

AEMO EAAP REPORT UPDATE DECEMBER 2011

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VERSION: Final
DATE: 23 December 2011

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EXECUTIVE SUMMARY

The purpose of the Energy Adequacy Assessment Projection (*EAAP*) report for December 2011 is to provide an analysis of the potential effects of the water availability and the other energy constraints¹ on the electricity system, under a range of scenarios, over a 24 month period.

National Electricity Market (NEM) standards currently state that *Unreserved Energy* per year for each region must not exceed 0.002 per cent of the total energy consumed in that region for that year.

The NEM is required to operate with defined levels of reserve in order to meet the required standard of supply reliability.

Based on the results of December 2011 *EAAP* studies, AEMO has determined that the forecast *Unreserved Energy* is below the Reliability Panel Standard of 0.002% for all regions except SA for both years in the three scenarios covered in the December *EAAP*. This indicates that the availability of energy in these NEM regions meets the reliability standard for supply adequacy over the coming 24 month period. More detailed results are presented in sections two and four.

Note: A large generating unit in South Australia will be out of service and on standby throughout 2011/12 summer. As the recall for this generating unit is longer than 24 hours, it was modelled as unavailable in December 2011 *EAAP*, resulting in *USE* marginally above 0.002% for the first year of the study period in all three rainfall scenarios for South Australia. This generating unit is available to be recalled in the event of supply shortfalls in South Australia. Had this generating unit been modelled as available in the studies, the *USE* for South Australia would have been significantly lower than 0.002% for Year 1 in all three scenarios.

The results of this study are largely based on the energy constraints provided by Scheduled Generators, as well as planned generation outages, power transfer capability of the *NEM* power system and demand forecasts that were provided by Jurisdictional Planning Bodies for the purposes of ES00.

Information was provided on the level of energy constraints that each scheduled generating unit would be likely to experience under the three rainfall scenarios below (further discussed in section 1.1):

- Low rainfall
- Short term average rainfall
- Long term average rainfall

¹ Energy generation can be constrained due to limitations of fuel supply in addition to the availability of water supplies.

List of Abbreviations

Abbreviation	Term
AEMO	Australian Energy Market Operator
EAAP	Energy Adequacy Assessment Projection
ESOO	Electricity Statement of Opportunities
GELF	Generator Energy Limitation Framework
NEM	National Electricity Market
NTNDP	National Transmission Network Development Plan
POE	Probability of Exceedence
USE	Unserved Energy
MT PASA	Medium Term Projected Assessment of System Adequacy

1 INTRODUCTION

AEMO publishes the EAAP² on a quarterly basis to provide an analysis of the potential effects of the water availability and the other energy constraints on the electricity system, under a range of scenarios, over a 24 month period.

The National Electricity Rule 3.7C(n) requires AEMO to comply with *EAAP guidelines*³ in preparing EAAP.

The EAAP⁴ replaced the quarterly AEMO Drought Scenarios Investigation Report, with the final Drought Report having been published in December 2009. The first EAAP was published on 31 March 2010.

EAAP uses probabilistic modelling to determine the regional *Unserviced Energy (USE)* at an hourly resolution during the 24 month study period.

The annual percentage of *USE* per region is the key indicator of energy adequacy in the NEM.

1.1 December 2011 EAAP Report

The study period⁵ for this EAAP report is from 1 January 2012 to 31 December 2013.

The closing date for submitting Variable GELF Parameters⁶ by Scheduled Generators was 7 November 2011.

For the purpose of this report 'Year 1' is defined as 1 January 2012 to 31 December 2012, and 'Year 2' is defined as 1 January 2013 to 31 December 2013.

This EAAP report is based on the following three Rainfall Scenarios:

Scenario 1: Low rainfall – based on rainfall between 1 July 2006 and 30 June 2007 for all Regions except New South Wales. For New South Wales the low rainfall scenario is based on the rainfall experienced between 1 June 2006 and 31 May 2007⁷.

