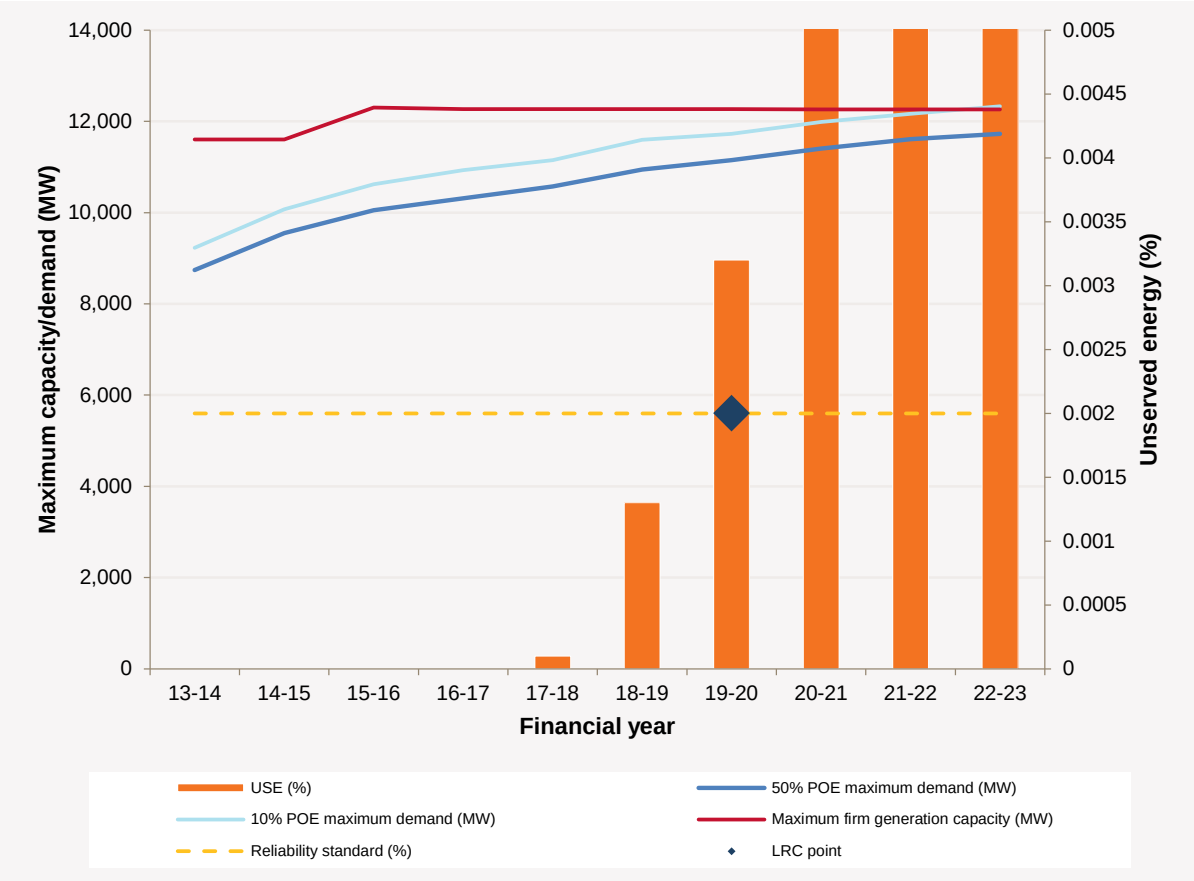
The high economic growth scenario advances the LRC point by a further three years to 2016–17. No LRC occurs under the low economic growth scenario.

**Table 4 — Queensland supply–demand outlook summary**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| Queensland | Beyond 2022–23 | - | 2019–20 | 159 | 2016–17 | 69 |

[28] See footnote 18.
[29] AEMC. Reliability Standards. 1 July 2012. Available: http://www.aemc.gov.au/panels-and-committees/reliability-panel/guidelines-and-standards.html. Viewed 3 July 2013.
[30] Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.
[31] Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.
[32] AEMO. 2013 Power System Adequacy report. Available: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Power-System-Adequacy.

