Energy Adequacy Assessment Projection

May 2018

Important notice

PURPOSE

AEMO publishes the Energy Adequacy Assessment Projection in accordance with rule 3.7C of the National Electricity Rules.

This publication has been prepared using information and forecasts available to AEMO at 6 April 2018 unless otherwise indicated.

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VERSION CONTROL

Version	Release date	Changes
1	31/5/2018	

Executive summary

The Energy Adequacy Assessment Projection (EAAP) quantifies the impact of potential energy constraints on expected levels of unserved energy (USE) in the National Electricity Market (NEM) over a two-year outlook period.

Potential energy constraints include, but are not limited to, water available for hydro generation and as cooling water for thermal generation during drought conditions, and constraints on fuel supply for thermal generation.

For water availability, the EAAP considers a range of rainfall scenarios which are specified in the EAAP Guidelines[1]:

The NEM reliability standard specifies that the level of expected USE, in megawatt hours (MWh), should not exceed 0.002% of consumption per region, in any financial year.

- Low rainfall – based on rainfall conditions between 1 July 2006 and 30 June 2007 for all regions except New South Wales. New South Wales is based on rainfall conditions between 1 June 2006 and 31 May 2007. Two low rainfall scenarios were modelled: with and without availability of cooling water from drought reserves.
- Short-term average rainfall – based on the average rainfall recorded over the past 10 years.
- Long-term average rainfall – based on the average rainfall recorded over the past 50 years, or the longest period for which rainfall data is available if this is less than 50 years (depending on the data available to participants).

This May 2018 EAAP highlights:

- There is a risk of supply interruption in New South Wales, South Australia and Victoria over the next two years, mainly during peak summer periods, although the annual expected level of unserved energy is below the reliability standard.
- This risk exists irrespective of the rainfall scenario, and is primarily driven by increased vulnerability to other climatic events such as extended periods of high temperature, corresponding with low wind or solar availability and unplanned generation outages.
- However, under low rainfall conditions, if sufficient cooling water for Latrobe Valley generators cannot be accessed from the drought reserve, the forecast expected unserved energy level in Victoria in 2019-20 increases and is close to exceeding the reliability standard:
  - The generator limitations in the low rainfall scenarios are based on current bulk water allocations. There is additional water available in a drought reserve (Blue Rock Lake[2]) that could potentially be made available to mitigate water shortages for brown coal generators that may occur during consecutive years of extreme drought.
- Limitations supplied by thermal generators related to fuel supply have no impact on the level of USE observed in any region. Fuel limits are generally submitted for longer periods, such as annual or quarterly limits, and provide sufficient flexibility to allow generators to have fuel available at times of tight supply-demand balance.

[1] Available at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Energy-Adequacy-Assessment-Projection.

[2] See Southern Rural Water's "Water Plan 3 for 2013-2018", available at: http://www.srw.com.au/files/General_publications/WP3_Final.pdf. Viewed on 22 May 2018.

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1. Introduction

1.1 Purpose and scope

The Energy Adequacy Assessment Projection (EAAP) report is an assessment that forecasts the impact of potential energy constraints on supply adequacy in the National Electricity Market (NEM) across a two-year outlook period.

Potential energy constraints include, but are not limited to, water available for hydro generation and as cooling water for thermal generation during drought conditions, and constraints on fuel supply for thermal generation.

In this report, AEMO identifies potential periods of unserved energy (USE) under various rainfall scenarios, and quantifies the projected annual expected USE at these times. The EAAP also presents the forecast monthly USE for each of the NEM regions under each scenario.

The forecast annual USE is assessed against the reliability standard to highlight any potential breaches. The NEM reliability standard is defined as the maximum expected USE, as a percentage of total energy demanded[3], allowable in a region over a financial year. It is currently set at 0.002%. AEMO's Reliability Standard Implementation Guidelines explain how AEMO makes this reliability standard assessment for EAAP purposes[4].

The EAAP report is published annually, with more frequent updates issued if AEMO becomes aware of new information that may materially alter the previously published EAAP report.

1.2 Scenarios

For the May 2018 EAAP report, AEMO assesses anticipated energy constraints under three different rainfall scenarios in accordance with the EAAP Guidelines[5]:

- **Low rainfall** – based on rainfall conditions between 1 July 2006 and 30 June 2007 for all regions except New South Wales. New South Wales was based on rainfall between 1 June 2006 and 31 May 2007. This was categorised into two alternative scenarios:
  - Low rainfall (cooling water restricted) – this is based on the assumption that there is limited water to supply the cooling systems of Latrobe Valley generators during drought conditions.
  - Low rainfall (cooling water available) – this is based on the assumption that there is sufficient water to supply the cooling systems of Latrobe Valley generators during drought conditions.
- **Short-term average rainfall** – based on the average rainfall recorded over the past 10 years.
- **Long-term average rainfall** – based on the average rainfall recorded over the past 50 years, or the longest period for which rainfall data is available if this is less than 50 years (depending on the data available to participants).

