AEMO EAAP REPORT UPDATE DECEMBER 2010

PREPARED BY:	Electricity System Operations Planning and Performance Division
APPROVED BY:	Mark Miller – Executive General Manager System Operations
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1 INTRODUCTION

AEMO is required by the National Electricity Rule 3.7C(d) to publish an *EAAP*[1] on a quarterly basis. The National Electricity Rule 3.7C(n) requires *AEMO* to comply with *EAAP guidelines*[2] in preparing *EAAP*.

The *EAAP* replaces the quarterly AEMO Drought Scenarios Investigation Report[3], 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. This involves the use of time-sequential, security constrained optimal dispatch simulations, incorporating Monte-Carlo Simulations.

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

1.1 December 2010 *EAAP* Report

Study period[4] for this *EAAP* report: **01-01-2011 to 31-12-2012**

Closing date for submitting Variable GELF Parameters by

Scheduled Generators: **19-11-2010**

For the purpose of this report 'Year 1' is defined as 01-01-2011 to 31-12-2011, and 'Year 2' is defined as 01-01-2012 to 31-12-2012.

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[5].

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.

[1] 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.'

[2] 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

[3] Previous AEMO EAAP and Drought Report Updates are available at the following location on *AEMO* website:
http://www.aemo.com.au/electricityops/eaap.html

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

[5] 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 and outputs

Scheduled generating units submitted Variable GELF Parameters[6]. These included all the *scheduled generating units* that have provided their generation constraints under various rainfall scenarios for the December 2010 *EAAP*.

The demand profiles used in December 2010 *EAAP* are consistent with the energy and demand projections that have been published in 2010 Electricity Statement of Opportunities (ESOO). Estimates of demand side participation published as "Very Likely" in the 2010 ESOO have also been used as an input in December 2010 *EAAP*.

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. Private *EAAP* reports 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 2010 covers the requirement to publish the *EAAP* Public Report (i.e. first report stated above).

1.3 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 2010, so the results should be regarded as reflecting an input 'snapshot' taken 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 *unserved energy* (*USE*) figures for each region, and provide comparisons between the *EAAP* published in September 2010 and the December 2010

[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."

EAAP report. The grey shading highlights where the annual *USE* is higher than the Reliability Panel standard of 0.002%[7].

The December 2010 *EAAP* results forecast small increases in *USE* for Queensland, New South Wales, Victoria and South Australia for Year 1 of the low rainfall scenario. The marginal levels of *USE* forecast for these four regions are below the Reliability Panel Standard of 0.002%.

There was no noticeable forecast *USE* for Tasmania in the September and December 2010 *EAAP* studies for Year 1 and 2 of the low rainfall scenario.

The December 2010 *EAAP* forecasts a marginal decrease in *USE* for New South Wales, South Australia and Victoria and a marginal increase for Queensland and Tasmania for the Year 2 of the low rainfall scenario, compared to September 2010 *EAAP*. The forecast *USE* is above the Reliability Panel Standard of 0.002% for Victoria and South Australia regions for the Year 2 in the low rainfall scenario. The forecast *USE* is below the Reliability Panel Standard of 0.002% for all other regions.

The forecast *USE* is higher than the Reliability Panel Standard in the Year 2 of the low rainfall scenario for Victoria and South Australia due to energy restrictions on a power station in Victoria.

Forecast *USE* in all regions is below 0.002% for both years of the short term and long term average rainfall scenarios.

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

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	September 2010 Update	0.0001%	0.0000%	0.0002%	0.0000%	0.0003%
	December 2010 Update	0.0002%	0.0001%	0.0004%	0.0000%	0.0004%
Year 2	September 2010 Update	0.0006%	0.0002%	0.0022%	0.0000%	0.0067%
	December 2010 Update	0.0002%	0.0005%	0.0021%	0.0001%	0.0058%

[7] The Reliability Panel establish the standard for supply reliability in the *NEM*, which is 0.002% *unserved 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 2010 Update	0.0001%	0.0000%	0.0002%	0.0000%	0.0003%
	December 2010 Update	0.0001%	0.0001%	0.0004%	0.0000%	0.0004%
Year 2	September 2010 Update	0.0000%	0.0001%	0.0000%	0.0000%	0.0001%
	December 2010 Update	0.0000%	0.0004%	0.0000%	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 2010 Update	0.0001%	0.0000%	0.0001%	0.0000%	0.0003%
	December 2010 Update	0.0001%	0.0001%	0.0004%	0.0000%	0.0004%
Year 2	September 2010 Update	0.0000%	0.0001%	0.0000%	0.0000%	0.0001%
	December 2010 Update	0.0002%	0.0005%	0.0000%	0.0000%	0.0002%

3 NEW GENERATION AND GENERATION RETIREMENTS

3.1 New Generator Projects

Based on the information published on the Generation Information Page[8], as well as on the subsequent updates received, the following committed significant generator projects have been included in the model:

[8] The Generation Information Page is available on *AEMO* website at: http://www.aemo.com.au/data/gendata.shtml

TABLE 4: NEW GENERATORS

Station	State	Capacity	When
Mortlake Stage 1	VIC	553 MW (winter) 518 MW (summer)	Winter 2011
Oaklands wind farm	VIC	67 MW	Summer 2011/12
Hallett 5 (The Bluff) wind farm	SA	53 MW	Summer 2011/12

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 2010 *EAAP* report.

Swanbank 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*[9], 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 Plan[10], 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 *EAAP* modelling is probabilistic in nature because it is not possible to be certain about future customer demand or generator failures, etc. As a result, 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. 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.

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

[10] 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 *Unserved Energy* (GWh)

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

	NSW	QLD	SA	TAS	VIC
Jan-11	0.030	0.018	0.003	0.000	0.033
Feb-11	0.092	0.019	0.000	0.000	0.066
Mar-11	0.000	0.003	0.049	0.000	0.109
Apr-11	0.000	0.000	0.000	0.000	0.000
May-11	0.000	0.000	0.000	0.000	0.000
Jun-11	0.000	0.000	0.000	0.000	0.000
Jul-11	0.000	0.000	0.000	0.000	0.000
Aug-11	0.000	0.000	0.000	0.000	0.000
Sep-11	0.000	0.000	0.000	0.000	0.000
Oct-11	0.000	0.000	0.000	0.000	0.000
Nov-11	0.000	0.000	0.000	0.000	0.000
Dec-11	0.000	0.002	0.000	0.000	0.000
Total GWh	0.123	0.042	0.051	0.000	0.208
Region %	0.0002%	0.0001%	0.0004%	0.0000%	0.0004%
Jan-12	0.002	0.016	0.007	0.000	0.169
Feb-12	0.146	0.190	0.046	0.000	1.992
Mar-12	0.000	0.012	0.227	0.000	0.864
Apr-12	0.000	0.000	0.000	0.000	0.000
May-12	0.000	0.000	0.000	0.000	0.000
Jun-12	0.000	0.000	0.000	0.000	0.000
Jul-12	0.002	0.000	0.000	0.000	0.000
Aug-12	0.000	0.000	0.000	0.000	0.000
Sep-12	0.000	0.000	0.000	0.000	0.000
Oct-12	0.000	0.000	0.000	0.000	0.000
Nov-12	0.000	0.003	0.000	0.000	0.000
Dec-12	0.000	0.055	0.000	0.005	0.040
Total GWh	0.150	0.276	0.280	0.005	3.064
Region %	0.0002%	0.0005%	0.0021%	0.0001%	0.0058%