### Figure 4 — Queensland supply adequacy[33]




Generation investment interest in Queensland is focused on gas generation to meet peak demand, dominated by the Aldoga and Blackstone Power Station proposals under consideration by EnergyAustralia in Gladstone and Ipswich respectively, and projects under consideration by ERM Power at Braemar.

Interest in wind generation is also high, with almost 1,900 MW of capacity proposed over 10 projects. Construction of the Solar Boost project at Kogan Creek is underway, where a solar thermal system contributing 44 MW towards the total generation of the coal-fired plant is due to be completed in 2014.

Table 5 shows the current capacity of existing, committed and publicly announced projects.

### Table 5 — Queensland potential new developments by generation type (MW)

| Project/generation type | Coal | CCGT[a] | OCGT[b] | Gas other (including biogas) | Solar | Wind | Water | Other |
|---|---|---|---|---|---|---|---|---|
| Existing | 8,406 | 1,627 | 1,857 | 171 | 0.4 | 12 | 664 | 356 |
| Committed | - | - | - | - | 44 | - | - | - |
| Publicly announced | - | - | 5,605 | - | - | 1,889 | - | 108 |

a. Combined-cycle gas turbine.
b. Open cycle gas turbine.

[33] From 2020–21, USE continues to grow beyond the scale of the chart. The chart has been capped at 0.005% on the secondary axis to preserve the detail of the Reliability Standard and LRC point.

## 4.2 New South Wales

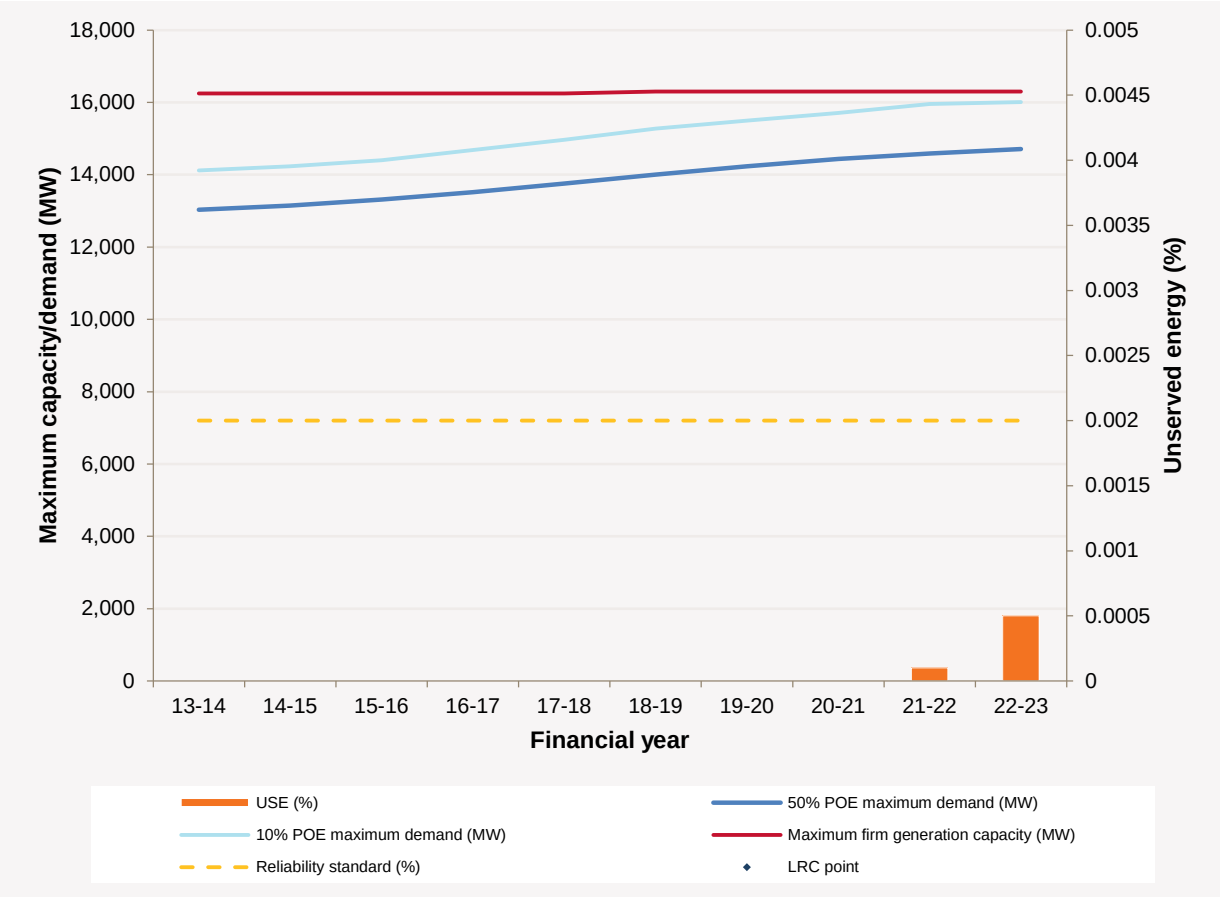
In the medium economic growth scenario shown in Figure 5, no LRC point is observed within the simulation horizon as USE remains within the Reliability Standard. Enough surplus generation exists in New South Wales to meet growing local demand and increasing simulated support for demand in Queensland.

