AEMO EAAP REPORT UPDATE DECEMBER 2012

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EXECUTIVE SUMMARY

The purpose of the Energy Adequacy Assessment Projection (*EAAP*) report for December 2012 is to provide an analysis of the potential effects of the water availability and the other energy constraints[1] on the electricity system, under a range of scenarios, over a 24 month period.

National Electricity Market (NEM) standards currently state that *Unserved Energy* per year for each region must not exceed 0.002% 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 2012 *EAAP* studies, AEMO has determined that the forecast *Unserved Energy* is below the Reliability Panel Standard of 0.002% for all regions for both years in the three scenarios covered in the December 2012 *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.

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 a combination of demand forecasts that were provided by Jurisdictional Planning Bodies for the purposes of ESOO as well AEMO's own forecasts.

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

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[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
MT PASA	Medium Term Projected Assessment of System Adequacy
NEM	National Electricity Market
NTNDP	National Transmission Network Development Plan
POE	Probability of Exceedence
USE	Unserved Energy

1   INTRODUCTION

AEMO publishes the EAAP[2] 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 *EAAP*[4] 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 *Unserved 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 2012 *EAAP* Report

The study period[5] for this *EAAP* report is from 1 January 2013 to 31 December 2014.

The closing date for submitting Variable Generator Energy Limitation Framework (GELF) Parameters[6] by Scheduled Generators was 7 November 2012.

For the purpose of this report 'Year 1' is defined as 1 January 2013 to 31 December 2013, and 'Year 2' is defined as 1 January 2014 to 31 December 2014.

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 2007[7].

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.

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[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 *Unserved 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/Electricity/Resources/Reports-and-Documents/EAAP/Copy-of-Development-of-Energy-Adequacy-Assessment-Projection-EAAP-Guidelines-Consultation

[4] Previous AEMO *EAAP* are available at the following location on *AEMO* website:
http://www.aemo.com.au/Electricity/Market-Operations/LINKS-FOR-ARCHIVEEnergy-Adequacy-Assessment-Projection

[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 2012 *EAAP*.

The demand profiles used in December 2012 *EAAP* are consistent with the energy and demand projections published in the 2012 National Electricity Forecasting Report (NEFR). 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* Guidelines[8] 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* reports[9] 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 2012 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 2012, so the results should be regarded as reflecting an input 'snapshot' taken at that time.

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[8] EAAP Guidelines are available at: 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 *Unserved Energy* (*USE*) figures for each region, and provide comparisons between the *EAAP* published in September 2012 and the December 2012.

Based on the results of December 2012 *EAAP* studies, AEMO has determined that the forecast *Unserved Energy* is below the Reliability Panel Standard of 0.002% for all regions for both years in the three scenarios covered in the December *EAAP* study. This indicates that the availability of energy in these NEM regions meets the reliability standard for supply adequacy in both years.

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

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2012 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0001%
	December 2012 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0003%

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

Short term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2012 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0001%

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

Long term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2012 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2012 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0000%
	December 2012 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0001%

3 NEW GENERATION AND GENERATION RETIREMENTS

3.1 New Generator Projects

Based on the information published on the Generation Information Page[10], 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
Macarthur wind farm	VIC	420 MW	Summer 2012/13
Musselroe wind farm	TAS	168 MW	Winter 2013

3.2 Retired Generation

TABLE 5: RETIRED GENERATORS

Station	State	Capacity	When
Swanbank B power station[11]	QLD	420 MW	May 2012
Collinsville power station[12]	QLD	192 MW	December 2012

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.

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[10] The Generation Information Page is available on *AEMO* website at:
http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information
 This webpage was last updated on 31 July 2012.

[11] The last remaining Swanbank generating unit (B3) was retired in May 2012.

[12] Collinsville Power Station Units 1–5 de-registration became effective at 00:00 hours on 30 November 2012. Refer to AEMO Communication 1243.

The results of all of these simulation studies have been 'averaged' as explained in the section 5.2 of the *EAAP guidelines*[13], by giving a higher weighting to the more expected 50% POE results, whilst still capturing the influence of the more pessimistic 10% POE results:

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

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 *Unserved 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 *Unserved 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.

