AEMO ENERGY ADEQUACY ASSESSMENT PROJECTION REPORT UPDATE DECEMBER 2013

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VERSION: FINAL

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Contents

EXECUTIVE SUMMARY

The purpose of the Energy Adequacy Assessment Projection (EAAP) report for December 2013 is to provide an analysis of the potential effects of water availability and other energy constraints[1] on the electricity system under three scenarios over a 24-month period.

National Electricity Market (NEM) standards currently state that unserved energy (USE) per year for each NEM 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 to meet the required standard of supply reliability.

Based on the results of December 2013 EAAP studies, AEMO USE falls within the required range determined by the Reliability Panel as less than 0.002% for all regions for both years in all three scenarios.

A small reduction in USE is noted for Queensland in Year 2 of the December 2013 EAAP compared to September 2013.This reduction was attributed to a shorter than planned outage of one generating unit in Queensland.

The results of this study are based on the energy constraints provided by scheduled generators, as well as planned generation outages, power transfer capability of the NEM power system, and AEMO's own demand 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:

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

[1] Energy generation can be constrained due to fuel supply limitations in addition to water supply availability.

List of abbreviations

Abbreviation	Term
AEMO	Australian Energy Market Operator
EAAP	Energy Adequacy Assessment Projection
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. It provides an analysis of the potential effects of water availability and other energy constraints on the electricity system, under three scenarios over a 24-month period.

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

The 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 National Electricity Market (NEM).

1.1 December 2013 EAAP

The study period[4] for this EAAP is from 1 January 2014 to 31 December 2015.

The closing date for scheduled generators to submit variable Generator Energy Limitation Framework (GELF) parameters[5] was 29 November 2013. All GELF data required for studies had been received.

For the purpose of this report "Year 1" is defined as 1 January 2014 to 31 December 2014, and "Year 2" is defined as 1 January 2015 to 31 December 2015.

This EAAP is based on the following three scenarios:

- Scenario 1: Low rainfall – based on rainfall between 1 July 2006 and 30 June 2007 for all regions except New South Wales. New South Wales is based on rainfall between 1 June 2006 and 31 May 2007.[6]
- 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, if less than 50 years.

1.2 EAAP inputs

Scheduled generators provided their generation constraints under the three rainfall scenarios for the December 2013 EAAP.

The demand profiles used are consistent with the energy and demand projections published in the 2013 National Electricity Forecasting Report. AEMO makes adjustments to the demand profiles used in the EAAP to account for generation contributions from existing and committed future non-scheduled generation.

The EAAP uses the following inputs to its forecast models:

- Existing scheduled and semi-scheduled generation.

[2] Defined in the Electricity Market Rules glossary 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 USE for each region."
[3] Determined following Electricity Rule Consultation Procedures. Available at: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx.
[4] A study period refers to a specified time period for which the EAAP is conducted.
[5] Defined in Electricity Market Rules glossary 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."
[6] 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.

- Committed scheduled and semi-scheduled generation.
- Planned increases in capacities of existing scheduled and semi-scheduled generation used in Medium term Projected Assessment of system Adequacy MT PASA.

Refer to EAAP Guidelines[7] 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 – includes the following items per scenario per region:
   - Monthly USE for the study period in gigawatt hours.
   - USE for Year 1 and Year 2 in the study period in gigawatt hours.
   - NEM-wide monthly energy generation for the study period in gigawatt hours.
2. Participant EAAP reports[8] for each generator who owns scheduled generating units, or hydro power schemes that have been included in each of the scenarios. These include:
   - Monthly energy generation reductions in gigawatt hours for the scheduled generating unit or hydro power scheme for the study period.
   - Monthly capacity reductions in megawatts for the scheduled generating unit or hydro power scheme for the study period.
   - Monthly generation contribution in gigawatt hours from the scheduled generating unit or hydro power scheme for the study period.
   - Monthly generation contribution in gigawatt hours for year 1 and year 2 in the study period.

This report covers the requirement to publish the EAAP Public Report.

1.4 Interpretation of USE forecasts determined by the EAAP studies

The electricity supply estimates in this report are based on the variable GELF parameters submitted by NEM scheduled generators (as per the EAAP guidelines) during October and November 2013. The results reflect an input “snapshot” at that time.

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 USE for each region, and compare these to the EAAP Report Update published in September 2013.

Based on the December 2013 EAAP results, AEMO has determined that the forecast USE falls within the required range determined by the Reliability Panel as less than 0.002% for all regions for both years in the three scenarios covered.

[7] EAAP Guidelines. Available at: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx.

[8] Participants are required to subscribe to the EAAP_Results file to receive participant EAAP reports. Participant file subscriptions are managed in the MMS Web Portal via the Data Subscriptions option available from the Data Interchange menu.

A small reduction in USE is noted for Queensland in Year 2 of the December 2013 EAAP compared to September 2013. This reduction is attributed to a shorter than planned outage duration for one generating unit in Queensland.