Table 6 shows that in the high economic growth scenario, an LRC point occurs in 2021–22, which is at least a year earlier compared to the 2012 ESOO despite lower projected demand. The change in LRC reflects the larger range of network limitations considered for the 2013 ESOO modelling compared to 2012. No LRC occurs under the low economic growth scenario.

**Table 6 — New South Wales supply–demand outlook summary**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| New South Wales | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 53 |

**Figure 5 — New South Wales supply adequacy**




Generation investment interest in New South Wales is focused on wind generation, with 27 projects, dominated by the Liverpool Range, Yass Valley, Rye Park and Sapphire proposals. The Gullen Range (166 MW), Boco Rock stage 1 (113 MW) and Taralga (107 MW) wind generation projects were recently committed.

Eight proposals for gas-fired peaking generation and two coal-fired proposals totalling 5,330 MW comprise the majority of proposed new scheduled generation. Approximately 210 MW of proposed gas-fired generation is dependent on coal seam methane developments near Narrabri.[34]

Interest in solar generation investment continues to be strong in New South Wales, with eight projects proposed, including the Solar Flagships Program funded Nyngan and Broken Hill projects (159 MW combined).

Table 7 shows the current capacity of existing, committed and publicly announced projects.

**Table 7 — New South Wales potential new developments by generation type (MW)**

| Project/generation type | Coal | CCGT | OCGT | Gas other (including biogas) | Solar | Wind | Water | Other |
|---|---|---|---|---|---|---|---|---|
| Existing | 11,384 | 598 | 1,530 | 197 | - | 281 | 2,744 | 102 |
| Committed | - | - | - | - | 0.1 | 385 | - | - |
| Publicly announced | 2,700 | 210 | 2,630 | 15 | 479 | 4,653 | - | 6 |

## 4.3 Victoria

Figure 6 shows Victorian supply adequacy under the medium economic growth scenario. No LRC point is observed within the simulation horizon, despite 10% POE maximum demand exceeding local generation capacity in 2018–19[35], as USE remains within the Reliability Standard.

Victoria's robust interconnection with neighbouring regions reduces the likelihood of network limitations leading to USE. Under simulated conditions Victoria is a net exporter, more frequently providing support for demand in New South Wales and South Australia, also using generation capacity in Tasmania to ensure reliable local supply.

Table 8 shows that in the high economic growth scenario, there is a LRC point in Victoria in 2021–22. This is six years later than forecast in the 2012 ESOO, reflecting lower projected demand growth and more detailed modelling of the relationship between USE and the Reliability Standard. No LRC occurs under the low economic growth scenario.