[3] To calculate the USE percentage, AEMO assumes that total energy is equivalent to native consumption, defined in AEMO's "Demand Terms in the EMMS Data Model", available at: http://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Dispatch/Policy_and_Process/2016/Demand-terms-in-EMMS-Data-Model_Final.pdf. Viewed on 22 May 2018.

[4] Available at: https://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Electricity_Consultations/2016/EAAP/Reliability-Standard-Implementation-Guidelines.pdf .

[5] Available at: http://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Electricity_Consultations/2016/EAAP/EAAP_Guidelines.pdf.

2. Methodology and assumptions

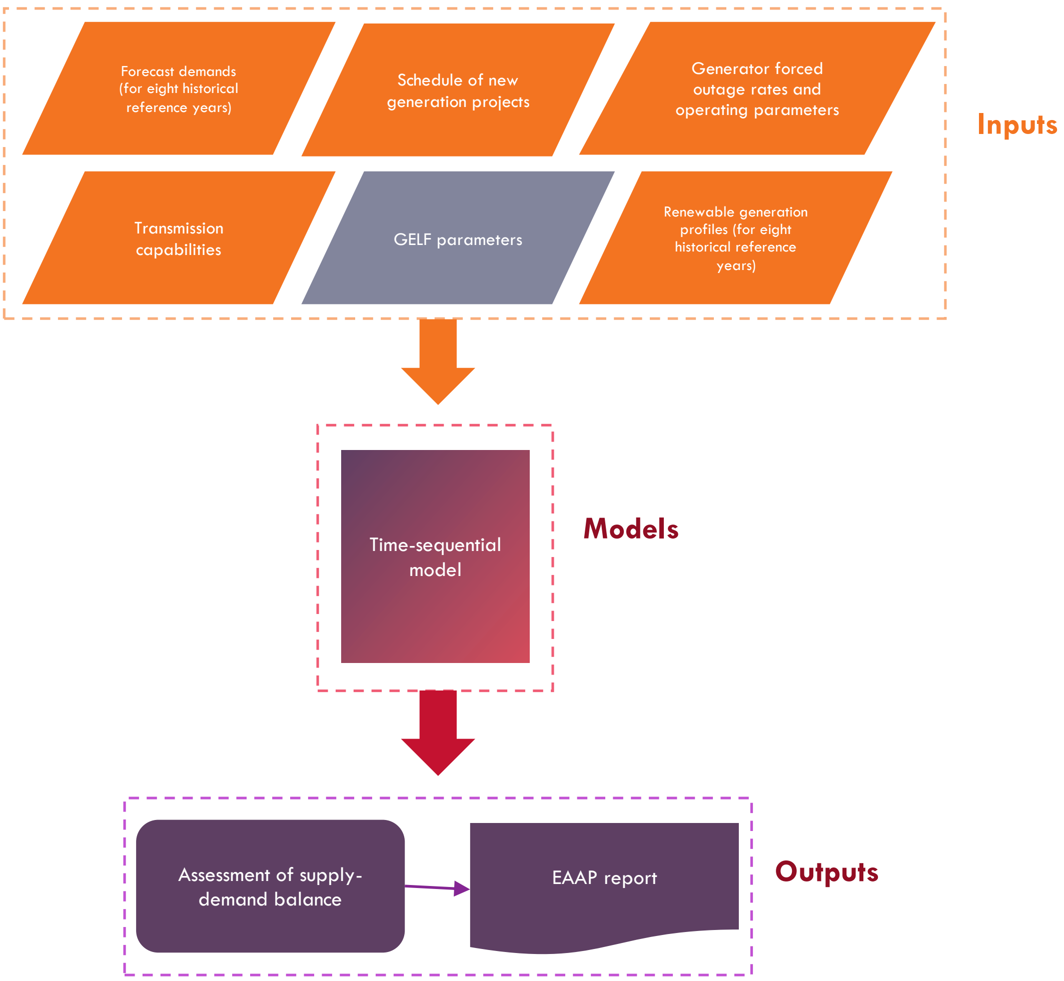
2.1 Methodology

The EAAP model is a probabilistic, time-sequential model that uses Monte Carlo[6] simulations of hourly market outcomes to determine potential future supply shortfalls across the three rainfall scenarios. This model accounts for uncertainties in generator availability, weather-sensitive demand and generation output.

As part of the EAAP process, Generator Energy Limitation Framework (GELF) parameters must be submitted by all scheduled generators as mandated under rule 3.7C (g) of the National Electricity Rules. These cover energy limitations faced by scheduled generators, as well as specifying which outages bid in Medium Term Projected Assessment of System Adequacy (MTPASA) are classified as inflexible.

Figure 1 provides a summary of key input parameters used in the EAAP model. The assumptions underlying the key input parameters are explained in Section 2.2.