TABLE 1: UNSERVED ENERGY FOR SCENARIO 1 - LOW RAINFALL

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2013 Update	0.0000%	0.0002%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

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

Short term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2013 Update	0.0000%	0.0002%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

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

Long term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	September 2013 Update	0.0000%	0.0002%	0.0000%	0.0000%	0.0000%
	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

3 NEW GENERATION AND GENERATION RETIREMENTS

3.1 New generator projects

The following new committed significant scheduled and semi-scheduled generating units were included in the EAAP model:

TABLE 4: NEW GENERATORS

Station	State	Capacity (MW)	Date
Snowtown Stage 2 South Wind Farm	SA	126	Winter 2014
Snowtown Stage 2 North Wind Farm	SA	144	Summer 2014–15
Gullen Range Wind Farm	NSW	166	Winter 2014
Mt Mercer Wind Farm	VIC	132	Summer 2014–15
Taralga Wind Farm	NSW	107	Summer 2014–15
Bocorock Wind Farm	NSW	113	Summer 2014–15

Details of these new generators is available on AEMO's Generation Information Page[9]

3.2 Retired generation

There was no generation retired in this quarter.

Munmorah generating units number 3 and number 4 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 met during the study period because of reduced generation caused by water availability and other energy constraints. As the studies are probabilistic in nature, AEMO performed 400 simulations for each scenario using both 10% probability of exceedence (POE) and 50% POE demand forecasts. AEMO averages the results of these simulation studies, as explained in Section 5.2 of the EAAP guidelines[10]. The methodology applies a higher weighting to the more likely 50% POE results, while accounting for the influence of the less likely 10% POE results. The methodology applied is as follows:

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

The following tables show the average monthly regional energy demand (in gigawatt hours) at risk. The forecast USE figures in the tables should not be interpreted as certainty of blackouts, but as an estimate of risk of what could occur based on the forecast assumptions.

[9] Available at: http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information. Last updated 15 November 2013.
[10] EAAP Guidelines. Available at: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx.

4.1 Scenario 1: Low rainfall – forecast USE (GWh)

TABLE 5: FORECAST USE IN SCENARIO 1 – LOW RAINFALL

	NSW	QLD	SA	TAS	VIC
Jan-14	-	-	0.0021	-	0.0006
Feb-14	-	-	0.0009	-	-
Mar-14	-	-	-	-	0.0010
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	-	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	-	0.0001	-	-
Total GWh	-	-	0.0030	-	0.0016
Region %	-	-	-	-	-
Jan-15	-	0.0032	0.0017	-	0.0011
Feb-15	-	0.0054	-	-	-
Mar-15	-	-	-	-	0.0011
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Jul-15	-	-	-	-	-
Aug-15	-	-	-	-	-
Sep-15	-	0.0079	-	-	-
Oct-15	-	-	-	-	-
Nov-15	-	-	-	-	-
Dec-15	-	0.0008	-	-	-
Total GWh	-	0.0173	0.0017	-	0.0023
Region %	-	-	-	-	-

4.2 Scenario 2: Short term average rainfall – forecast USE (GWh)

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

	NSW	QLD	SA	TAS	VIC
Jan-14	-	-	0.0015	-	0.0007
Feb-14	-	-	0.0007	-	-
Mar-14	-	-	-	-	0.0008
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	-	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	-	0.0001	-	-
Total GWh	-	-	0.0023	-	0.0016
Region %	-	-	-	-	-
Jan-15	-	0.0032	0.0016	-	0.0008
Feb-15	-	0.0054	-	-	-
Mar-15	-	-	-	-	0.0011
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Jul-15	-	-	-	-	-
Aug-15	-	-	-	-	-
Sep-15	-	0.0079	-	-	-
Oct-15	-	-	-	-	-
Nov-15	-	-	-	-	-
Dec-15	-	0.0008	-	-	-
Total GWh	-	0.0173	0.0016	-	0.0019
Region %	-	-	-	-	-

4.3 Scenario 3: Long term average rainfall – forecast USE (GWh)

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

	NSW	QLD	SA	TAS	VIC
Jan-14	-	-	0.0015	-	0.0008
Feb-14	-	-	0.0006	-	-
Mar-14	-	-	-	-	0.0010
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	-	-	-
Jul-14	-	-	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	-	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	-	0.0001	-	-
Total GWh	-	-	0.0022	-	0.0018
Region %	-	-	-	-	-
Jan-15	-	0.0031	0.0016	-	0.0008
Feb-15	-	0.0054	-	-	-
Mar-15	-	-	-	-	0.0011
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Jul-15	-	-	-	-	-
Aug-15	-	-	-	-	-
Sep-15	-	0.0079	-	-	-
Oct-15	-	-	-	-	-
Nov-15	-	-	-	-	-
Dec-15	-	0.0008	-	-	-
Total GWh	-	0.0173	0.0016	-	0.0019
Region %	-	-	-	-	-