Scenario 2: Short term average rainfall – based on the average rainfall recorded over the past 10 years.

Scenario 3: 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 should this be less than 50 years.

² Energy Adequacy Assessment Projection (EAAP) – Glossary of the Electricity Market Rules defines the EAAP as 'A projection of AEMO's assessment of energy availability that accounts for energy constraints for each month over a 24 month period, which is prepared and published in accordance with rule 3.7C and is measured as *Unserviced Energy* for each region.'

³ The EAAP guidelines have been determined following Electricity Rule Consultation Procedures and can be accessed using the following web link:

<http://www.aemo.com.au/electricityops/408-0001.html>

⁴ Previous AEMO EAAP are available at the following location on AEMO website:

<http://www.aemo.com.au/electricityops/eaap.html>

⁵ A study period refers to a specified time period for which the Energy Adequacy Assessment Projections are conducted.

⁶ Generator Energy Limitation Framework (GELF) – Glossary of the Electricity Market Rules defines the GELF as "A description of the energy constraints that affect the ability of scheduled generating unit to generate electricity prepared in accordance with the EAAP guidelines."

⁷ Had this change not been made for New South Wales, the low rainfall scenario would have had more rainfall than the short term average rainfall scenario in the catchment areas.

1.2 EAAP inputs

Scheduled Generators provided their generation constraints under various rainfall scenarios for the December 2011 EAAP.

The demand profiles used in December 2011 EAAP are consistent with the energy and demand projections published in the 2011 Electricity Statement of Opportunities (ESOO). These projections are based on the energy and demand projections provided to AEMO by Jurisdictional Planning Bodies for the purposes of ESOO. Suitable adjustments have been made to the demand profiles used in EAAP to take into account the generation contributions from the existing and committed future non-scheduled generation.

EAAP models the availability of the existing and committed future scheduled and semi-scheduled generation as well as the anticipated increases to capacities of existing scheduled and semi-scheduled generation used in MT PASA process as a key input.

Refer to EAAP Guidelines⁸ for information on the other EAAP inputs.

1.3 EAAP outputs

The EAAP guidelines require AEMO to publish the following EAAP reports:

1. EAAP Public Report – This report will include the following items for each of the Scenarios on regional basis:
 - Monthly USE for the study period in GWh
 - USE for the first 12 months and for the second 12 months in the study period in GWh
 - Monthly energy generation for the study period in GWh on a NEM-wide basis
2. Participant EAAP reports⁹ for each Generator who owns scheduled generating units or hydro power schemes that have been included in each of the Scenarios:
 - Monthly energy generation reductions in GWh for the scheduled generating unit or hydro power scheme for the study period
 - Monthly capacity reductions in MW for the scheduled generating unit or hydro power scheme for the study period
 - Monthly generation contribution in GWh from the scheduled generating unit or hydro power scheme for the study period
 - Monthly generation contribution in GWh for the first 12 months and for the second 12 months in the study period.

This AEMO EAAP Report Update December 2011 covers the requirement to publish the EAAP Public Report (i.e. first report stated above).

1.4 Interpretation of USE forecasts determined by EAAP studies

The electricity supply estimates in this EAAP Report are based on the variable GELF parameters submitted by NEM Scheduled Generators as required by the EAAP guidelines, during October and November 2011, so the results should be regarded as reflecting an input 'snapshot' taken at that time.

⁸ <http://www.aemo.com.au/electricityops/408-0006.pdf>

⁹ Participants are required to subscribe to the "EAAP_Results" file if they wish to receive the participant EAAP reports. Participant file subscriptions are managed in the MMS Web Portal via the Data Subscriptions option available from the Data Interchange menu.

The water-related energy limitations submitted by Scheduled Generators are based on the known share of water available for generation at the time, as advised by jurisdictions and water authorities.

2 RESULTS SUMMARY

The following tables summarise the annual *Unserviced Energy (USE)* figures for each region, and provides comparisons between the *EAAP* published in September 2011 and the December 2011 *EAAP*. The grey shading highlights where the annual *USE* is higher than the Reliability Panel standard of 0.002%¹⁰.