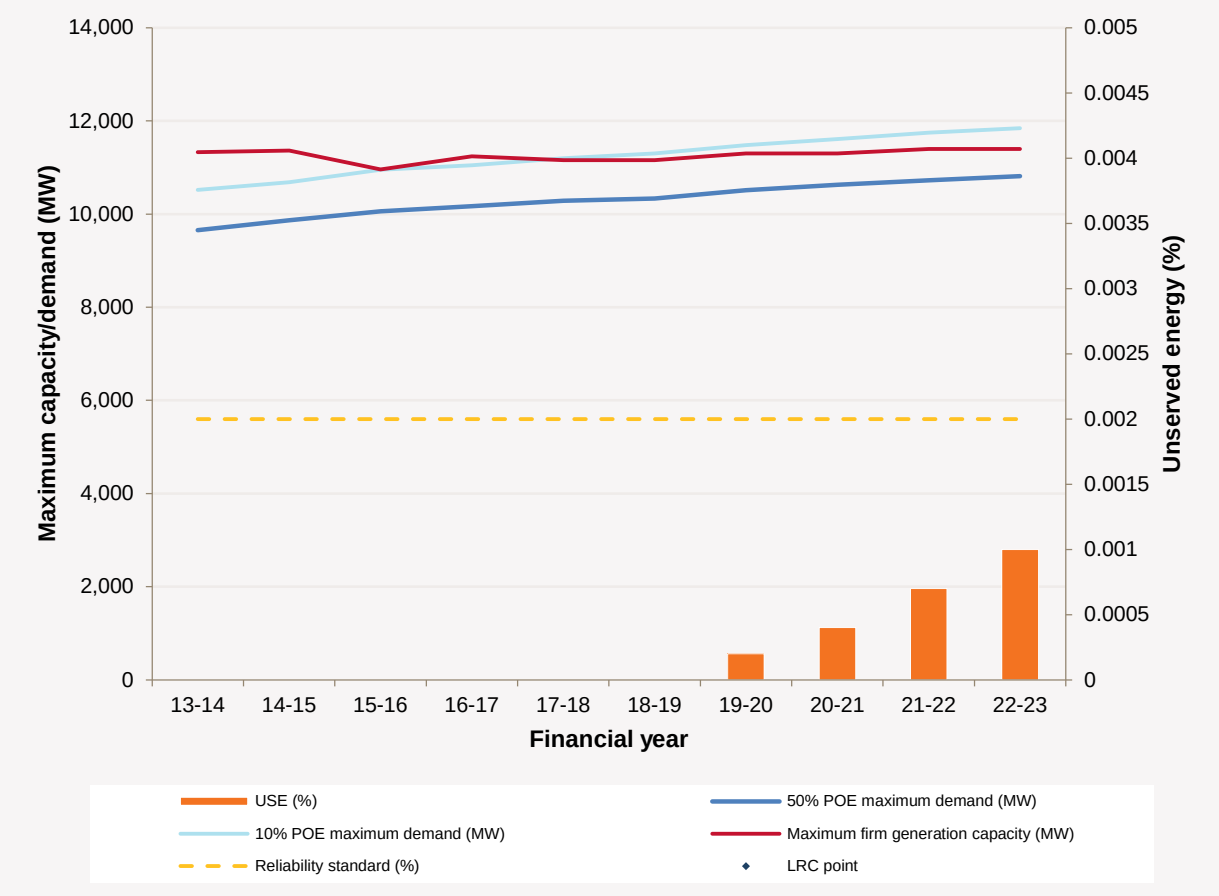
**Table 8 — Victoria supply–demand outlook summary**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| Victoria | Beyond 2022–23 | - | Beyond 2022–23 | - | 2021–22 | 123 |

[34] East Coast Power Pty Ltd have proposed two CCGT projects, Narribri 1 and Narrabri 2 (30 MW and 180 MW proposed nameplate capacity respectively).

[35] The maximum firm generation capacity shown in the supply adequacy charts reflects the installed capacity taking into account only the wind contribution to peak demand percentage of installed wind capacity. For further information on the treatment of wind in the ESOO, see the ESOO methodology document. Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.

**Figure 6 — Victoria supply adequacy**




Generation investment interest in Victoria is focused on wind generation, with 28 projects announced. These are dominated by the Penshurst, Darlington, Dundonnell, Willatook and Ararat proposals. The Mount Mercer wind generation project (131 MW) was recently committed, due for commissioning in 2015.

Gas-fired generation proposals comprising approximately 1,600 MW are located west of Melbourne, and intend to draw gas from the Otway basin.