Figure 1 Overview of key inputs into EAAP modelling



[6] Monte Carlo is a simulation approach that iteratively runs the model to capture impacts of uncertain inputs. For EAAP modelling, each iteration has different timings for generator forced outages.

The May 2018 EAAP modelling used 800 simulations of the full two-year horizon at an hourly resolution for each rainfall scenario, covering both 10% and 50% probability of exceedance (POE)[7] demand forecasts.

The breakdown of simulations is as follows:

- Demand under extreme weather conditions (10% POE):
  - Eight historical reference years to represent variable patterns of intermittent generation and demand.
  - 50 generator forced outage patterns per reference year.
- Demand under moderate weather conditions (50% POE):
  - Eight historical reference years to represent variable patterns of intermittent generation and demand.
  - 50 generator forced outage patterns per reference year.

The model uses a probability-weighted USE assessment to identify any potential reliability standard breaches in each region. Expected USE is derived by applying the following weightings to results from the moderate and extreme demand scenarios:

- 30.4% for 10% POE.
- 69.6% for 50% POE.

2.2 Assumptions

2.2.1 Electricity demand

AEMO applied the Neutral demand forecast from the March 2018 *Electricity Forecasting Insights Update*[8]. This forecast updates the 2017 demand forecast with:

- Updated electricity consumption forecast by Queensland's coal seam gas sector.
- Updated electric vehicle usage forecasts.
- Revised price outlook and impact on industrial consumption.
- Updated estimate of current demand side participation (DSP) in the NEM, reflecting new data and the revised methodology.

2.2.2 Generation capacity

The EAAP model uses:

- Existing scheduled and semi-scheduled generation.
- Committed scheduled and semi-scheduled generation.

The list of committed generation developments included in the EAAP is summarised in Appendix A2. The nameplate capacity and full commercial operation date of the projects presented in this appendix are based on the Generation Information Page March 2018 update[9]. Table 1 shows the new generating units that have been added since the 2017 EAAP. In total, more than 2600 MW additional committed generation and storage capacity is expected to be in operation in 2018-19 that was not included in the 2017 EAAP. This capacity is not reliant on water for generation, reducing the power system's vulnerability to drought situations to maintain reliability.

[7] Probability of exceedance (POE) means the probability, as a percentage, that a maximum demand forecast will be met or exceeded (e.g., due to weather conditions). For example, a 10% POE forecast is expected to be met or exceeded, on average, only one year in 10, so considers more extreme weather than a 50% POE forecast, which is expected to be met or exceeded, on average, one year in two.

[8] Available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Electricity-Forecasting-Insights/2018-Electricity-Forecasting-Insights.

[9] Available at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information.

Table 1 Additional committed generating units now modelled, that were not included in the 2017 EAAP

Project	State	Capacity (MW)	Commercial operation date
Bodangora Wind Farm	New South Wales	113.2	Aug-18
Crookwell 2 Wind Farm	New South Wales	91	Aug-18
Hunter Economic Zone	New South Wales	28.8	Sep-18
Collinsville PV	Queensland	42.5	Sep-18
Darling Downs Solar Farm	Queensland	110	Sep-18
Daydream Solar Farm	Queensland	167.5	Aug-18
Hayman Solar Farm	Queensland	57.5	May-18
Kennedy Energy Park Solar	Queensland	15	Dec-18
Lilyvale Solar Farm	Queensland	100	Sep-18
Oakey 1 Solar Farm	Queensland	25	Aug-18
Oakey 2 Solar Farm	Queensland	55	Dec-18
Ross River Solar Farm	Queensland	116	Summer 2018-19
Rugby Run Solar Farm	Queensland	65	Summer 2018-19
Sun Metals Solar Farm	Queensland	125	Apr-18
Coopers Gap Wind Farm	Queensland	453	Jun-19
Kennedy Energy Park Wind	Queensland	43.2	Dec-18
Lincoln Gap Wind Farm Stage 1	South Australia	126	Oct-18
Willogoleche Wind Farm	South Australia	119	Winter 2018
Barker Inlet Power Station	South Australia	210	Sep-19
Granville Harbour Wind Farm	Tasmania	111.6	Summer 2018-19
Bannerton Solar Park	Victoria	88	Jul-18
Yatpool Solar Farm	Victoria	81	Apr-18
Crowlands Wind Farm	Victoria	80	May-19
Mt Gellibrand (additional)	Victoria	66	Jun-18
Salt Creek Wind Farm	Victoria	54	Jun-18
Hornsdale Battery storage	South Australia	100	Operational

Since the 2017 EAAP, the retirement of the Torrens Island A power station in South Australia has also been announced. This results in a reduction in capacity from 480 MW to 240 MW for summer 2019-20.