4.4 Forecast NEM-wide monthly energy generation (GWh)

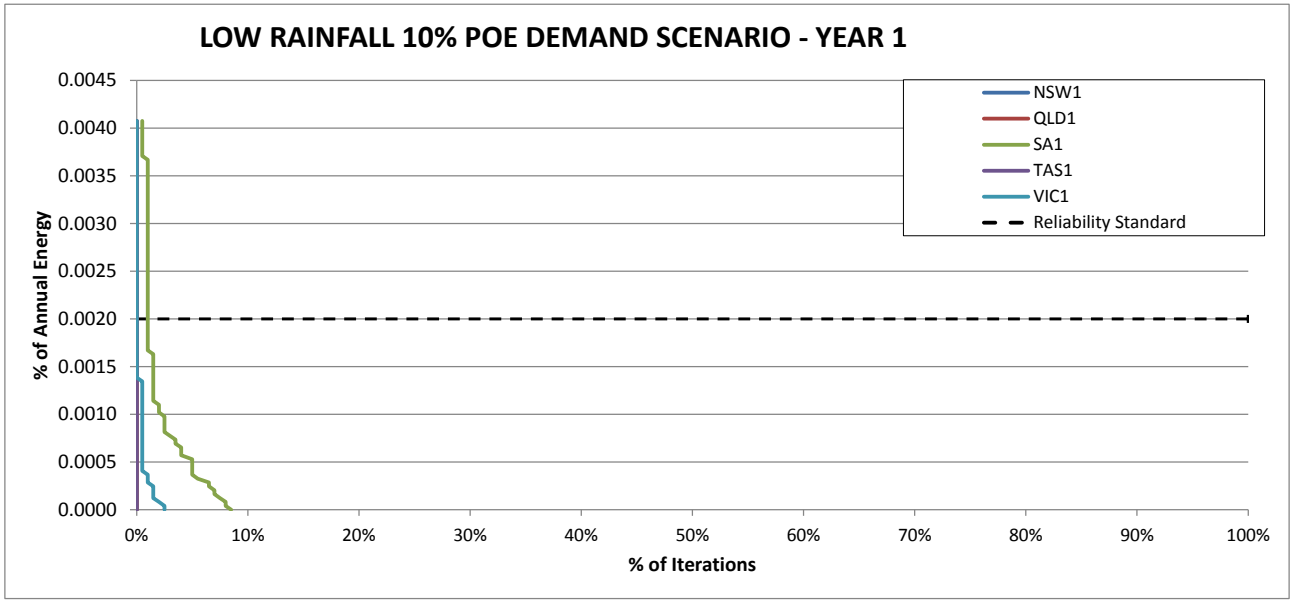
TABLE 8: FORECAST MONTHLY NEM-WIDE ENERGY GENERATION

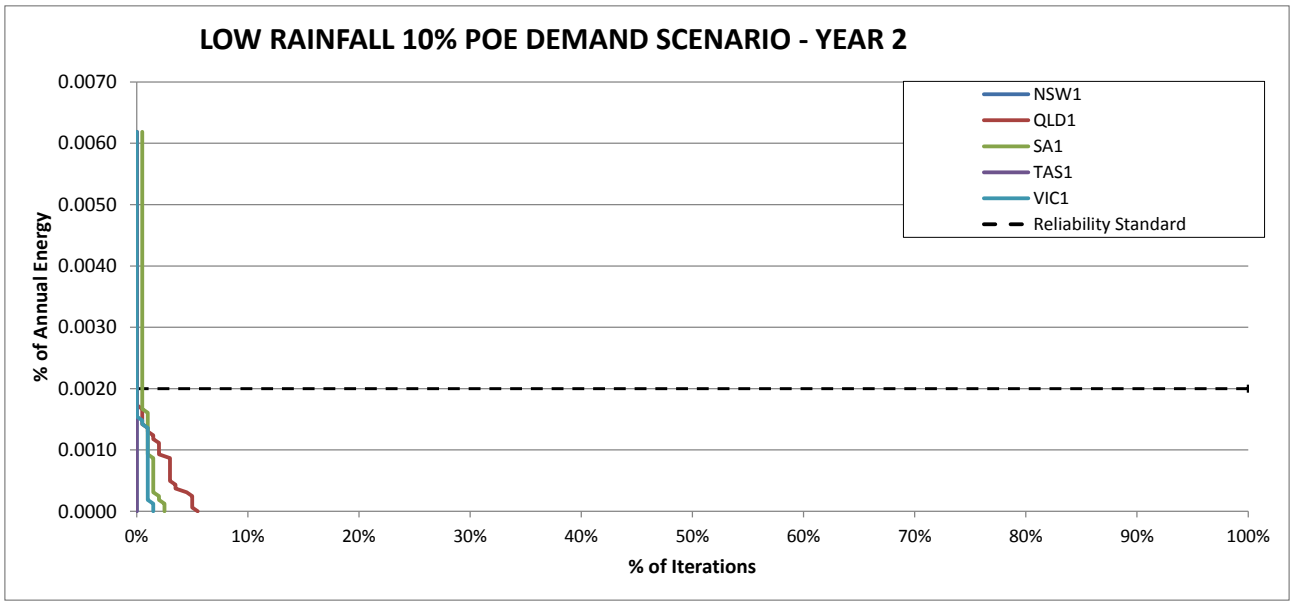
	Low rainfall	Short term average rainfall	Long term average rainfall
Jan-14	17,209	17,209	17,170
Feb-14	15,580	15,595	15,594
Mar-14	16,642	16,606	16,635
Apr-14	15,351	15,322	15,328
May-14	16,782	16,775	16,754
Jun-14	16,505	16,542	16,517
Jul-14	17,724	17,717	17,725
Aug-14	17,201	17,217	17,223
Sep-14	15,966	15,967	15,966
Oct-14	16,353	16,338	16,338
Nov-14	15,977	16,014	15,965
Dec-14	16,708	16,757	16,736
Total GWh	197,997	198,058	197,952
Jan-15	17,749	17,808	17,741
Feb-15	16,156	16,143	16,124
Mar-15	17,213	17,221	17,216
Apr-15	15,827	15,830	15,835
May-15	17,232	17,262	17,244
Jun-15	17,116	17,133	17,107
Jul-15	18,018	18,041	18,012
Aug-15	17,433	17,437	17,427
Sep-15	16,128	16,137	16,127
Oct-15	16,544	16,556	16,551
Nov-15	16,373	16,392	16,377
Dec-15	16,961	16,981	16,946
Total GWh	202,750	202,941	202,705