Based on the results of December 2011 *EAAP* studies, AEMO has determined that the forecast *USE* in December 2011 *EAAP* is below the Reliability Panel Standard of 0.002% for all regions except SA in both years for the three scenarios covered in *EAAP*.

One of the large generating units in South Australia will be out of service and on standby throughout 2011/12 summer. As the recall time of this generating unit is longer than 24 hours, it was modelled as unavailable in December 2011 *EAAP* resulting in *USE* marginally above 0.002% for the first year of the study period in all three rainfall scenarios for South Australia. This generating unit is available to be recalled in the event of supply shortfalls in South Australia. Had this generating unit been modelled as available in the studies, the *USE* for South Australia would have been significantly lower than 0.002% for Year 1 in all three scenarios.

There was no significant change in forecast *USE* for Queensland, New South Wales and Tasmania between the September 2011 and December 2011 *EAAP* studies for any of the rainfall scenarios. The December 2011 *EAAP* forecasts some increase in *USE* for South Australia for Year 1 and Year 2 in all rainfall scenarios as well as for Year 2 for Victoria in the low rainfall scenario due to planned outages of generating units in these regions.

TABLE 1: *UNSERVED ENERGY* FOR SCENARIO 1 - LOW RAINFALL

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2011 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0000%
	December 2011 Update	0.0001%	0.0002%	0.0022%	0.0000%	0.0005%
Year 2	September 2011 Update	0.0002%	0.0008%	0.0003%	0.0000%	0.0003%
	December 2011 Update	0.0000%	0.0008%	0.0011%	0.0000%	0.0013%

¹⁰ The Reliability Panel establish the standard for supply reliability in the *NEM*, which is 0.002% *Unserviced Energy* in each region. This standard requires that no more than 0.002% of each region's energy demand should be unserved due to supply shortfalls. Note that this does not include customer interruptions due to failures in transmission and distribution networks.

TABLE 2: *UNSERVED ENERGY* FOR SCENARIO 2 - SHORT TERM AVERAGE RAINFALL

Short term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2011 Update	0.0000%	0.0000%	0.0003%	0.0000%	0.0000%
	December 2011 Update	0.0000%	0.0001%	0.0021%	0.0000%	0.0005%
Year 2	September 2011 Update	0.0000%	0.0008%	0.0000%	0.0000%	0.0000%
	December 2011 Update	0.0000%	0.0008%	0.0007%	0.0000%	0.0004%

TABLE 3: *UNSERVED ENERGY* FOR SCENARIO 3 - LONG TERM AVERAGE RAINFALL

Long term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2011 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0000%
	December 2011 Update	0.0000%	0.0001%	0.0021%	0.0000%	0.0005%
Year 2	September 2011 Update	0.0000%	0.0008%	0.0000%	0.0000%	0.0000%
	December 2011 Update	0.0000%	0.0008%	0.0008%	0.0000%	0.0004%

3 NEW GENERATION AND GENERATION RETIREMENTS

3.1 New Generator Projects

Based on the information published on the Generation Information Page¹¹, as well as on the subsequent updates received, the following committed significant scheduled and semi-scheduled generating units have been included in the model:

TABLE 4: NEW GENERATORS

Station	State	Capacity	When
Mortlake No.2 (MORTLK 12)	VIC	281 MW (winter)	End of summer 2011/12
		270 MW (summer)	
Macarthur wind farm	VIC	420 MW	Winter 2012

¹¹ The Generation Information Page is available on AEMO website at:
<http://www.aemo.com.au/data/gendata.shtml>
 This webpage has been updated on 29 July 2011.

3.2 Retired Generation

Based on the information published on the Generation Information Page, as well as the subsequent updates received, there were no retirements of Scheduled Generating Units modelled in December 2011 *EAAP* report.