The EAAP model uses confidential information submitted by participants in the form of MTPASA available capacity offers. If USE is forecast in periods where outages of scheduled generating units are planned (according to the PASA availability), the outages were removed provided they were not specified as inflexible outages through the GELF submission. This approach is based on the assumption that, through the MT PASA process, flexible outages would be rearranged if they were likely to cause USE in one or more regions.

2.2.3 Transmission capability

As specified in the EAAP guidelines, only system-normal network constraints are applied. This assumes that planned network outages would be shifted from periods where there was some likelihood of USE.

2.2.4 GELF parameters

The GELF parameters submitted to AEMO by scheduled generators are confidential. They describe the limitations on producing energy over time, reflecting constraints such as water availability for hydro generation, thermal fuel supply limitations, and cooling water availability. GELF parameters are classified into two types:

- Static GELF parameters.
  - Technical specifications of the power stations such as power station name, type of power station, number of generating units at the power station, and their capacities.

- Additional components associated with hydropower schemes such as maximum and minimum active reservoir storage limits, water utilisation factor for generation and pumping for each generating unit or for the power station, and which hydro generators are connected to which reservoirs (for example, upstream reservoir and downstream reservoir).

- Variable GELF parameters. These include:
  - Monthly forecast generation capability or monthly capacity profiles to be submitted by non-hydro power stations.
  - Active reservoir storage at the beginning of the study period, monthly inflows to reservoirs during the study period, minimum reservoir levels that can be reached in each month of the study period without violating long-term reservoir management policy, and any other limitations on reservoir capacities or levels that should be considered within the study period to be submitted for hydro power schemes.

Please see the EAAP Guidelines[10] for full details of the GELF parameters.

2.2.5 Renewable generation profiles

EAAP applies hourly traces of intermittent semi-scheduled generation. These traces are generated based on eight historical weather traces, correlated to demand traces, representing unconstrained wind and solar generation from each generator.

2.3 Differences between EAAP and MT PASA

EAAP uses many of the same inputs as MT PASA and employs a similar probabilistic methodology. Although a similar methodology is employed, the two studies have different purposes. MT PASA does provide an assessment of reliability but is also used to highlight where supply-demand balance is tight to assist participants in scheduling outages. EAAP assumes that flexible outages have been removed from periods which could exacerbate reliability issues and focuses on the impact of energy limitations on reliability outcomes.

There are three key differences in assumptions and methodology between the two forecasts, reflecting the different purposes of the two processes:

- EAAP applies more detailed information relating to energy limitations as specified above.
- EAAP will remove outages that are provided by participants in MT PASA that result in or increase the level of USE, provided these outages are not specified as inflexible in GELF submissions.
- EAAP uses a subset of the constraints in MT PASA. MT PASA incorporates transmission constraints that apply during planned transmission outages whereas EAAP applies only system normal constraints.

[10] Available at http://www.aemo.com.au/-/media/Files/Stakeholder_Consultation/Consultations/Electricity_Consultations/2016/EAAP/EAAP_Guidelines.pdf.

3. Results

The reliability assessment indicates that, under all rainfall scenarios, there is a risk of supply interruption in New South Wales, South Australia and Victoria over the next two years, mainly during peak summer periods, although the annual expected level of unserved energy is below the reliability standard. This risk is primarily driven by increased vulnerability to other climatic events such as extended periods of high temperature, corresponding with low wind or solar availability and unplanned generation outages.

Energy limitations over the next two years are projected to have the following impact on supply adequacy:

- Under the low rainfall scenario:
  - USE is observed in New South Wales, South Australia, and Victoria over the next two years.
  - In 2018-19, forecast USE is within the reliability standard.
  - In 2019-20, forecast USE in Victoria is very close to exceeding the reliability standard if sufficient cooling water for Latrobe Valley generators cannot be accessed from the drought reserve. If the drought reserve can cover additional needs from the generators following two years of extreme low rainfall, the level of USE falls to well within the reliability standard. Forecast USE in New South Wales and South Australia is within the reliability standard under both low rainfall cases.
  - When it is assumed that cooling water can be accessed by Latrobe Valley generators, USE is only marginally higher than observed in the short-term and long-term average rainfall scenario. This indicates that with the exception of potential cooling water risks, the impact of energy limitations even under low rainfall is relatively minor. The small differences that are observed are due to capacity constraints submitted for some hydro generators under low rainfall conditions.
- Under short-term and long-term average rainfall scenarios:
  - USE is observed in New South Wales, South Australia, and Victoria over the next two years but is below the reliability standard at all times.
  - The level of USE is very similar between the short-term and long-term average scenarios, indicating that energy limitations under average conditions are not likely to affect reliability outcomes.
- No USE is projected in Queensland and Tasmania across all rainfall scenarios over the next two years.
- The limitations supplied by thermal generators related to fuel supply have no impact on the level of USE observed in any region. There is no material change in the level of limitations on thermal generators compared to the 2017 EAAP.
- The reduction in USE across all regions from 2018-19 to 2019-20 is primarily due to the introduction of the Barker Inlet Power Station in September 2019 and the introduction of an additional 2.4 GW of renewable generation across the NEM over the EAAP modelling horizon.