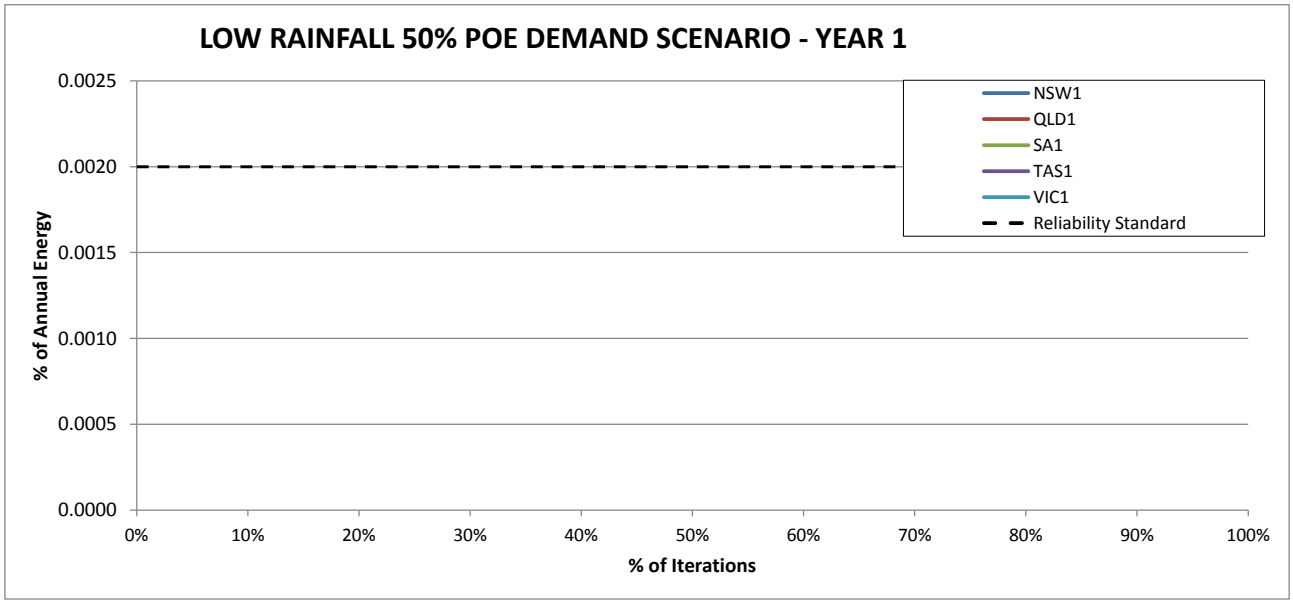
4.5 USE distributions

The USE distribution graphs below show the number of EAAP simulation studies (Monte Carlo iterations) that exceeded the 0.002% USE level. The USE values are expressed as a percentage of regional energy.