Table 9 shows the current capacity of existing, committed and publicly announced projects.

**Table 9 — Victorian potential new developments by generation type (MW)**

| Project/generation type | Coal | CCGT | OCGT | Water | Solar | Wind | Gas other (including biogas) |
|---|---|---|---|---|---|---|---|
| Existing | 6,599 | 21 | 1,904 | 2,296 | - | 939 | 562 |
| Committed | - | - | - | - | 1.5 | 131 | - |
| Publicly announced | - | 500 | 1,150 | 36 | 130 | 3,451 | - |

## 4.4 South Australia

Under the medium economic growth scenario shown in Figure 7 no LRC point is observed within the simulation horizon despite 10% POE maximum demand presently exceeding local firm generation capacity. USE remains within the Reliability Standard.

Due to its high penetration of wind generation, South Australia is sensitive to correlations between wind generation and demand. The visible quantity of USE in 2017–18 is associated with times of correlated high demand and low wind availability that do not occur in adjacent years, due to the way in which the model matches weekday, weekend and holiday demand periods with wind availability. The chart shows that with high wind penetration, uncertainty in the wind resource can result in a higher impact on supply than growth in demand.

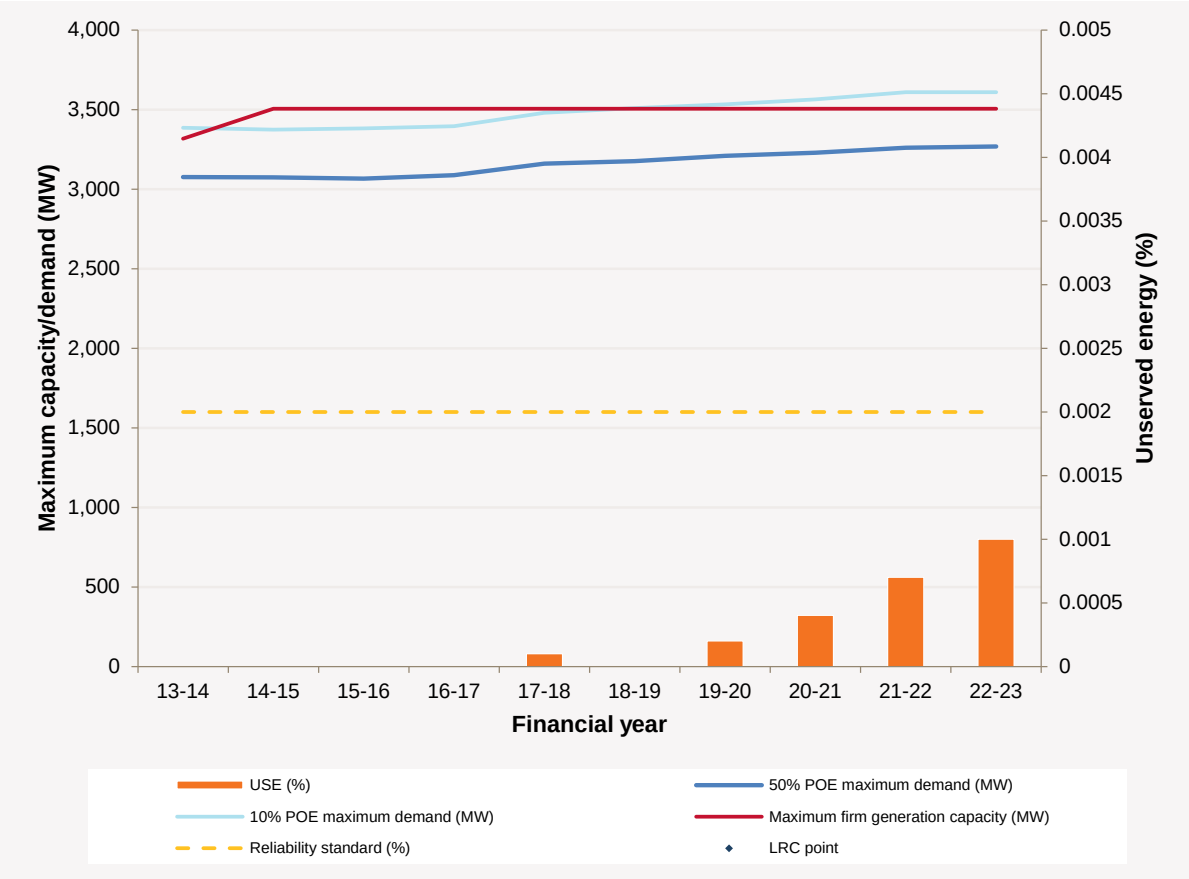
South Australia relies heavily on wind generation, which has an historical summer contribution to peak demand of 8.6% of installed capacity; this is reflected in the maximum firm generation capacity line shown in Figure 7. Installed capacity is significantly higher than the firm capacity shown in Figure 7, and South Australia is able to rely on generation in Victoria to meet demand at times of reduced output from local wind resources.