These annual USE forecasts are shown in Figure 2.

The modelling results show the occurrence of USE during the months of November-December and January-March.

The monthly forecast USE for all regions under the three rainfall scenarios is provided in Appendix A1.

Figure 2 Forecast USE range across all rainfall scenarios

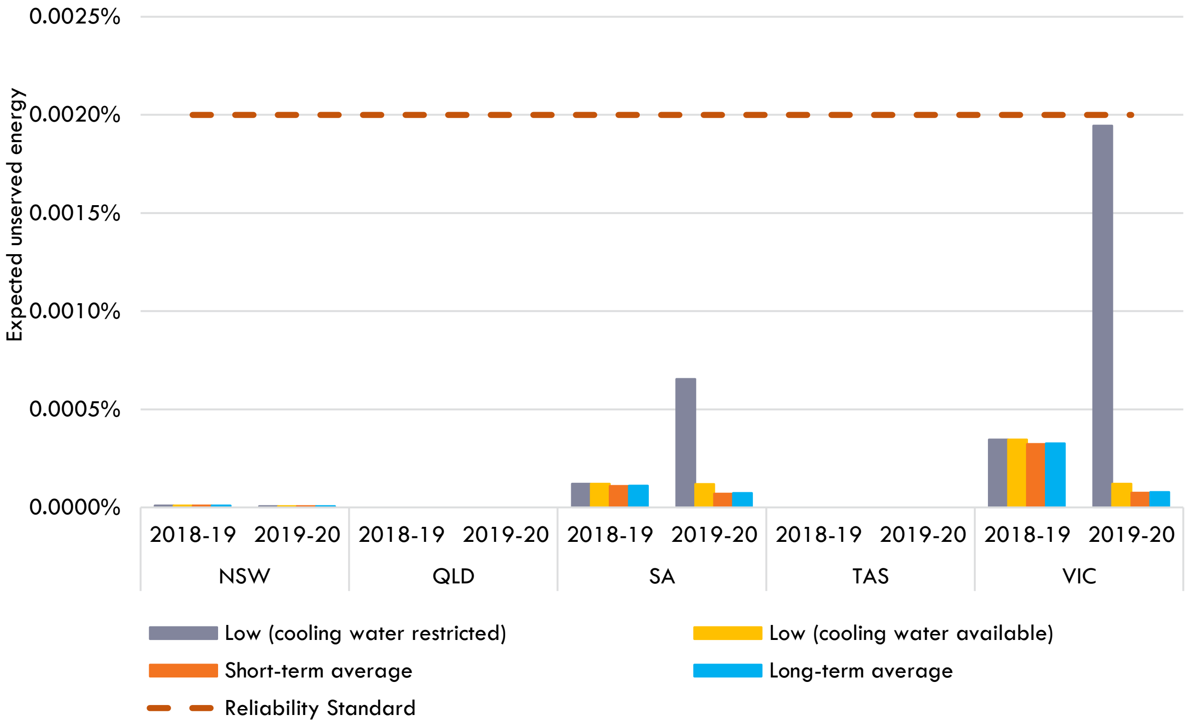


Table 2 Forecast USE in low rainfall (cooling water restricted) scenario

	2018-19 USE		2019-20 USE	
	(MWh)	(% of regional demand)	(MWh)	(% of regional demand)
New South Wales	6	0.0000%	5	0.0000%
Queensland	-	-	-	-
South Australia	15	0.0001%	82	0.0007%
Tasmania	-	-	-	-
Victoria	152	0.0003%	849	0.0019%

Table 3 Forecast USE in low rainfall (cooling water available) scenario

	2018-19 USE		2019-20 USE	
	(MWh)	(% of regional demand)	(MWh)	(% of regional demand)
New South Wales	6	0.0000%	4	0.0000%
Queensland	-	-	-	-
South Australia	15	0.0001%	15	0.0001%
Tasmania	-	-	-	-
Victoria	152	0.0003%	52	0.0001%

Table 4 Forecast USE in short-term average rainfall scenario

	2018-19 USE		2019-20 USE	
	(MWh)	(% of regional demand)	(MWh)	(% of regional demand)
New South Wales	6	0.0000%	4	0.0000%
Queensland	-	-	-	-
South Australia	13	0.0001%	9	0.0001%
Tasmania	-	-	-	-
Victoria	142	0.0003%	33	0.0001%

Table 5 Forecast USE in long-term average rainfall scenario

	2018-19 USE		2019-20 USE	
	(MWh)	(% of regional demand)	(MWh)	(% of regional demand)
New South Wales	6	0.0000%	4	0.0000%
Queensland	-	-	-	-
South Australia	13	0.0001%	9	0.0001%
Tasmania	-	-	-	-
Victoria	143	0.0003%	34	0.0001%