Swanbank B1, B2 and B4 units in Queensland region were assumed unavailable since these generating units would be in long term storage during the study period.

Munmorah No.3 and 4 units in New South Wales were assumed to be out of service with a recall time longer than 24 hours.

4 DETAILED RESULTS

The *EAAP* simulation studies provide forecasts of customer load that might not be able to be met during the study period. As the studies are probabilistic in nature, 400 simulation studies were performed for each rainfall scenario using both 10% Probability of Exceedence (POE) and 50% POE demand forecasts.

The results of all of these simulation studies have been 'averaged' as explained in the section 5.2 of the *EAAP guidelines*¹², using the following weightings:

Weighted result = 0.696 x 50% POE result + 0.304 x 10% POE result.

The above weighting is similar to the weightings used in studies for the 2010 National Transmission Network Development Plan¹³, and provides a balance by giving higher weighting to the more expected 50% POE results, whilst still capturing the influence of the more pessimistic 10% POE results.

The figures in the following tables represent the average monthly regional energy demand that was not able to be met in gigawatt hours (GWh).

The forecast *Unserviced Energy* figures presented in the following tables should not be interpreted as certainty of blackouts, but rather as an estimate of what could occur as it is not possible to be certain about future customer demand or generator failures with the *EAAP* modelling conducted.

If customer demand is moderate to low, or generator failures do not occur at critical times, then the *Unserviced Energy* estimates contained in this update are unlikely to eventuate.

Shaded cells indicate where *USE* exceeds the Reliability Panel Standard of 0.002% in a region.

¹² The *EAAP guidelines* are available at the following location on AEMO website:
<http://www.aemo.com.au/electricityops/408-0001.html>

¹³ The 2010 National Transmission Network Development Plan is available at the following location on AEMO website:
<http://www.aemo.com.au/planning/ntndp.html>

4.1 Scenario 1: Low Rainfall - Forecast *Unserviced Energy* (GWh)

TABLE 5: FORECAST *USE* IN SCENARIO 1 – LOW RAINFALL

	NSW	QLD	SA	TAS	VIC
Jan-12	0.0039	0.0296	0.0273	-	0.0604
Feb-12	0.0983	0.0392	0.2730	-	0.2108
Mar-12	-	0.0004	0.0003	-	0.0099
Apr-12	-	-	-	-	-
May-12	-	-	-	-	-
Jun-12	-	-	-	-	-
Jul-12	0.0002	-	-	-	-
Aug-12	-	-	-	-	-
Sep-12	-	-	-	-	-
Oct-12	-	-	-	-	-
Nov-12	-	0.0016	-	-	-
Dec-12	-	0.0140	0.0029	-	-
Total GWh	0.1023	0.0848	0.3035	-	0.2811
Region %	0.0001%	0.0002%	0.0022%	0.0000%	0.0005%
Jan-13	-	0.0749	0.0099	-	0.0250
Feb-13	0.0113	0.1482	0.1388	-	0.3586
Mar-13	-	0.0071	0.0013	-	0.2751
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0246	-	-	-
Aug-13	-	0.0008	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0113	-	-	0.0014
Dec-13	-	0.2155	0.0107	-	0.0019
Total GWh	0.0113	0.4824	0.1606	-	0.6619
Region %	0.0000%	0.0008%	0.0011%	0.0000%	0.0013%