Table 10 shows that in the high economic growth scenario, an LRC point occurs in 2020–21. This is six years later than forecast in the 2012 ESOO, reflecting lower projected demand growth and a more detailed representation of the relationship between USE and the Reliability Standard afforded by improved modelling techniques. No LRC occurs under the low economic growth scenario.

**Table 10 — South Australia supply–demand outlook summary**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| South Australia | Beyond 2022–23 | - | Beyond 2022–23 | - | 2020–21 | 36 |

**Figure 7 — South Australia supply adequacy**




Generation investment interest in South Australia is focused on wind generation, with 16 projects announced. These are dominated by the Ceres, Woakwine and Hornsdale proposals. The Snowtown Stage 2 project (270 MW) was recently committed.

Table 11 shows the current capacity of existing, committed and publicly announced projects.

**Table 11 — South Australian potential new developments by generation type (MW)**

| Project/generation type | Coal | CCGT | OCGT | Gas other (including biogas) | Geothermal | Solar | Wind | Water | Other |
|---|---|---|---|---|---|---|---|---|---|
| Existing | 770 | 658 | 915 | 1,293 | - | - | 1,203 | 2.5 | 133.3 |
| Committed | - | - | - | - | - | - | 270 | - | - |
| Publicly announced | 570 | 150 | 570 | - | 544 | 90 | 2,717 | - | 10 |

## 4.5 Tasmania

Tasmania has considerable surplus generation capacity and, as Table 12 shows, no LRC point is observed in any simulated economic growth scenario. Tasmania's winter outlook is included because the maximum demand occurs during winter. For this reason, and because there is minimal USE over the 10-year outlook period, the Tasmanian adequacy chart has not been included.

**Table 12 — Tasmania supply–demand outlook summary**

| Region | Low | | Medium | | High | |
|---|---|---|---|---|---|---|
| | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) | LRC point | Reserve deficit (MW) |
| Tasmania | Beyond winter 2023 | - | Beyond winter 2023 | - | Beyond winter 2023 | - |

Figure 8 shows the Tasmanian monthly energy generation required to meet demand, highlighting the region's reliance on hydro generation, and the support that Tasmania provides to Victoria.