A1. Detailed results

Table 6 Monthly forecast USE in low (cooling water restricted) rainfall scenario, MWh

Month	NSW	QLD	SA	TAS	VIC
Jul-18	0.2	0.0	0.0	0.0	0.0
Aug-18	0.0	0.0	0.0	0.0	0.0
Sep-18	0.0	0.0	0.0	0.0	0.0
Oct-18	0.0	0.0	0.0	0.0	0.0
Nov-18	0.4	0.0	0.0	0.0	5.3
Dec-18	0.2	0.0	0.2	0.0	0.1
Jan-19	3.8	0.0	5.2	0.0	113.8
Feb-19	1.5	0.0	9.2	0.0	31.2
Mar-19	0.0	0.0	0.0	0.0	1.5
Apr-19	0.0	0.0	0.0	0.0	0.0
May-19	0.0	0.0	0.0	0.0	0.0
Jun-19	0.0	0.0	0.0	0.0	0.0
Jul-19	0.0	0.0	0.0	0.0	0.0
Aug-19	0.0	0.0	0.0	0.0	0.0
Sep-19	0.0	0.0	0.0	0.0	0.0
Oct-19	0.0	0.0	0.0	0.0	0.0
Nov-19	1.4	0.0	0.0	0.0	2.8
Dec-19	0.2	0.0	0.2	0.0	0.9
Jan-20	0.6	0.0	12.5	0.0	109.8
Feb-20	2.7	0.0	68.3	0.0	557.8
Mar-20	0.0	0.0	0.7	0.0	177.5
Apr-20	0.0	0.0	0.0	0.0	0.0
May-20	0.0	0.0	0.0	0.0	0.0
Jun-20	0.0	0.0	0.0	0.0	0.0

Table 7 Monthly forecast USE in low (cooling water available) rainfall scenario, MWh

Month	NSW	QLD	SA	TAS	VIC
Jul-18	0.2	0.0	0.0	0.0	0.0
Aug-18	0.0	0.0	0.0	0.0	0.0
Sep-18	0.0	0.0	0.0	0.0	0.0
Oct-18	0.0	0.0	0.0	0.0	0.0
Nov-18	0.5	0.0	0.0	0.0	5.3
Dec-18	0.2	0.0	0.2	0.0	0.1
Jan-19	3.7	0.0	5.2	0.0	113.8
Feb-19	1.5	0.0	9.2	0.0	31.2
Mar-19	0.0	0.0	0.0	0.0	1.5
Apr-19	0.0	0.0	0.0	0.0	0.0
May-19	0.0	0.0	0.0	0.0	0.0
Jun-19	0.0	0.0	0.0	0.0	0.0
Jul-19	0.0	0.0	0.0	0.0	0.0
Aug-19	0.0	0.0	0.0	0.0	0.0
Sep-19	0.0	0.0	0.0	0.0	0.0
Oct-19	0.0	0.0	0.0	0.0	0.0
Nov-19	1.3	0.0	0.0	0.0	2.8
Dec-19	0.2	0.0	0.2	0.0	0.9
Jan-20	0.5	0.0	4.7	0.0	27.1
Feb-20	2.3	0.0	10.0	0.0	21.2
Mar-20	0.0	0.0	0.0	0.0	0.4
Apr-20	0.0	0.0	0.0	0.0	0.0
May-20	0.0	0.0	0.0	0.0	0.0
Jun-20	0.0	0.0	0.0	0.0	0.0

Table 8 Monthly forecast USE in short-term average rainfall scenario, MWh

Month	NSW	QLD	SA	TAS	VIC
Jul-18	0.2	0.0	0.0	0.0	0.0
Aug-18	0.0	0.0	0.0	0.0	0.0
Sep-18	0.0	0.0	0.0	0.0	0.0
Oct-18	0.0	0.0	0.0	0.0	0.0
Nov-18	0.4	0.0	0.0	0.0	4.9
Dec-18	0.3	0.0	0.1	0.0	0.1
Jan-19	3.9	0.0	5.2	0.0	108.6
Feb-19	1.5	0.0	8.0	0.0	27.4
Mar-19	0.0	0.0	0.0	0.0	0.8
Apr-19	0.0	0.0	0.0	0.0	0.0
May-19	0.0	0.0	0.0	0.0	0.0
Jun-19	0.0	0.0	0.0	0.0	0.0
Jul-19	0.0	0.0	0.0	0.0	0.0
Aug-19	0.0	0.0	0.0	0.0	0.0
Sep-19	0.0	0.0	0.0	0.0	0.0
Oct-19	0.0	0.0	0.0	0.0	0.0
Nov-19	1.2	0.0	0.0	0.0	1.7
Dec-19	0.2	0.0	0.1	0.0	0.7
Jan-20	0.5	0.0	0.6	0.0	15.3
Feb-20	2.4	0.0	8.1	0.0	14.8
Mar-20	0.0	0.0	0.0	0.0	0.2
Apr-20	0.0	0.0	0.0	0.0	0.0
May-20	0.0	0.0	0.0	0.0	0.0
Jun-20	0.0	0.0	0.0	0.0	0.0