4.2 Scenario 2: Short Term Average Rainfall - Forecast *Unserved Energy* (GWh)

TABLE 6: FORECAST *USE* IN SCENARIO 2 – SHORT TERM AVERAGE RAINFALL

	NSW	QLD	SA	TAS	VIC
Jan-12	0.0032	0.0293	0.0277	-	0.0618
Feb-12	0.0129	0.0364	0.2622	-	0.1758
Mar-12	-	0.0003	0.0003	-	0.0104
Apr-12	-	-	-	-	-
May-12	-	-	-	-	-
Jun-12	-	-	-	-	-
Jul-12	-	-	-	-	-
Aug-12	-	-	-	-	-
Sep-12	-	-	-	-	-
Oct-12	-	-	-	-	-
Nov-12	-	0.0016	-	-	-
Dec-12	-	0.0140	0.0029	-	-
Total GWh	0.0161	0.0816	0.2931	-	0.2480
Region %	0.0000%	0.0001%	0.0021%	0.0000%	0.0005%
Jan-13	-	0.0791	0.0092	-	0.0230
Feb-13	0.0055	0.1482	0.0853	-	0.1629
Mar-13	-	0.0066	0.0002	-	0.0030
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0246	-	-	-
Aug-13	-	0.0008	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0113	-	-	-
Dec-13	-	0.2139	0.0106	-	-
Total GWh	0.0055	0.4846	0.1054	-	0.1889
Region %	0.0000%	0.0008%	0.0007%	0.0000%	0.0004%

4.3 Scenario 3: Long Term Average Rainfall - Forecast *Unservd Energy* (GWh)

TABLE 7: FORECAST *USE* IN SCENARIO 3 – LONG TERM AVERAGE RAINFALL

	NSW	QLD	SA	TAS	VIC
Jan-12	0.0029	0.0293	0.0274	-	0.0612
Feb-12	0.0059	0.0357	0.2634	-	0.1712
Mar-12	-	0.0003	0.0004	-	0.0100
Apr-12	-	-	-	-	-
May-12	-	-	-	-	-
Jun-12	-	-	-	-	-
Jul-12	-	-	-	-	-
Aug-12	-	-	-	-	-
Sep-12	-	-	-	-	-
Oct-12	-	-	-	-	-
Nov-12	-	0.0016	-	-	-
Dec-12	-	0.0144	0.0029	-	-
Total GWh	0.0089	0.0813	0.2939	-	0.2424
Region %	0.0000%	0.0001%	0.0021%	0.0000%	0.0005%
Jan-13	-	0.0789	0.0085	-	0.0206
Feb-13	0.0162	0.1522	0.0902	-	0.1792
Mar-13	-	0.0066	0.0002	-	0.0030
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0246	-	-	-
Aug-13	-	0.0008	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0113	-	-	-
Dec-13	-	0.2140	0.0106	-	-
Total GWh	0.0162	0.4884	0.1096	-	0.2028
Region %	0.0000%	0.0008%	0.0008%	0.0000%	0.0004%

4.4 FORECAST MONTHLY ENERGY GENERATION ON NEM-WIDE BASIS

TABLE 8: FORECAST MONTHLY ENERGY GENERATION ON NEM-WIDE BASIS

	Low Rainfall	Short-Term Average Rainfall	Long-Term Average Rainfall
Jan-12	18419	18485	18470
Feb-12	17457	17443	17428
Mar-12	17952	17994	17933
Apr-12	16064	16101	16062
May-12	17743	17745	17732
Jun-12	17608	17604	17623
Jul-12	19032	19038	19064
Aug-12	18593	18616	18599
Sep-12	16882	16907	16884
Oct-12	17248	17284	17233
Nov-12	17423	17434	17413
Dec-12	18003	18066	18019
Total GWh	212425	212718	212459
Jan-13	19229	19235	19228
Feb-13	17394	17428	17426
Mar-13	18666	18672	18653
Apr-13	16772	16797	16766
May-13	18349	18390	18367
Jun-13	18187	18196	18182
Jul-13	19486	19492	19499
Aug-13	18904	18950	18910
Sep-13	17266	17289	17263
Oct-13	17733	17733	17734
Nov-13	17836	17879	17834
Dec-13	18489	18465	18484
Total GWh	218309	218526	218345

4.5 USE Distributions

The *USE* distribution graphs are used to show how many *EAAP* simulation studies (Monte Carlo iterations) exceeded a given *USE* level. The *USE* values are expressed as a percentage of regional energy. This is to allow easier reference to the Reliability Panel standard of 0.002% *USE*.

Separate graphs are presented for the 10% and 50% POE simulations.