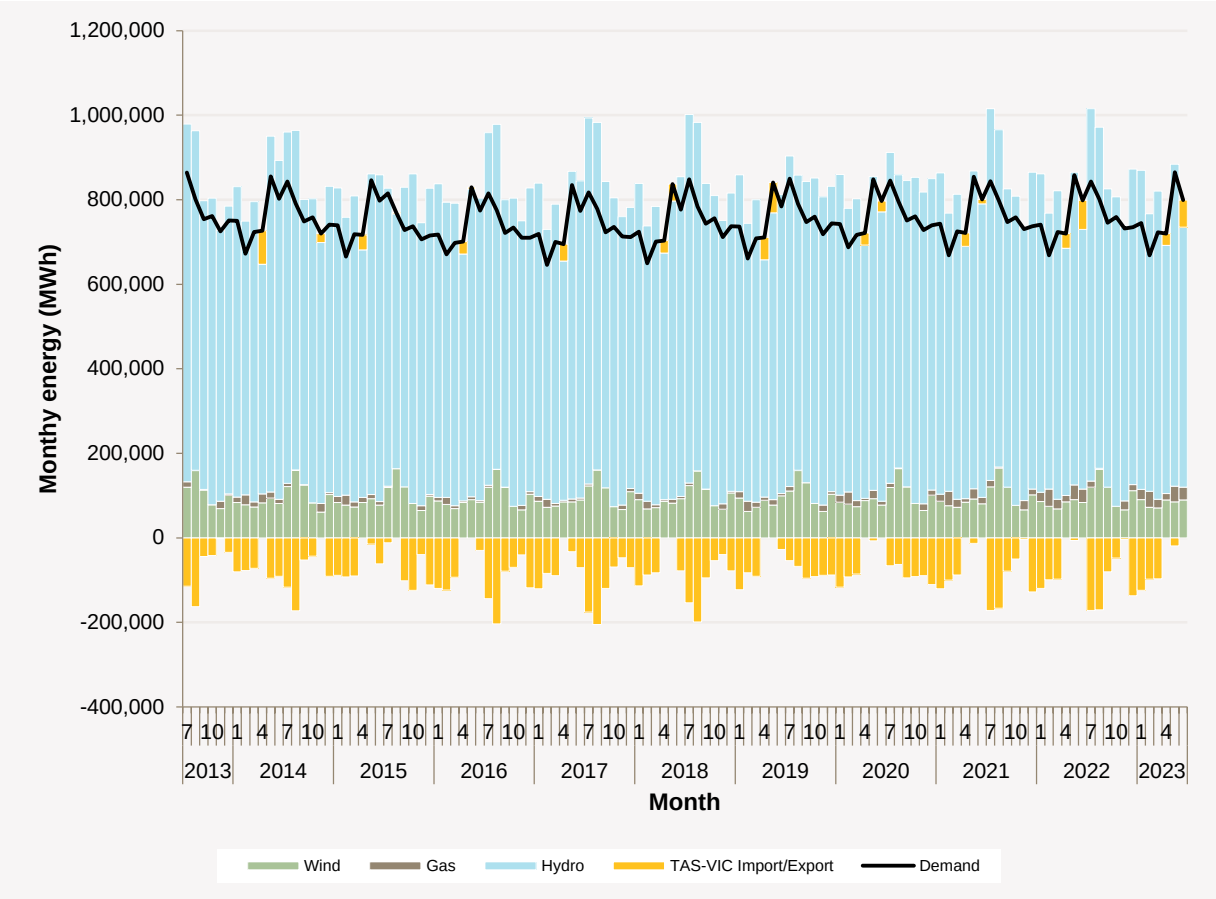
Tasmania's large fleet of hydro generation and modest local demand insulate the region from short-term supply shortfall. However, Tasmania's capability for continuous generation may be affected under protracted drought conditions. The modelling performed for the ESOO does not account for the energy limitations under such conditions. Hydro Tasmania forecasts annual inflows at an equivalent generation volume of 8,700 GWh.[36] This compares to a simulated average annual hydro energy generation in Tasmania of 8,593 GWh over the 10-year outlook period, which is dependent on water availability.

AEMO publishes a quarterly EAAP[37] report that provides more relevant information about projected energy limitations and reliability in the Tasmanian and other regions.

[36] Hydro Tasmania Annual Report 2012. Pg 119. Available: http://www.hydro.com.au/system/files/documents/Hydro-AR-2012-Full-Report.pdf. Viewed: 31 July 2013.

[37] AEMO. "Energy Adequacy Assessment Projection (EAAP)". Available http://www.aemo.com.au/AEMO%20Home/Electricity/Resources/Reports%20and%20Documents/EAAP.

**Figure 8 — Tasmanian monthly energy generation**




Generation investment interest in Tasmania is focused on wind generation, with four projects announced, dominated by the White Rock (450 MW) and Cattle Hill (240 MW) proposals. Construction was recently completed on the 168 MW Musselroe Wind Farm.

Table 13 shows the current capacity of existing, committed and publicly announced projects.