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-11	0.019	0.022	0.002	0.000	0.026
Feb-11	0.076	0.019	0.000	0.000	0.056
Mar-11	0.000	0.003	0.047	0.000	0.106
Apr-11	0.000	0.000	0.000	0.000	0.000
May-11	0.000	0.000	0.000	0.000	0.000
Jun-11	0.000	0.000	0.000	0.000	0.000
Jul-11	0.000	0.000	0.000	0.000	0.000
Aug-11	0.000	0.000	0.000	0.000	0.000
Sep-11	0.000	0.000	0.000	0.000	0.000
Oct-11	0.000	0.000	0.000	0.000	0.000
Nov-11	0.000	0.000	0.000	0.000	0.000
Dec-11	0.000	0.002	0.000	0.000	0.000
Total GWh	0.096	0.047	0.049	0.000	0.188
Region %	0.0001%	0.0001%	0.0004%	0.0000%	0.0004%
Jan-12	0.003	0.019	0.000	0.000	0.011
Feb-12	0.006	0.162	0.000	0.000	0.017
Mar-12	0.000	0.012	0.006	0.000	0.019
Apr-12	0.000	0.000	0.000	0.000	0.000
May-12	0.000	0.000	0.000	0.000	0.000
Jun-12	0.000	0.000	0.000	0.000	0.000
Jul-12	0.001	0.000	0.000	0.000	0.000
Aug-12	0.000	0.000	0.000	0.000	0.000
Sep-12	0.000	0.000	0.000	0.000	0.000
Oct-12	0.000	0.000	0.000	0.000	0.000
Nov-12	0.000	0.003	0.000	0.000	0.000
Dec-12	0.000	0.054	0.000	0.000	0.000
Total GWh	0.009	0.250	0.006	0.000	0.047
Region %	0.0000%	0.0004%	0.0000%	0.0000%	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-11	0.021	0.022	0.002	0.000	0.021
Feb-11	0.083	0.019	0.000	0.000	0.059
Mar-11	0.001	0.003	0.047	0.000	0.105
Apr-11	0.000	0.000	0.000	0.000	0.000
May-11	0.000	0.000	0.000	0.000	0.000
Jun-11	0.000	0.000	0.000	0.000	0.000
Jul-11	0.000	0.000	0.000	0.000	0.000
Aug-11	0.000	0.000	0.000	0.000	0.000
Sep-11	0.000	0.000	0.000	0.000	0.000
Oct-11	0.000	0.000	0.000	0.000	0.000
Nov-11	0.000	0.000	0.000	0.000	0.000
Dec-11	0.000	0.002	0.000	0.000	0.000
Total GWh	0.104	0.046	0.049	0.000	0.185
Region %	0.0001%	0.0001%	0.0004%	0.0000%	0.0004%
Jan-12	0.002	0.017	0.000	0.000	0.008
Feb-12	0.141	0.209	0.000	0.000	0.086
Mar-12	0.000	0.012	0.006	0.000	0.021
Apr-12	0.000	0.000	0.000	0.000	0.000
May-12	0.000	0.000	0.000	0.000	0.000
Jun-12	0.000	0.000	0.000	0.000	0.000
Jul-12	0.001	0.000	0.000	0.000	0.000
Aug-12	0.000	0.000	0.000	0.000	0.000
Sep-12	0.000	0.000	0.000	0.000	0.000
Oct-12	0.000	0.000	0.000	0.000	0.000
Nov-12	0.000	0.003	0.000	0.000	0.000
Dec-12	0.000	0.054	0.000	0.000	0.000
Total GWh	0.144	0.294	0.007	0.000	0.115
Region %	0.0002%	0.0005%	0.0000%	0.0000%	0.0002%