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[13] The *EAAP guidelines* are available at the following location on AEMO website:
http://www.aemo.com.au/electricityops/408-0006.pdf

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

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

	NSW	**QLD**	**SA**	**TAS**	**VIC**
Jan-13	-	0.0048	0.0022	-	0.0062
Feb-13	-	0.0032	0.0002	-	0.0011
Mar-13	-	0.0001	-	-	-
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0004	-	-	-
Aug-13	-	0.0002	-	-	-
Sep-13	-	0.0026	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0012	-	-	-
Dec-13	-	0.0001	-	-	-
Total GWh	-	0.0125	0.0024	-	0.0073
Region %	-	-	-	-	-
Jan-14	-	0.0009	0.0086	-	0.0252
Feb-14	-	0.0009	0.0027	-	0.0117
Mar-14	-	-	-	-	0.1064
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0001	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	0.0015	-	-	-
Dec-14	-	0.0104	-	-	0.0005
Total GWh	-	0.0138	0.0113	-	0.1437
Region %	-	-	0.0001%	-	0.0003%

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-13	-	0.0048	0.0022	-	0.0059
Feb-13	-	0.0032	0.0002	-	0.0012
Mar-13	-	0.0001	-	-	-
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0004	-	-	-
Aug-13	-	0.0002	-	-	-
Sep-13	-	0.0009	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0012	-	-	-
Dec-13	-	0.0001	-	-	-
Total GWh	-	0.0107	0.0024	-	0.0071
Region %	-	-	-	-	-
Jan-14	-	0.0009	0.0068	-	0.0207
Feb-14	-	0.0008	0.0027	-	0.0116
Mar-14	-	-	-	-	0.0049
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0001	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	0.0015	-	-	-
Dec-14	-	0.0104	-	-	-
Total GWh	-	0.0136	0.0095	-	0.0371
Region %	-	-	0.0001%	-	0.0001%

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

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

	NSW	QLD	SA	TAS	VIC
Jan-13	-	0.0038	0.0022	-	0.0064
Feb-13	-	0.0032	0.0002	-	0.0010
Mar-13	-	0.0001	-	-	-
Apr-13	-	-	-	-	-
May-13	-	-	-	-	-
Jun-13	-	-	-	-	-
Jul-13	-	0.0004	-	-	-
Aug-13	-	0.0002	-	-	-
Sep-13	-	0.0009	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	0.0012	-	-	-
Dec-13	-	0.0001	-	-	-
Total GWh	-	0.0097	0.0024	-	0.0074
Region %	-	-	-	-	-
Jan-14	-	0.0009	0.0047	-	0.0129
Feb-14	-	0.0008	0.0024	-	0.0109
Mar-14	-	-	-	-	0.0051
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0001	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	0.0015	-	-	-
Dec-14	-	0.0104	-	-	-
Total GWh	-	0.0136	0.0072	-	0.0289
Region %	-	-	0.0001%	-	0.0001%

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-13	17301	17351	17337
Feb-13	15734	15735	15725
Mar-13	16851	16856	16847
Apr-13	15400	15417	15436
May-13	16860	16905	16870
Jun-13	16844	16899	16829
Jul-13	17931	17930	17916
Aug-13	17363	17370	17357
Sep-13	15705	15723	15717
Oct-13	16125	16139	16164
Nov-13	15996	16004	16008
Dec-13	16646	16647	16620
Total GWh	198756	198977	198827
Jan-14	17756	17771	17736
Feb-14	16036	16036	16026
Mar-14	17107	17093	17085
Apr-14	15640	15659	15650
May-14	17118	17129	17124
Jun-14	17092	17106	17072
Jul-14	18371	18389	18365
Aug-14	17716	17733	17696
Sep-14	16159	16167	16170
Oct-14	16538	16557	16553
Nov-14	16317	16330	16309
Dec-14	17049	17080	17027
Total GWh	202900	203049	202813

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.

LOW RAINFALL 10% POE DEMAND SCENARIO - YEAR 1

LOW RAINFALL 10% POE DEMAND SCENARIO - YEAR 2

LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 1

LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 2

SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1

SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2

SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1

SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2

LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1

LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2

LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1

LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2