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



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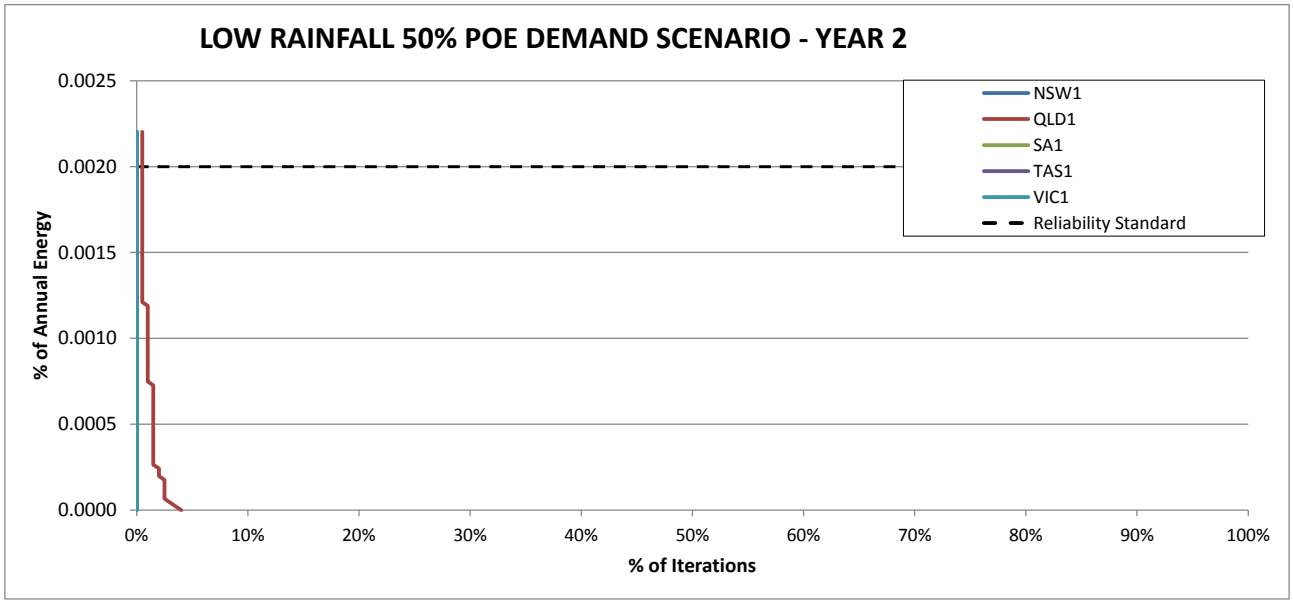
LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
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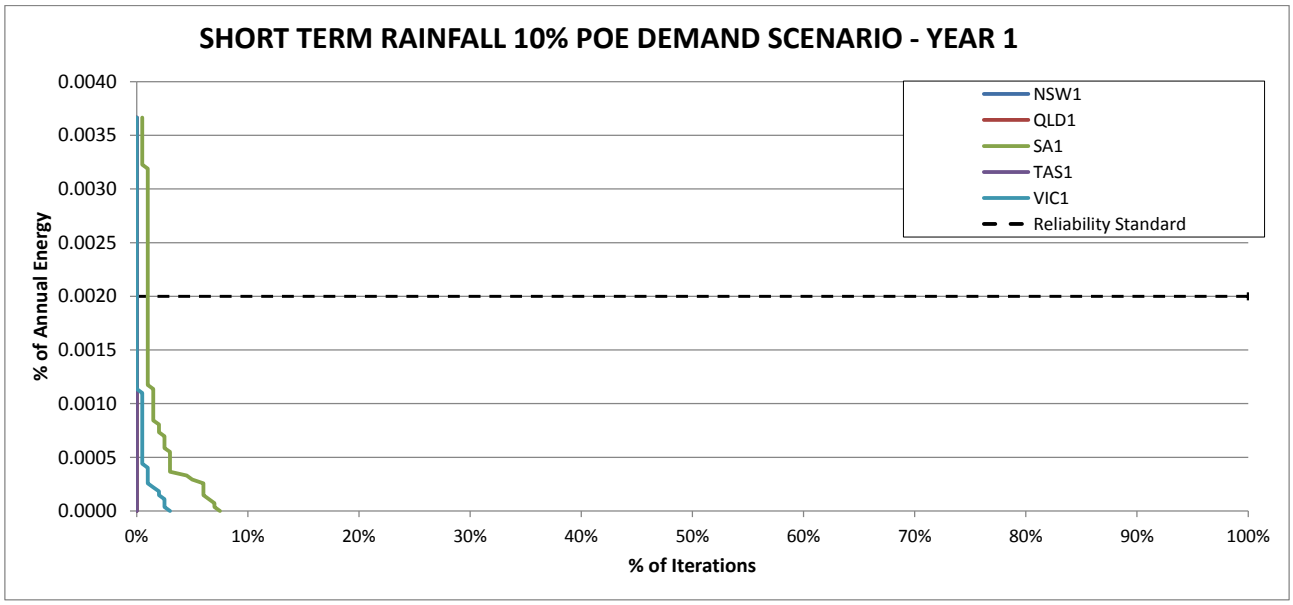