4.4 FORECAST MONTHLY ENERGY GENERATION ON *NEM*-WIDE BASIS

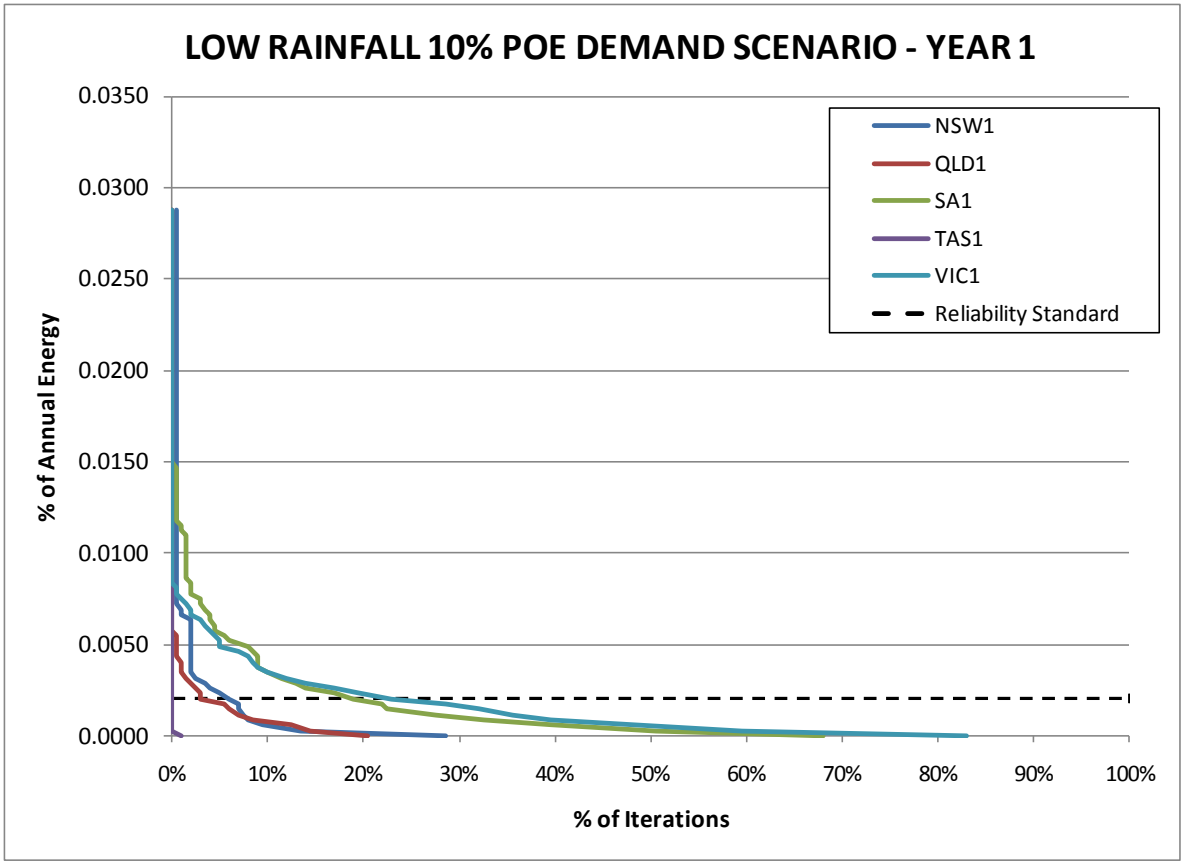
TABLE 8: FORECAST MONTHLY ENERGY GENERATION ON *NEM*-WIDE BASIS

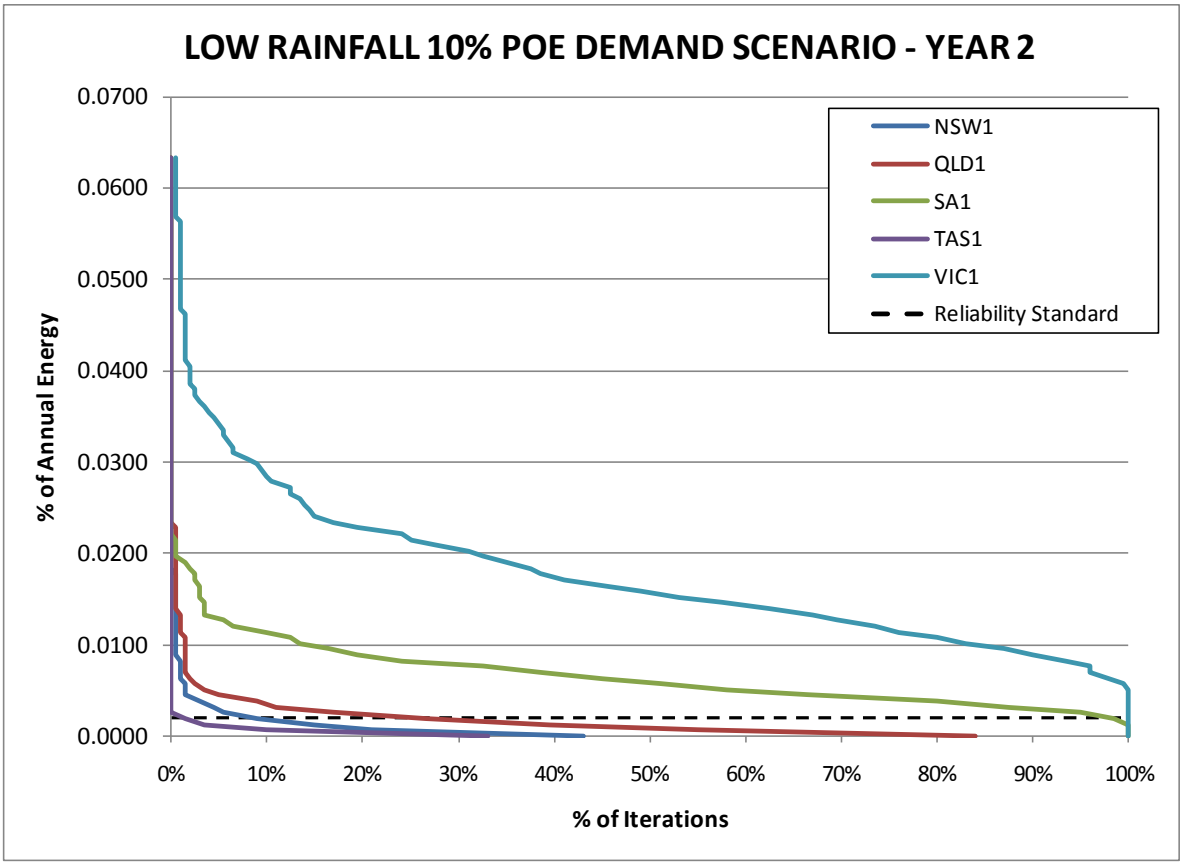
	Low Rainfall	Short-Term Average Rainfall	Long-Term Average Rainfall
Jan-11	18849.229	18840.154	18849.463
Feb-11	16980.842	16952.395	16923.221
Mar-11	18200.898	18186.414	18179.426
Apr-11	16504.072	16501.299	16485.418
May-11	18308.080	18329.818	18297.191
Jun-11	18003.533	18016.277	17986.215
Jul-11	19164.906	19159.428	19156.533
Aug-11	18757.217	18776.293	18752.732
Sep-11	17241.354	17253.027	17235.080
Oct-11	17366.010	17363.727	17379.123
Nov-11	17505.291	17523.699	17510.215
Dec-11	18157.709	18098.459	18121.477
Total GWh	215039.141	215001.000	214876.094
Jan-12	19282.297	19197.426	19225.100
Feb-12	18129.918	18051.861	18086.934
Mar-12	18716.119	18679.807	18736.004
Apr-12	16943.307	16939.910	16952.664
May-12	18704.473	18731.111	18704.174
Jun-12	18430.373	18437.074	18443.227
Jul-12	19663.748	19666.258	19709.701
Aug-12	19234.084	19252.627	19243.428
Sep-12	17540.783	17523.906	17537.623
Oct-12	17917.129	17912.176	17924.986
Nov-12	17899.631	17924.826	17893.879
Dec-12	18557.451	18586.721	18545.701
Total GWh	221019.313	220903.703	221003.422