Table 9 Monthly forecast USE in long-term average rainfall scenario, MWh

Month	NSW	QLD	SA	TAS	VIC
Jul-18	0.2	0.0	0.0	0.0	0.0
Aug-18	0.0	0.0	0.0	0.0	0.0
Sep-18	0.0	0.0	0.0	0.0	0.0
Oct-18	0.0	0.0	0.0	0.0	0.0
Nov-18	0.4	0.0	0.0	0.0	4.9
Dec-18	0.3	0.0	0.1	0.0	0.1
Jan-19	3.9	0.0	5.2	0.0	109.2
Feb-19	1.6	0.0	8.1	0.0	28.2
Mar-19	0.0	0.0	0.0	0.0	0.8
Apr-19	0.0	0.0	0.0	0.0	0.0
May-19	0.0	0.0	0.0	0.0	0.0
Jun-19	0.0	0.0	0.0	0.0	0.0
Jul-19	0.0	0.0	0.0	0.0	0.0
Aug-19	0.0	0.0	0.0	0.0	0.0
Sep-19	0.0	0.0	0.0	0.0	0.0
Oct-19	0.0	0.0	0.0	0.0	0.0
Nov-19	1.2	0.0	0.0	0.0	1.7
Dec-19	0.2	0.0	0.1	0.0	0.7
Jan-20	0.5	0.0	0.6	0.0	16.0
Feb-20	2.4	0.0	8.3	0.0	15.6
Mar-20	0.0	0.0	0.0	0.0	0.2
Apr-20	0.0	0.0	0.0	0.0	0.0
May-20	0.0	0.0	0.0	0.0	0.0
Jun-20	0.0	0.0	0.0	0.0	0.0

A2. Generation developments

Table 10 Committed and very advanced generation developments as at 16 March 2018

Project	Technology type	Fuel type	Unit status	Nameplate capacity (MW)	Full commercial use date	Region
Bodangora Wind Farm	Wind - Onshore	Wind	Com*	113.2	Aug-18	NSW
Crookwell 2 Wind Farm	Wind - Onshore	Wind	Com*	91	Aug-18	NSW
Griffith Solar Farm	PV Panels	Solar	Com	34.9424	Summer 2018-19	NSW
Gullen Range Solar Farm (expansion)	PV Panels	Solar	Com	10	Summer 2017-18	NSW
Hunter Economic Zone	Diesel Peaking Power station reconnection	Other	Com*	28.8	Sep-18	NSW
Manildra Photovoltaic Solar Farm	PV Panels	Solar	Com	50	Winter 2018	NSW
Parkes Solar Farm	PV Panels	Solar	Com	55	Summer 2017-18	NSW
Sapphire Wind Farm Phase 1 and 2	Wind - Onshore	Wind	Com	270	Jul-18	NSW
Silverton Wind Farm	Wind - Onshore	Wind	Com	199	Winter 2018	NSW
Clare Solar Farm	PV - single axis tracking	Solar	Com	150	Summer 2017-18	QLD
Collinsville PV	PV Panels	Solar	Com*	42.5	Sep-18	QLD
Coopers Gap Wind Farm	Wind - Onshore	Wind	Com	453	Jun-19	QLD
Darling Downs Solar Farm	PV – no tracking (fixed flat plate)	Solar	Com*	110	Sep-18	QLD
Daydream Solar Farm	PV - single axis tracking	Solar	Com	167.5	Aug-18	QLD
Hamilton Solar Farm	PV - single axis tracking	Solar	Com	57.5	Mar-18	QLD
Hayman Solar Farm	PV - single axis tracking	Solar	Com	57.5	May-18	QLD
Kennedy Energy Park	Wind - Onshore	Wind	Com	43.2	Dec-18	QLD
Kennedy Energy Park	PV - single axis tracking	Solar	Com	15	Dec-18	QLD
Kidston Solar Project Phase One 50MW	PV Panels	Solar	Com	50	Summer 2017-18	QLD
Lilyvale Solar Farm	PV Tracking flat panel	Solar	Com*	100	Sep-18	QLD
Mt Emerald Wind Farm	Wind - Onshore	Wind	Com	180.5	Sep-18	QLD
Oakey 1 Solar Farm	PV - single axis tracking	Solar	Com*	25	Aug-18	QLD
Oakey 2 Solar Farm	PV - single axis tracking	Solar	Com*	55	Dec-18	QLD
Ross River Solar Farm	PV - single axis tracking	Solar	Com*	116	Summer 2018-19	QLD
Rugby Run Solar Farm	PV Panels	Solar	Com*	65	Summer 2018-19	QLD