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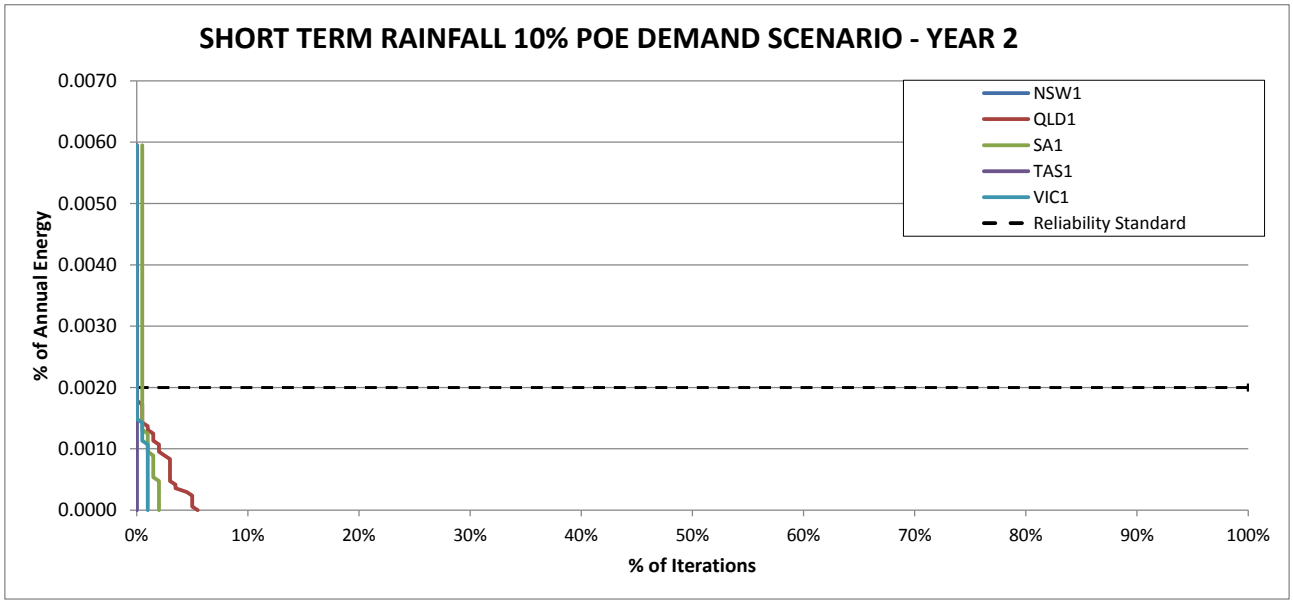
SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
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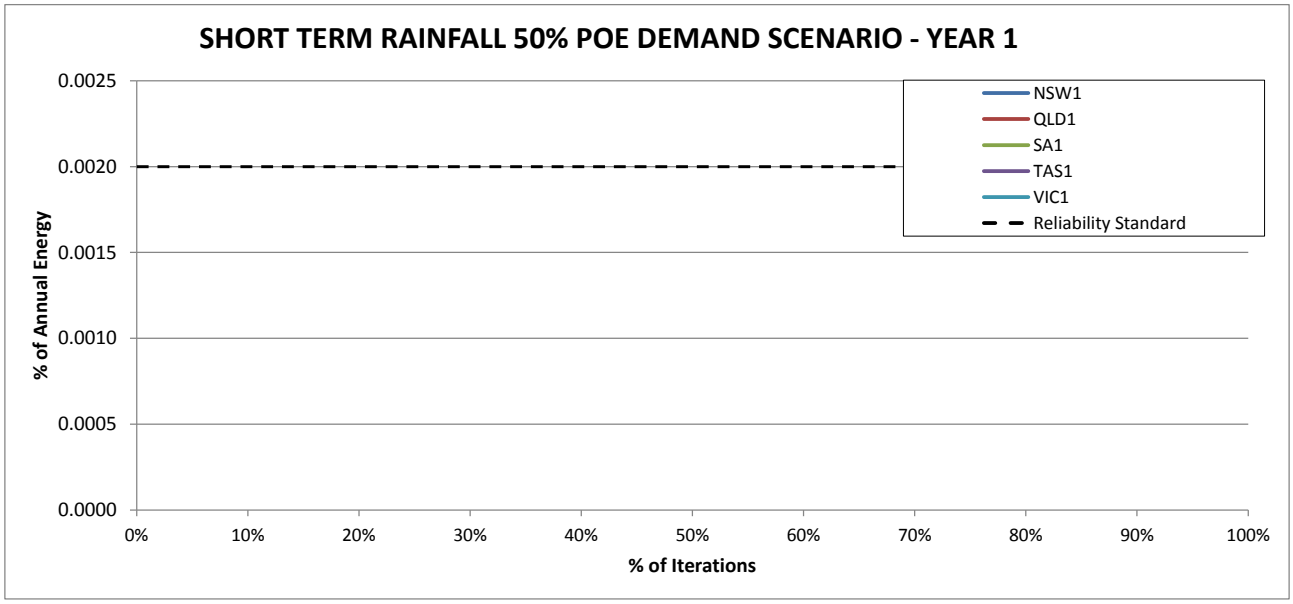