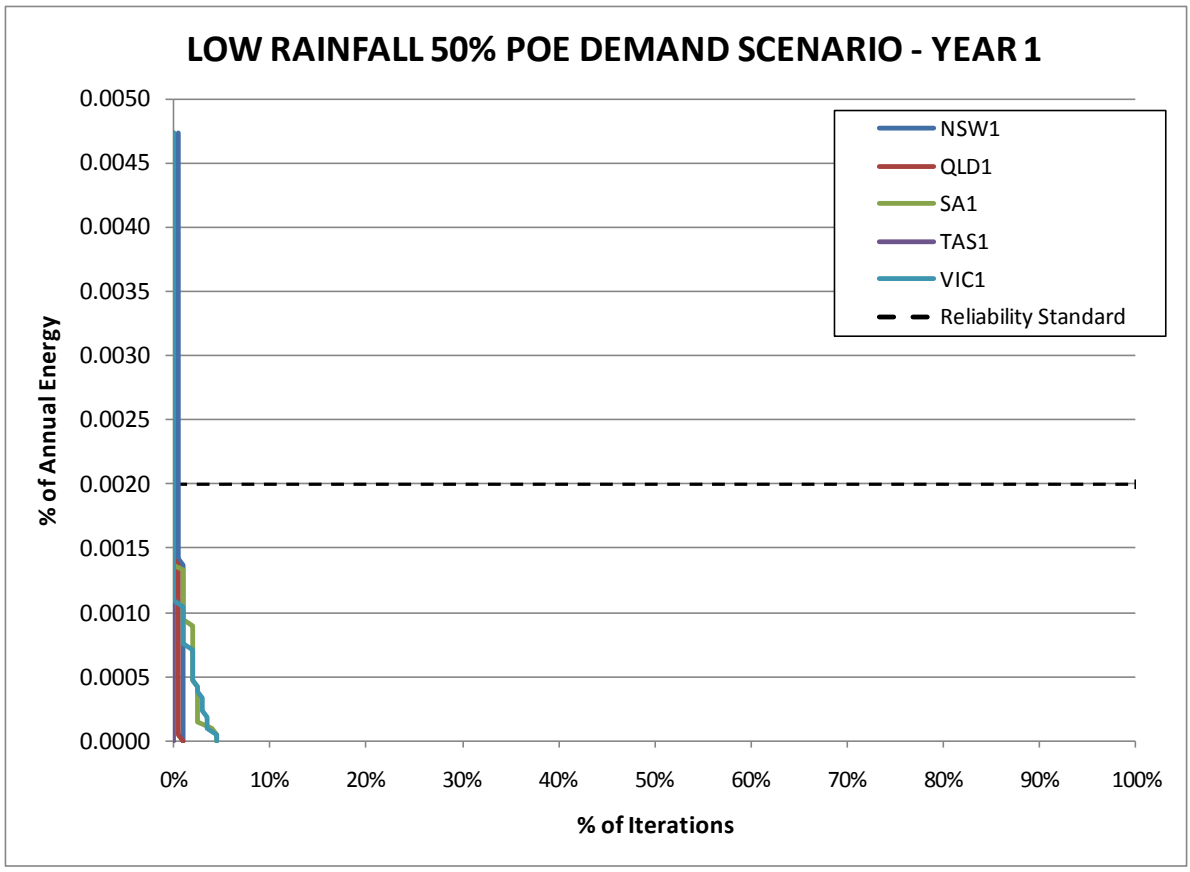
4.5 *USE* Distributions

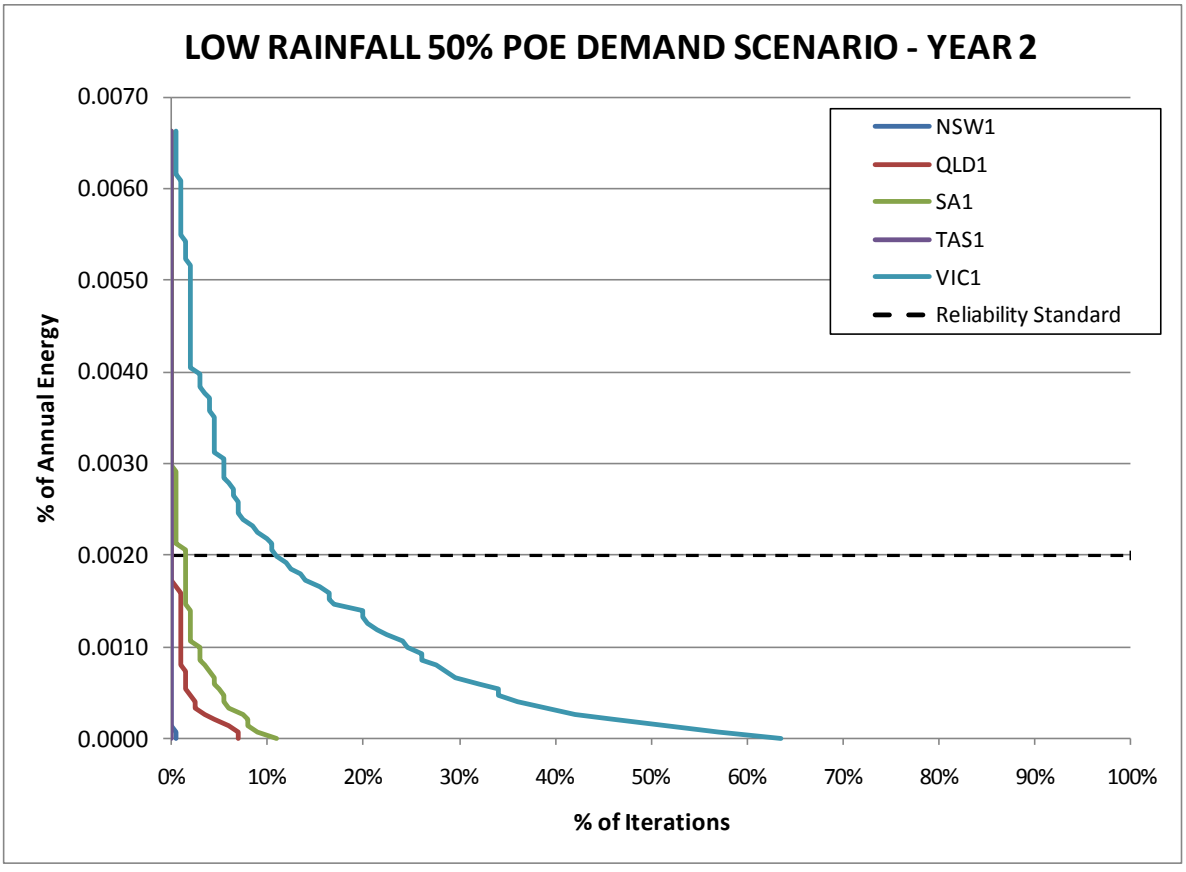
The *USE* distribution graphs are used to show how many *EAAP* simulation studies (Monte Carlo iterations) exceeded a given *USE* level. The *USE* values are expressed as a percentage of regional energy. This is to allow easier reference to the Reliability Panel standard of 0.002% *USE*.