Project	Technology type	Fuel type	Unit status	Nameplate capacity (MW)	Full commercial use date	Region
Sun Metals Solar Farm	PV Panels	Solar	Com*	125	Apr-18	QLD
Whitsunday	PV - single axis tracking	Solar	Com	57.5	Apr-18	QLD
Barker Inlet Power Station	Reciprocating engines (gas/diesel)	Natural Gas / Diesel	Com*	210	Sep-19	SA
Bungala Solar Power Project	PV - single axis tracking	Solar	Com	220	Aug-18	SA
Lincoln Gap Wind Farm Stage 1	Wind - Onshore	Wind	Com	126	Oct-18	SA
Willogoleche Wind Farm	Wind - Onshore	Wind	Com	119	Winter 2018	SA
Granville Harbour Wind Farm	Wind - Onshore	Wind	Com*	111.6	Summer 2018-19	TAS
Bannerton Solar Park	PV - single axis tracking	Solar	Com	88	Jul-18	VIC
Crowlands Wind Farm	Wind - Onshore	Wind	Com	80	May-19	VIC
Gannawarra Solar Farm	PV - single axis tracking	Solar	Com	55	Mar-18	VIC
Kiata Wind Farm	Wind - Onshore	Wind	Com	31.05	Dec-17	VIC
Loy Yang B (upgrade)	Steam Sub Critical	Brown Coal	Com*	78.4	Summer 2020-21	VIC
Mt Gellibrand	Wind - Onshore	Wind	Com	132	Jun-18	VIC
Salt Creek Wind Farm	Wind - Onshore	Wind	Com	54	Jun-18	VIC
Yatpool Solar Farm	PV Tracking flat panel	Solar	Com*	81	Apr-18	VIC

* Identifies projects that are under construction, but AEMO has not been informed that the project meets all five commitment criterialisted on the Generation Information webpage, in each regional spreadsheet.

Measures and abbreviations

Measures

Abbreviation	Unit of measure
MW	Megawatts
MWh	Megawatt hours

Abbreviations

Abbreviation	Expanded name
AEMO	Australian Energy Market Operator
CCGT	Combined Cycle Gas Turbine
DSP	Demand Side Participation
EAAP	Energy Adequacy Assessment Projection
ESOO	Electricity Statement of Opportunities
GELF	Generator Energy Limitation Framework
LRC	Low Reserve Conditions
MT PASA	Medium Term Projected Assessment of System Adequacy
NEM	National Electricity Market
NEFR	National Electricity Forecasting Report
NER	National Electricity Rules
NSW	New South Wales
POE	Probability of Exceedance
QLD	Queensland
RSIG	Reliability Standard Implementation Guidelines
SA	South Australia
ST PASA	Short Term Projected Assessment of System Adequacy
TAS	Tasmania
USE	Unserved Energy
VIC	Victoria
VRET	Victorian Renewable Energy Target

Glossary

Term	Definition
committed projects	Generation that is considered to be proceeding under AEMO's commitment criteria (see Generation Information on AEMO's website at http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Planning-and-forecasting/Generation-information. The criteria are listed on each regional spreadsheet, under the Background Information tab).
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.
generating unit	Power stations may be broken down into separate components known as generating 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 conditions) for the period being assessed is below the Reliability Standard.
maximum demand	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.
non-scheduled generation	Generating units classified as non-scheduled under the National Electricity Rules, generally with an aggregate nameplate capacity for the associated generating system of less than 30 MW.
probability of exceedance (POE) maximum demand	The probability, as a percentage, that a maximum demand level will be met or exceeded (for example, due to weather conditions) in a particular period of time. For example, a 10% POE maximum demand for a given season means a 10% probability that the projected level will be met or exceeded – in other words, projected maximum demand levels are expected to be met or exceeded, on average, only one year in 10.
reliability standard	The power system reliability benchmark set in clause 3.9.3C of the National Electricity Rules. The reliability standard for generation and inter-regional transmission elements in the national electricity market is a maximum expected unserved energy (USE) in a region of 0.002% of the total energy demanded in that region for a financial year, under credible contingency conditions.
scenario	Consistent set of assumptions to develop demand, transmission, and supply forecasts.
scheduled generation	Any generating unit classified as scheduled under the National Electricity Rules, generally with an aggregate nameplate capacity for the associated generating system of 30 MW or more.
semi-scheduled generation	Any generating system with intermittent output (such as wind or run-of-river hydro) classified as semi-scheduled under the National Electricity Rules, generally with an aggregate nameplate capacity for the associated generating system of 30 MW or more. Semi-scheduled generators are not required to submit GELF information to AEMO.
unserved energy (USE)	Unserved energy is energy that cannot be supplied to consumers, resulting in involuntary load shedding (loss of customer supply), because there is not enough generation capacity, demand side participation, or network capability, to meet demand.