Reliability Standard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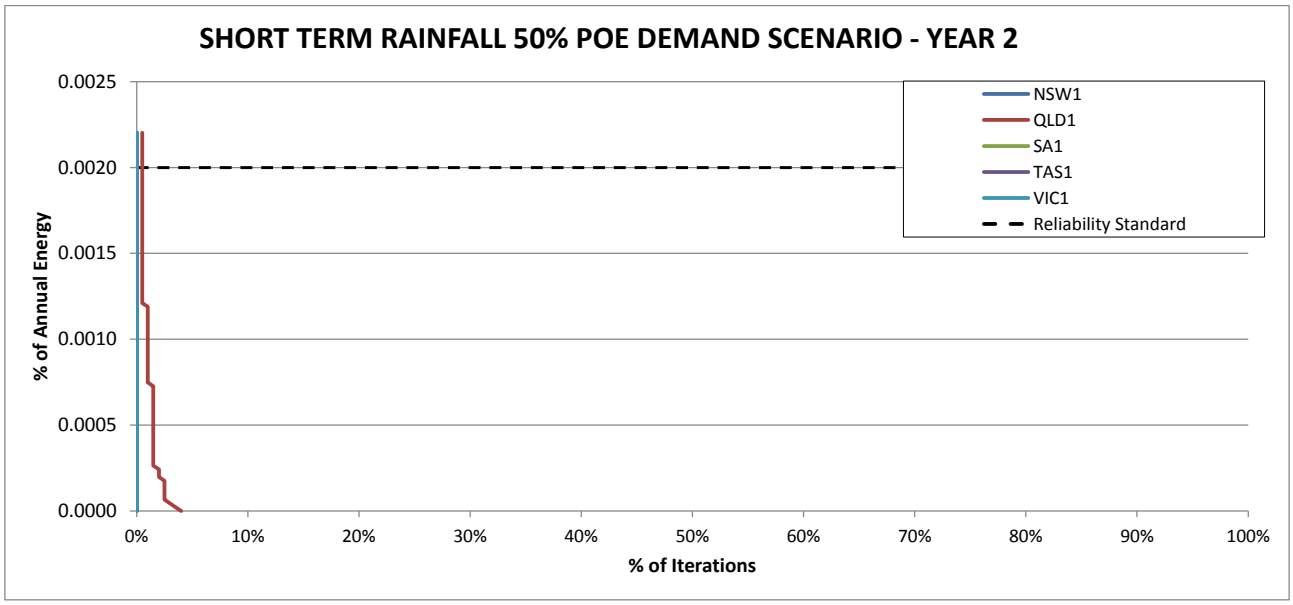
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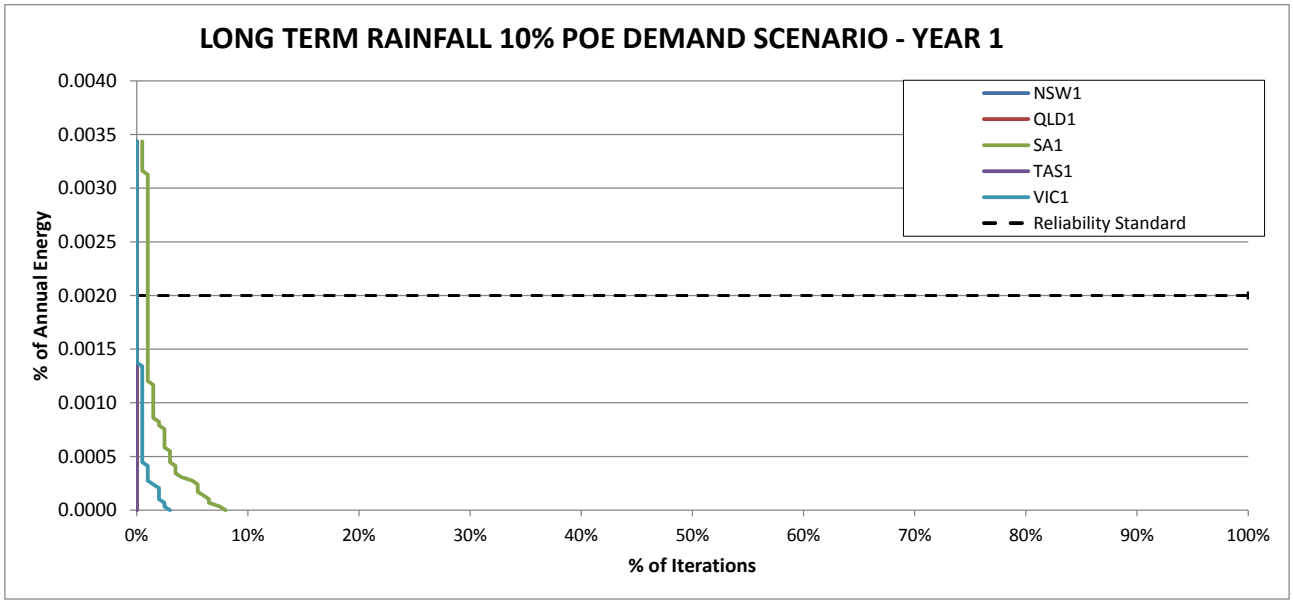
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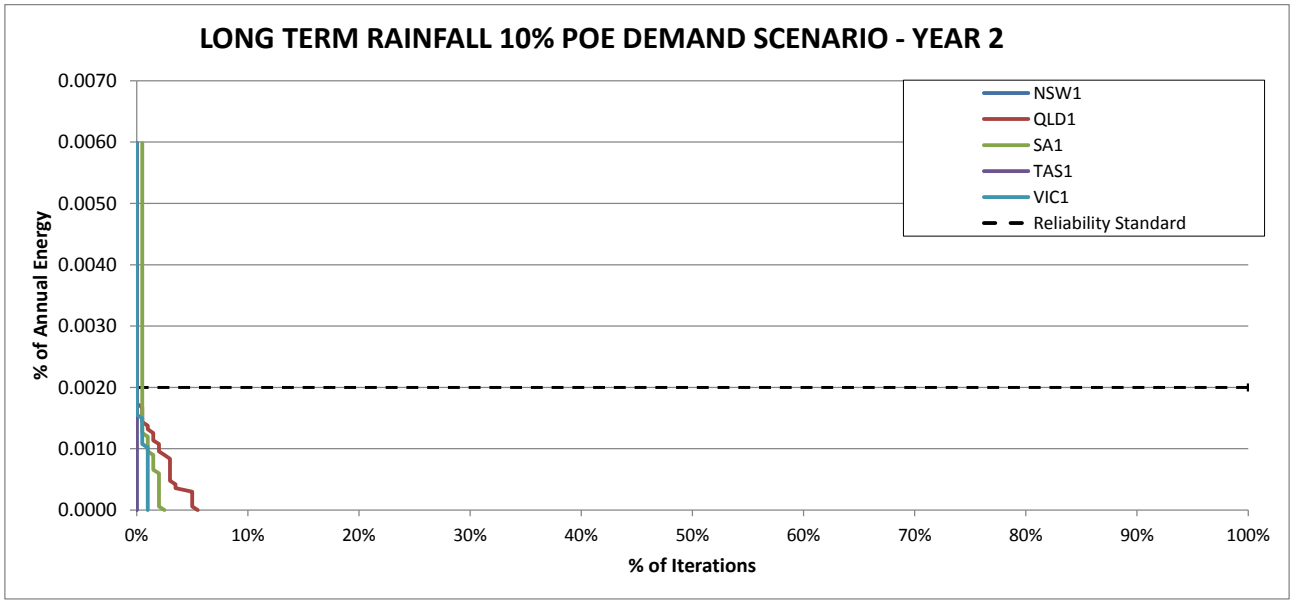