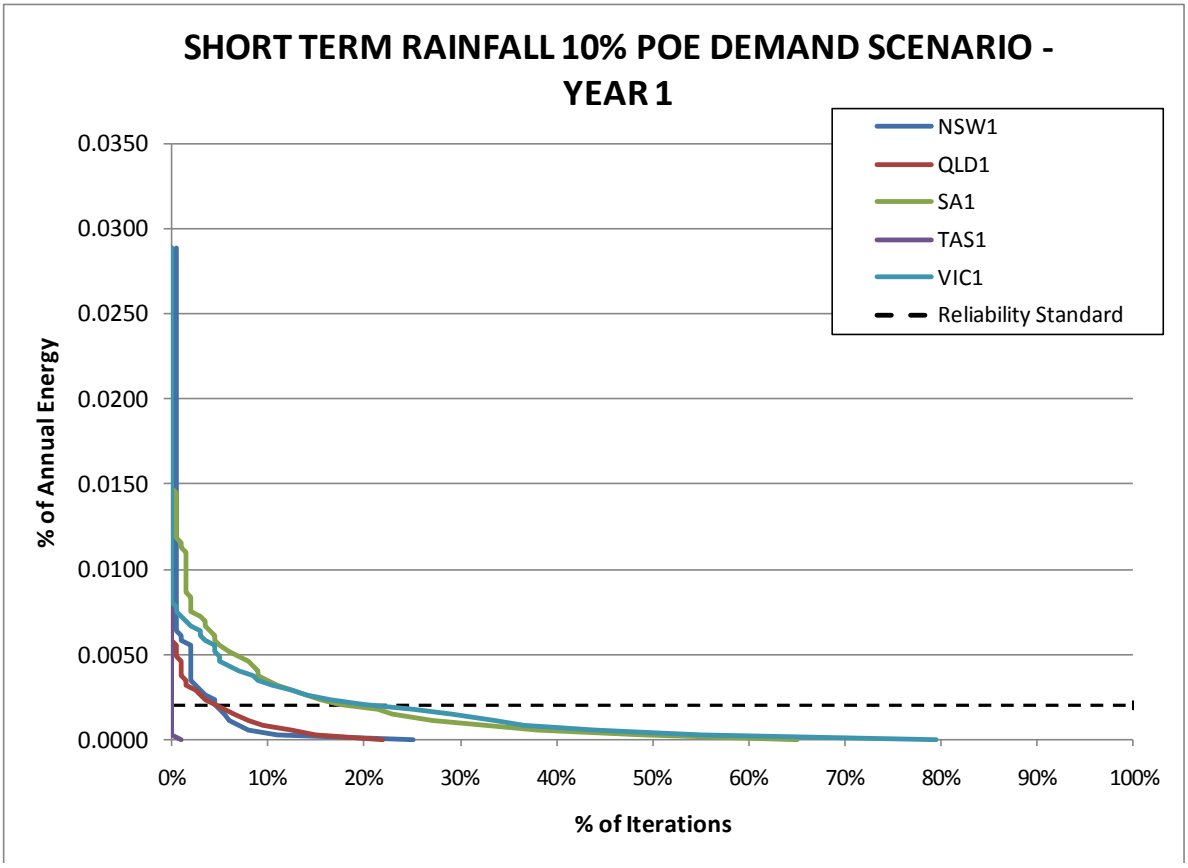
Separate graphs are presented for the 10% and 50% POE simulations.

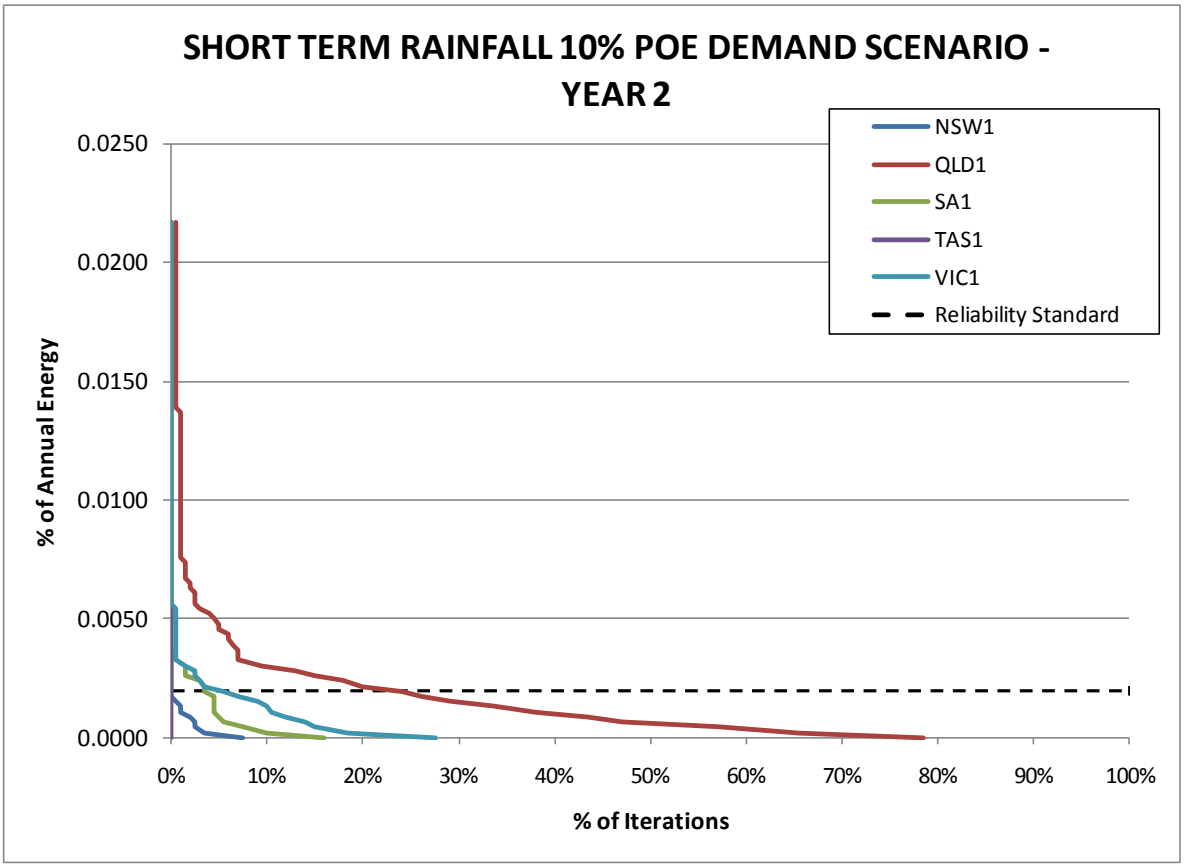

LOW RAINFALL 10% POE DEMAND SCENARIO - YEAR 1
0.0350
0.0300
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard

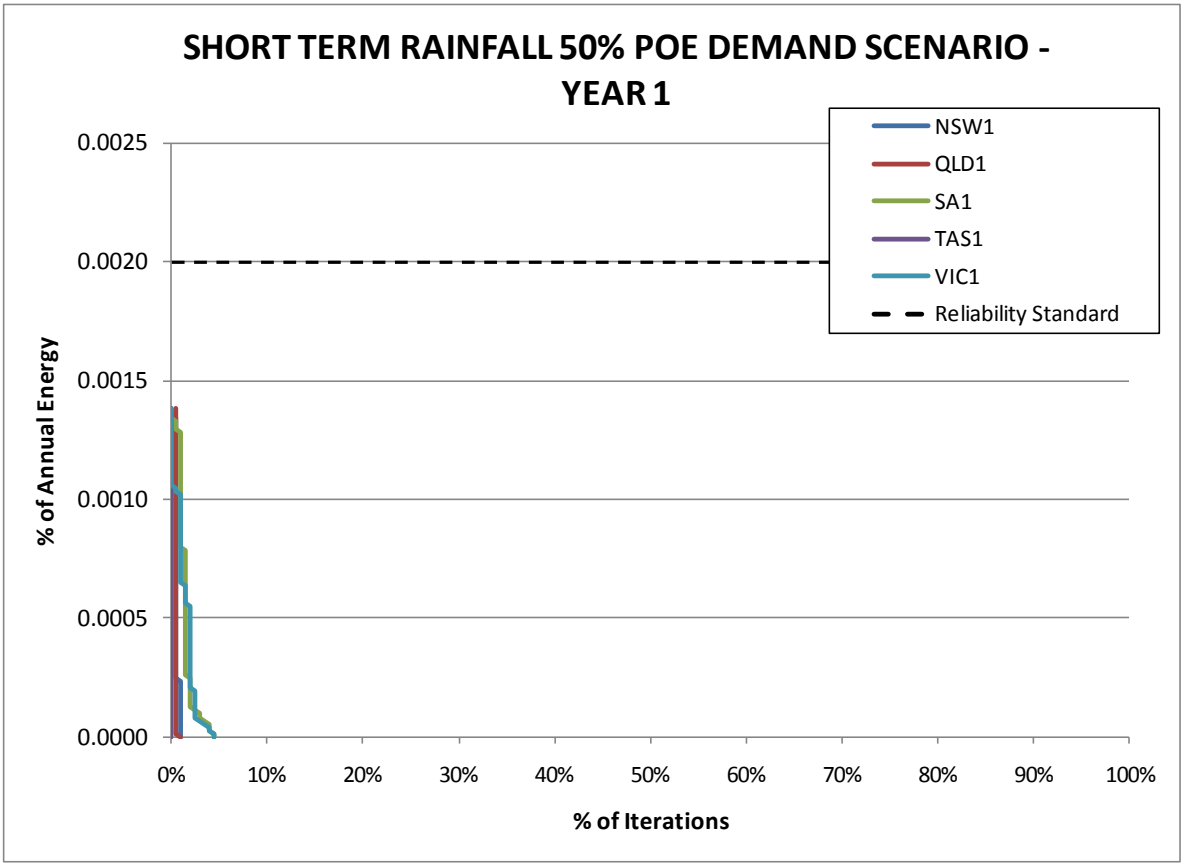

LOW RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
0.0700
0.0600
0.0500
0.0400
0.0300
0.0200
0.0100
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard

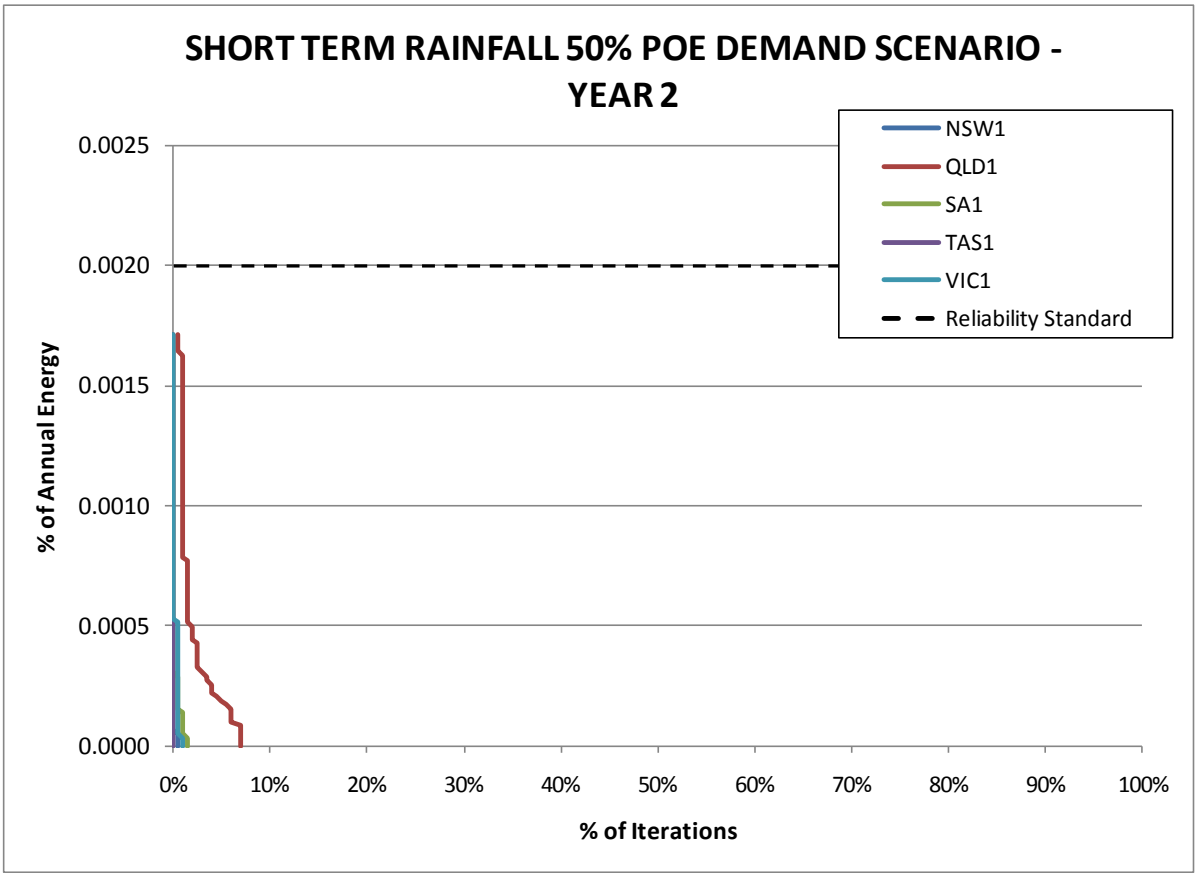

LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard

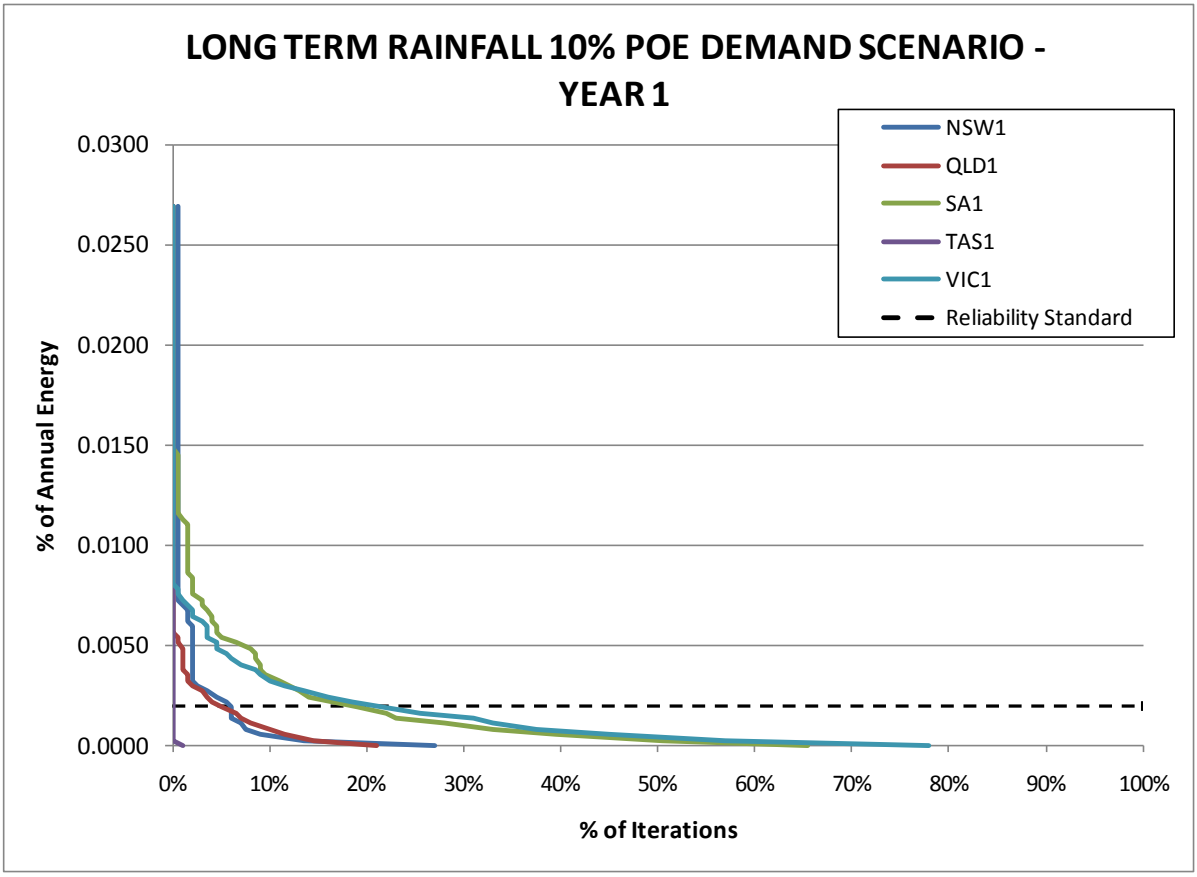

LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard

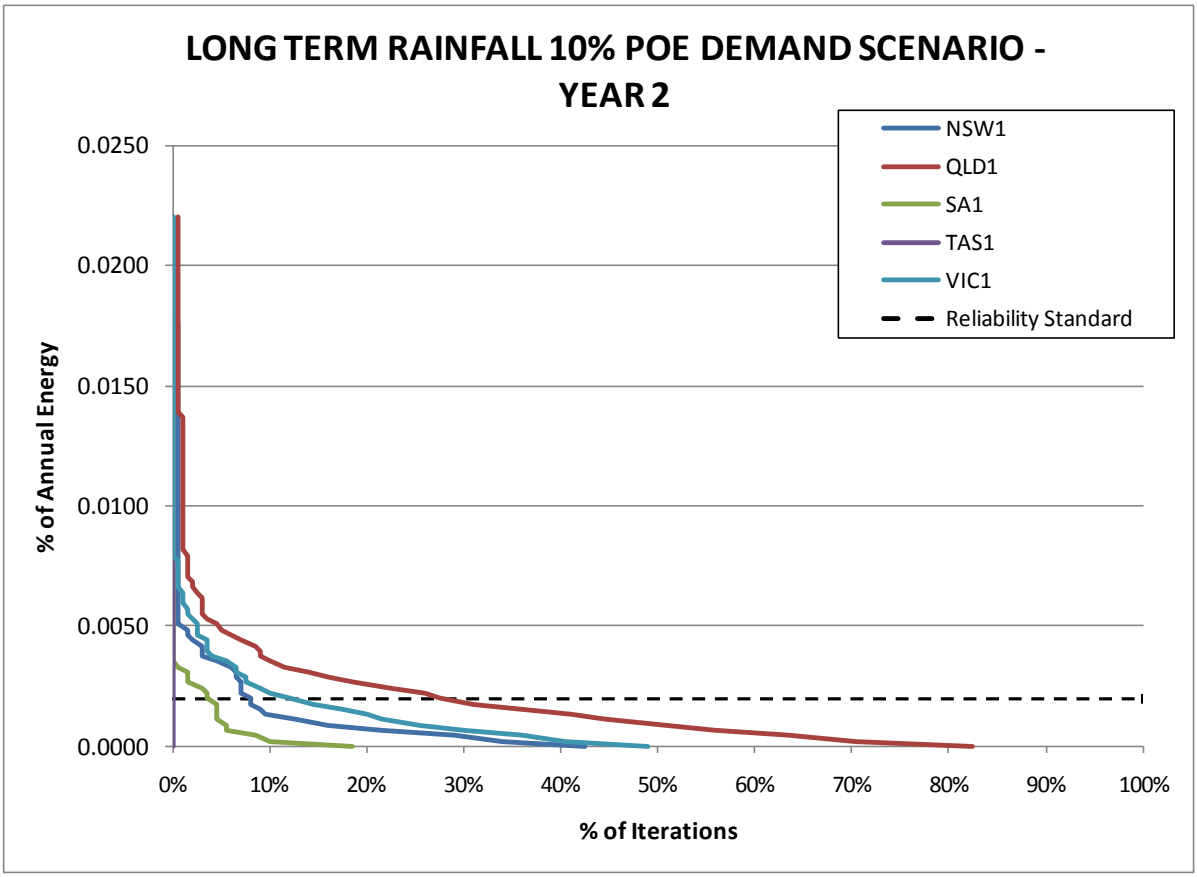

SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
0.0350
0.0300
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations

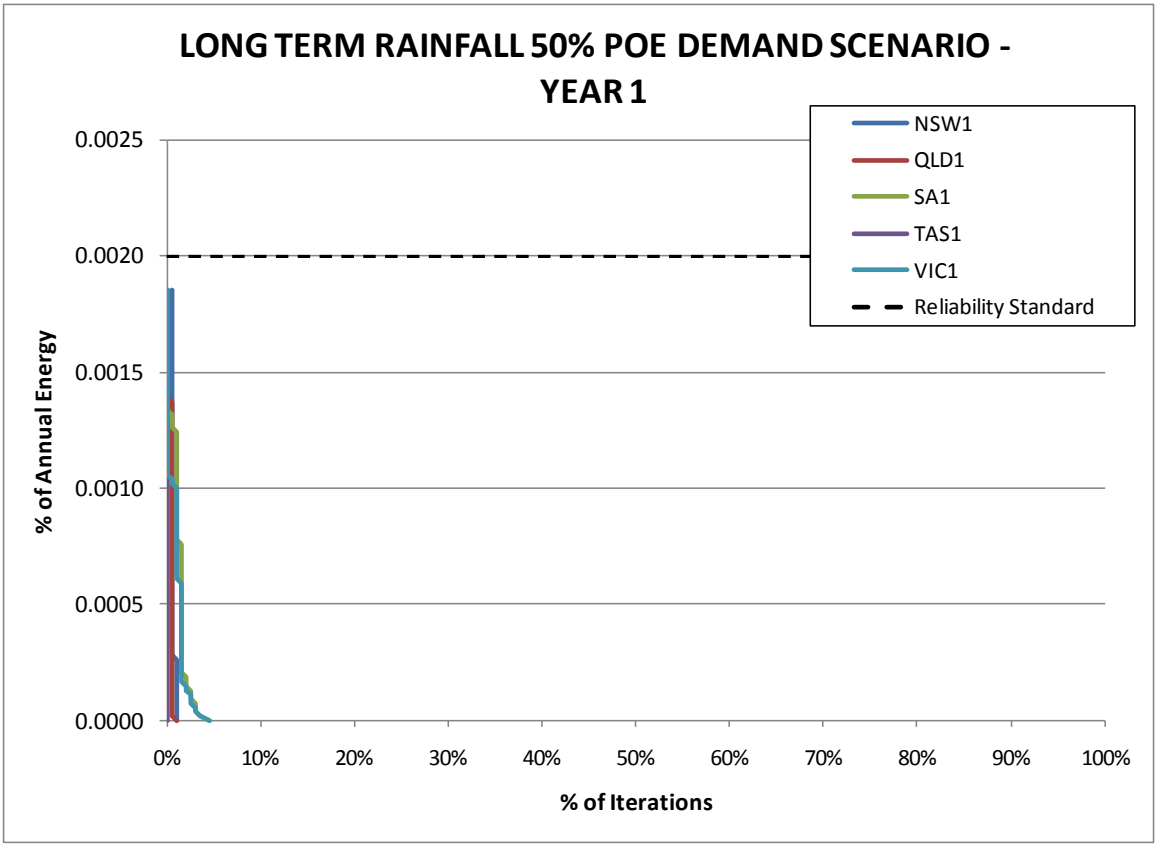

SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations

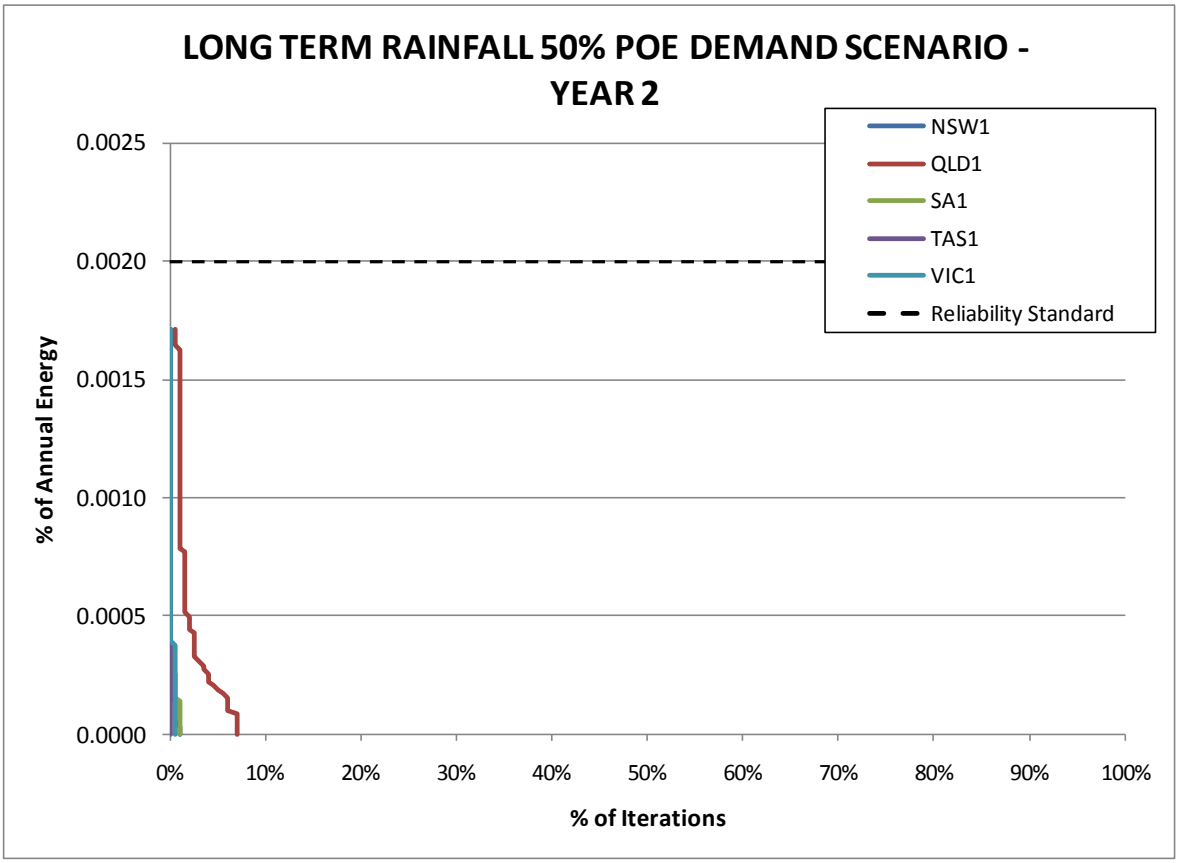

SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations


SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
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


LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
% of Annual Energy
0.0300
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations


LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
% of Annual Energy
0.0250
0.0200
0.0150
0.0100
0.0050
0.0000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations


LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
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


LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard
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