**Table 13 — Tasmanian potential new developments by generation type (MW)**

| Project/generation type | Biomass | CCGT | OCGT | Gas other (including biogas) | Water | Wind |
|---|---|---|---|---|---|---|
| Existing | - | 208 | 178 | 5 | 2,281 | 140 |
| Committed | - | - | - | - | - | 168 |
| Publicly announced | 273 | - | - | - | 302 | 720 |

# 5. LINKS TO SUPPORTING INFORMATION

Table 14 provides links to additional information provided either as part of the 2013 ESOO accompanying information suite, or other related AEMO planning information.

**Table 14 — Links to supporting information**

| Information Source | Website Address |
|---|---|
| 2013 ESOO Constraints Workbook | http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities |
| 2013 ESOO Glossary, Acronyms and List of Company Names | http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities |
| 2013 ESOO Methodology document | http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities |
| 2013 ESOO supplementary results and data files | http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities |
| 2013 ESOO time-sequential modelling (Prophet) database | http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities |
| 2013 National Electricity Forecasting Report | http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013 |
| 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 |
| Introduction to the Australian NEM | http://www.aemo.com.au/~/media/Files/Other/corporate/0000-0262%20pdf.ashx |
| 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 investor's guide | http://www.aemo.com.au/Electricity/Planning/Archive-of-previous-Planning-reports/2011-Victorian-Annual-Planning-Report/Appendices |
| Planning Assumptions (including information on modelling inputs) | http://www.aemo.com.au/Electricity/Planning/Related-Information/2013-Planning-Assumptions |
| Power System Adequacy – Two Year Outlook | http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/Power-System-Adequacy |
| Scenario descriptions | http://www.aemo.com.au/Electricity/Planning/Related-Information/~/media/Files/Other/planning/2012_Scenarios_Descriptions.ashx |

# IMPORTANT NOTICE

## Purpose

The purpose of this publication is to provide technical, market data and information regarding opportunities in the National Electricity Market.

AEMO publishes the Electricity Statement of Opportunities in accordance with clause 3.13.3(q) of the National Electricity Rules (Rules). This publication has been prepared by AEMO using information available at 7 June 2013, unless otherwise specified. Information made available after 7 June 2013 may have been included in this publication where practical.

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## Acknowledgement

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

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# APPENDIX A - ESOO COMPONENT GUIDE

This appendix is designed to assist readers to find information, given that some information previously included in the ESOO is now published in the suite of ESOO support documents or in related AEMO planning reports.

Table A - 1 lists the information that AEMO is obliged to provide under the National Electricity Rules (NER)[38], and states where that content is located.

**Table A - 1 — ESOO checklist of compliance clauses**

| Clause | Summary of requirements | Where to find this information |
|---|---|---|
| NER, Chapter 3, Section 3.13.3(q) | By August in each year, AEMO must prepare and publish at a reasonable charge to cover the cost of production, a statement of opportunities, including at least the following information for the subsequent 10 year period: | |
| | (1) projections of aggregate MW demand and energy requirements for each region. | 2013 National Electricity Forecasting Report.[a]<br>2013 ESOO Generation Adequacy (Section 2) and Regional Outlook (Section 4). |
| | (2) generating capabilities of existing generating units and generating units for which formal commitments have been made for construction or installation. | Generation Information pages.[b] |
| | (3) planned plant retirements. | Generation Information pages[b] and ESOO Generation Investment (Section 3). |
| | (4) a summary of network capabilities and constraints based upon Transmission Annual Planning Reports; and | Constraint Workbook.[c] |
| | (5) operational and economic information about the market to assist planning by:<br>(i) Scheduled Generators, Semi-scheduled Generators and Market Participants; and<br>(ii) potential Scheduled Generators, Semi-scheduled Generators and Market Participants. | 2013 National Electricity Forecasting Report.[a]<br>NEM Historical Market Information report.[d] |

a. AEMO. http://www.aemo.com.au/Electricity/Planning/Forecasting/National-Electricity-Forecasting-Report-2013. Viewed 10 July 2013.

b. AEMO. Available: http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information. Viewed 10 July 2013.

c. AEMO. Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.

d. AEMO. Available: http://www.aemo.com.au/Electricity/Planning/Electricity-Statement-of-Opportunities.

[38] AEMC. Available: http://www.aemc.gov.au/Electricity/National-Electricity-Rules/Current-Rules.html. Viewed 10 July 2013.