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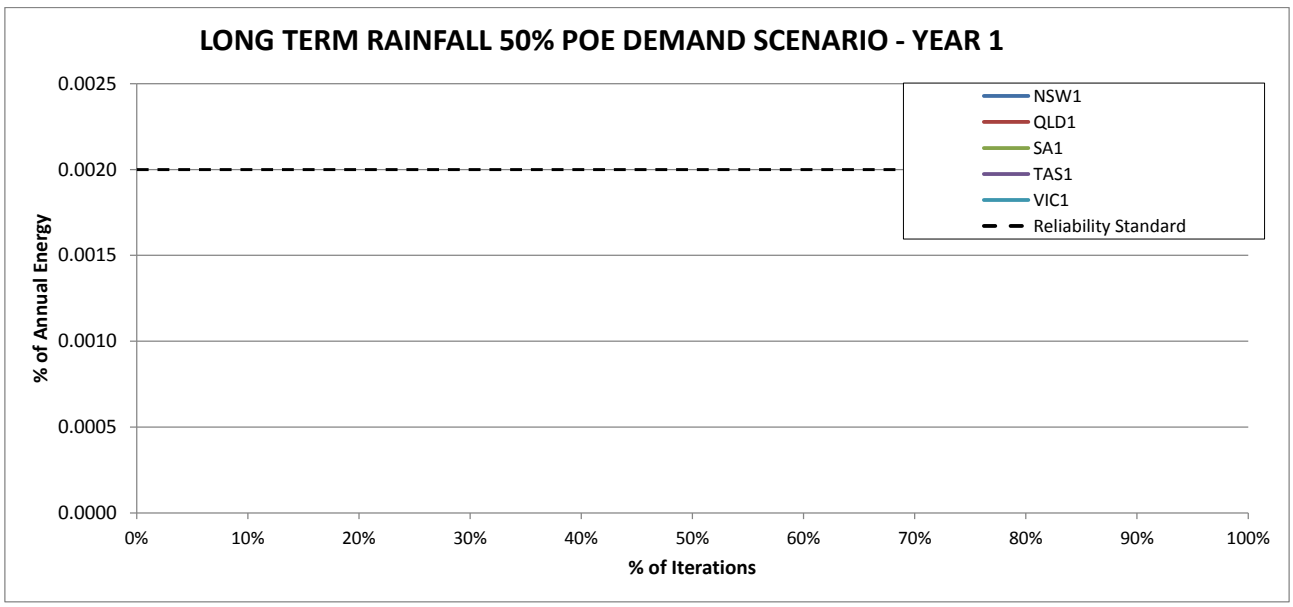
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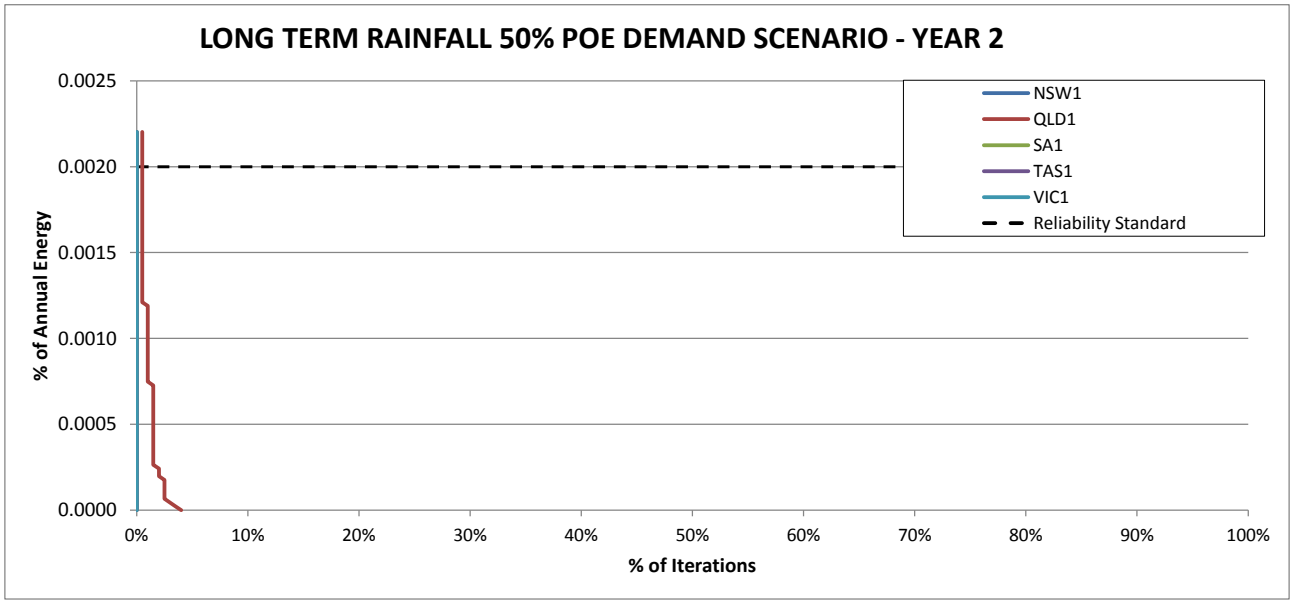
VIC1
Reliability Standard


LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard