AEMO EAAP REPORT UPDATE JUNE 2013

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Contents

EXECUTIVE SUMMARY

The purpose of the Energy Adequacy Assessment Projection (*EAAP*) report for June 2013 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 June 2013 *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, with the exception of the South Australia and Victoria regions, in year 2, low rainfall scenario.

This indicates that the availability of energy in all NEM regions, excluding the South Australia and Victoria Regions for the low rain fall scenario in year 2, meets the reliability standard for supply adequacy over the coming 24 month period.

More detailed results are presented in sections 2 and 4.

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 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 (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
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 June 2013 *EAAP* Report

The study period[5] for this *EAAP* report is from 1 July 2013 to 30 June 2015.

The closing date for submitting Variable Generator Energy Limitation Framework (GELF) Parameters[6] by Scheduled Generators was 7 May 2013.

For the purpose of this report 'Year 1' is defined as 1 July 2013 to 30 June 2014, and 'Year 2' is defined as 1 July 2014 to 30 June 2015.

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.

[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/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx

[4] Previous AEMO *EAAP* are available at the following location on *AEMO* website:
http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/EAAP

[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 June 2013 *EAAP*.

The demand profiles used in June 2013 *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 June 2013 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 April and May 2013, 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.

[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.

2 RESULTS SUMMARY

The following tables summarise the annual *Unserved Energy* (*USE*) figures for each region, and provide comparisons between the *EAAP* published in March 2013 and June 2013.

Based on the results of June 2013 *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 June *EAAP* study, except for the South Australia and Victoria regions, in year 2, low rainfall scenario. Increase in *USE* is observed for Victoria and South Australia in the second year in June 2013 *EAAP* as compared to March 2013 because of energy restrictions on a major power station in Victoria.

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

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	March 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	June 2013 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0002%
Year 2	March 2013 Update	0.0000%	0.0001%	0.0016%	0.0000%	0.0052%
	June 2013 Update	0.0000%	0.0001%	**0.0026%**	0.0000%	**0.0055%**

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

Short term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	March 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	June 2013 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0002%
Year 2	March 2013 Update	0.0000%	0.0000%	0.0001%	0.0000%	0.0001%
	June 2013 Update	0.0000%	0.0001%	0.0002%	0.0000%	0.0002%

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

Long term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	March 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	June 2013 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0002%
	March 2013	0.0000%	0.0000%	0.0001%	0.0000%	0.0001%

Year 2	Update					
	June 2013 Update	0.0000%	0.0001%	0.0002%	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
Musselroe wind farm	TAS	168 MW	Winter 2013
Snowtown Stage 2 South	SA	126 MW	Winter 2014
Snowtown Stage 2 North	SA	144 MW	Summer 2014/15
Gullen Range	NSW	166 MW	Winter 2014
Mt Mercer	VIC	132 MW	Summer 2014/15

3.2 Retired Generation

No additional retired generation for this quarter.

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*[11], 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.

[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 22 February 2013.

[11] The *EAAP guidelines* are available at the following location on AEMO website:
http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx

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.

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

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

	NSW	QLD	SA	TAS	VIC
Jul-13	-	0.0024	-	-	-
Aug-13	-	-	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	-	-	-	-
Dec-13	-	-	-	-	-
Jan-14	-	0.0011	0.0182	-	0.0331
Feb-14	-	-	0.0082	-	0.0399
Mar-14	-	-	-	-	0.0290
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0039	-	-
Total GWh	-	0.0035	0.0304	-	0.1021
Region %	-	-	0.0002%	-	0.0002%
Jul-14	-	0.0003	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	0.0004	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	0.0004	-	-	-
Jan-15	-	0.0146	0.0561	-	0.2055
Feb-15	0.0001	0.0084	0.2624	-	2.3408
Mar-15	-	0.0057	-	-	0.2566
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Total GWh	0.0001	0.0297	0.3186	-	2.8029
Region %	-	0.0001%	0.0026%	-	0.0055%

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
Jul-13	-	0.0024	-	-	-
Aug-13	-	-	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	-	-	-	-
Dec-13	-	-	-	-	-
Jan-14	-	0.0011	0.0185	-	0.0365
Feb-14	-	-	0.0083	-	0.0411
Mar-14	-	-	-	-	0.0301
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0036	-	-
Total GWh	-	0.0036	0.0304	-	0.1076
Region %	-	-	0.0002%	-	0.0002%
Jul-14	-	0.0003	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	0.0004	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	0.0005	-	-	-
Jan-15	-	0.0149	0.0111	-	0.0336
Feb-15	0.0001	0.0084	0.0122	-	0.0440
Mar-15	-	0.0056	-	-	0.0028
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Total GWh	0.0001	0.0301	0.0233	-	0.0804
Region %	-	0.0001%	0.0002%	-	0.0002%

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
Jul-13	-	0.0024	-	-	-
Aug-13	-	-	-	-	-
Sep-13	-	-	-	-	-
Oct-13	-	-	-	-	-
Nov-13	-	-	-	-	-
Dec-13	-	-	-	-	-
Jan-14	-	0.0011	0.0172	-	0.0310
Feb-14	-	-	0.0084	-	0.0413
Mar-14	-	-	-	-	0.0369
Apr-14	-	-	-	-	-
May-14	-	-	-	-	-
Jun-14	-	-	0.0039	-	-
Total GWh	-	0.0035	0.0295	-	0.1091
Region %	-	-	0.0002%	-	0.0002%
Jul-14	-	0.0003	-	-	-
Aug-14	-	-	-	-	-
Sep-14	-	-	-	-	-
Oct-14	-	0.0004	-	-	-
Nov-14	-	-	-	-	-
Dec-14	-	0.0003	-	-	-
Jan-15	-	0.0149	0.0102	-	0.0295
Feb-15	-	0.0084	0.0122	-	0.0436
Mar-15	-	0.0056	-	-	0.0026
Apr-15	-	-	-	-	-
May-15	-	-	-	-	-
Jun-15	-	-	-	-	-
Total GWh	-	0.0300	0.0224	-	0.0757
Region %	-	0.0001%	0.0002%	-	0.0001%

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

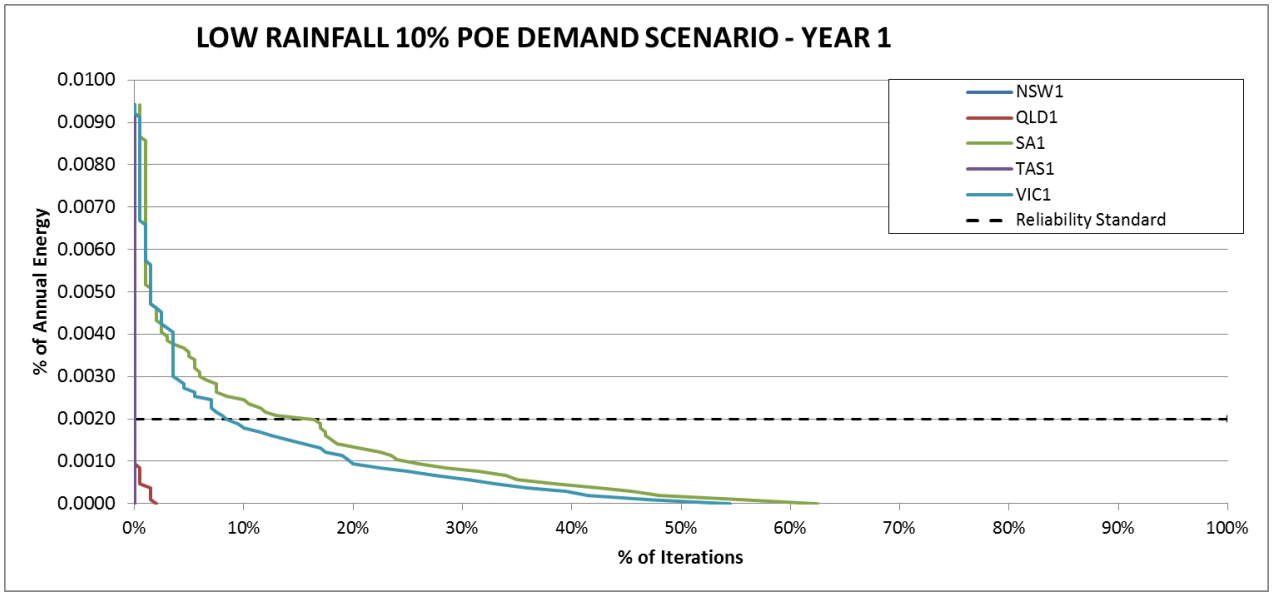
TABLE 8: FORECAST MONTHLY ENERGY GENERATION ON *NEM*-WIDE BASIS

	Low Rainfall	Short-Term Average Rainfall	Long-Term Average Rainfall
Jul-13	17925	17950	17914
Aug-13	17373	17368	17358
Sep-13	15727	15736	15730
Oct-13	16138	16149	16164
Nov-13	16005	16030	16034
Dec-13	16658	16636	16658
Jan-14	17710	17752	17719
Feb-14	16052	16060	16022
Mar-14	17089	17133	17089
Apr-14	15635	15672	15654
May-14	17117	17145	17109
Jun-14	17084	17090	17040
Total GWh	200512	200722	200490
Jul-14	18372	18395	18361
Aug-14	17711	17765	17708
Sep-14	16162	16174	16172
Oct-14	16541	16565	16541
Nov-14	16296	16288	16287
Dec-14	17064	17101	17045
Jan-15	18174	18156	18153
Feb-15	16492	16493	16448
Mar-15	17542	17555	17545
Apr-15	16032	16034	16010
May-15	17469	17488	17456
Jun-15	17578	17598	17586
Total GWh	205431	205611	205312

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
% of Annual Energy
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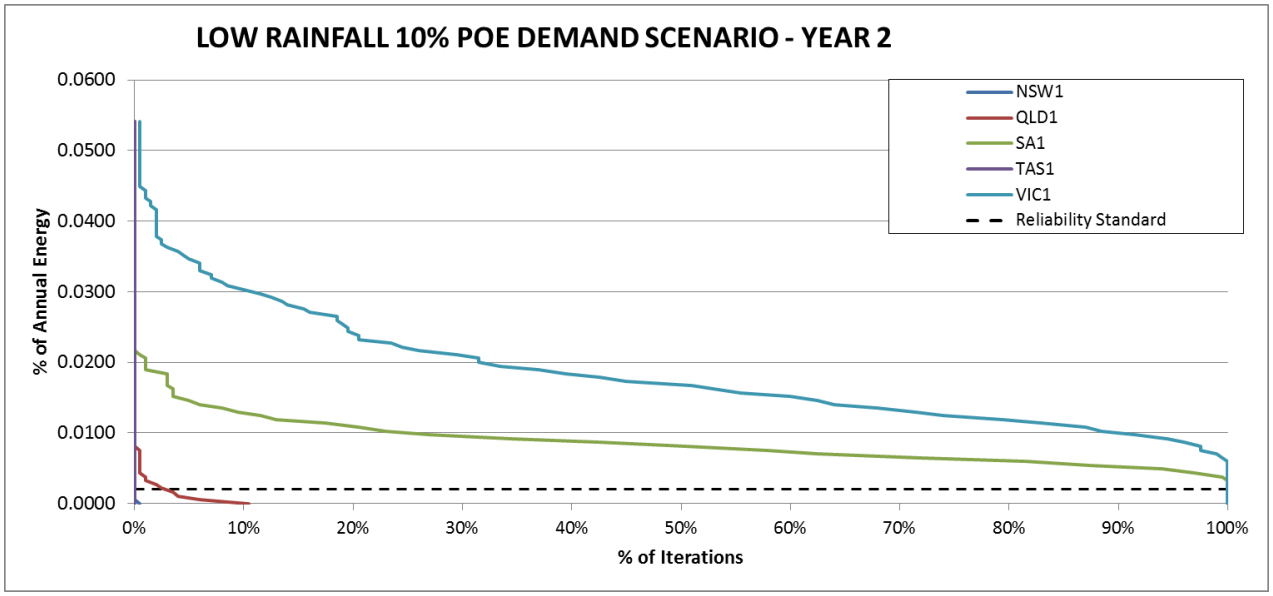
0.0090
0.0080
0.0070
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard


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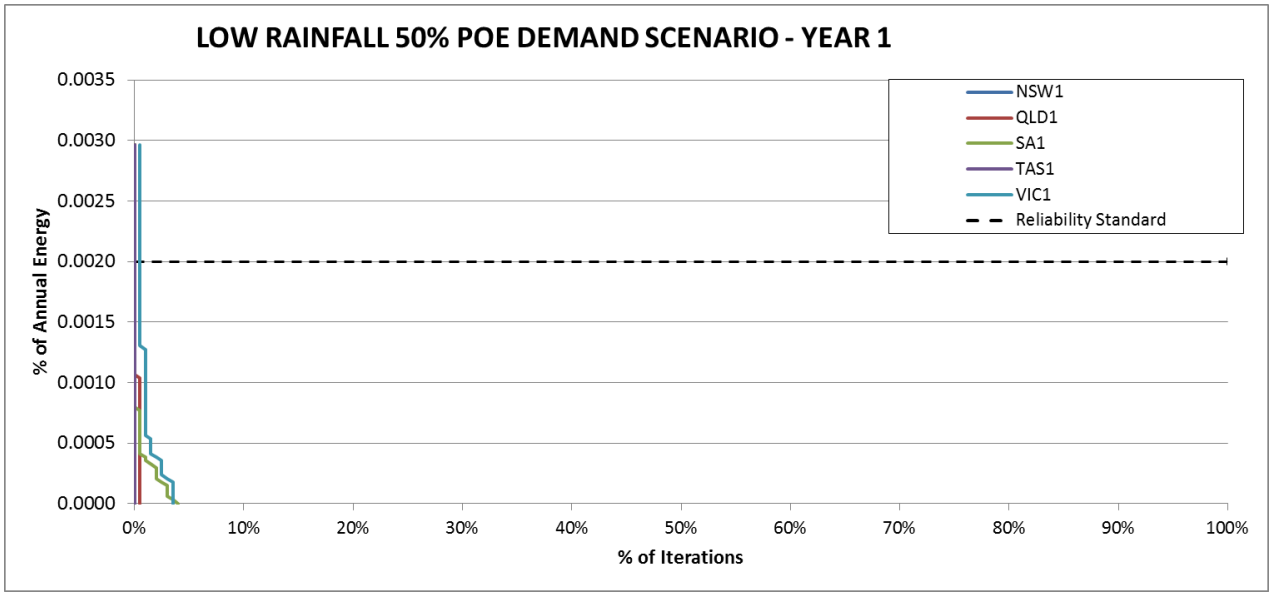
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard


LOW RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
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%
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100%
% of Iterations
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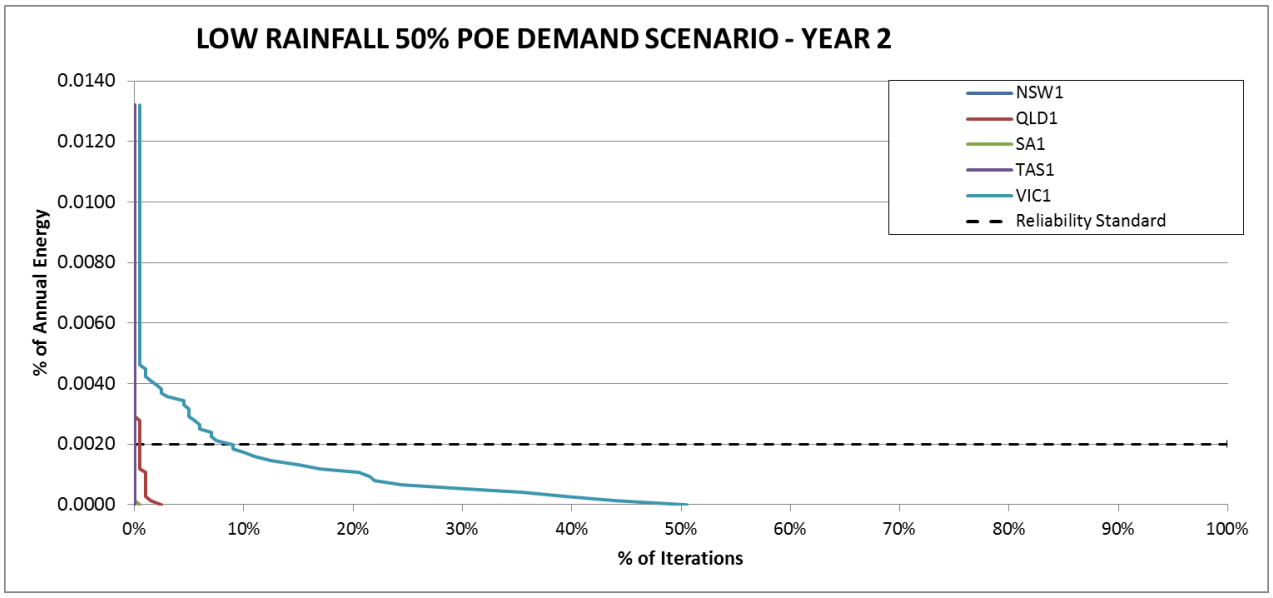
QLD1
SA1
TAS1
VIC1
Reliability Standard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0.0120
0.0100
0.0080
0.0060
0.0040
0.0020
0.0000
% of Annual Energy
0%
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NSW1
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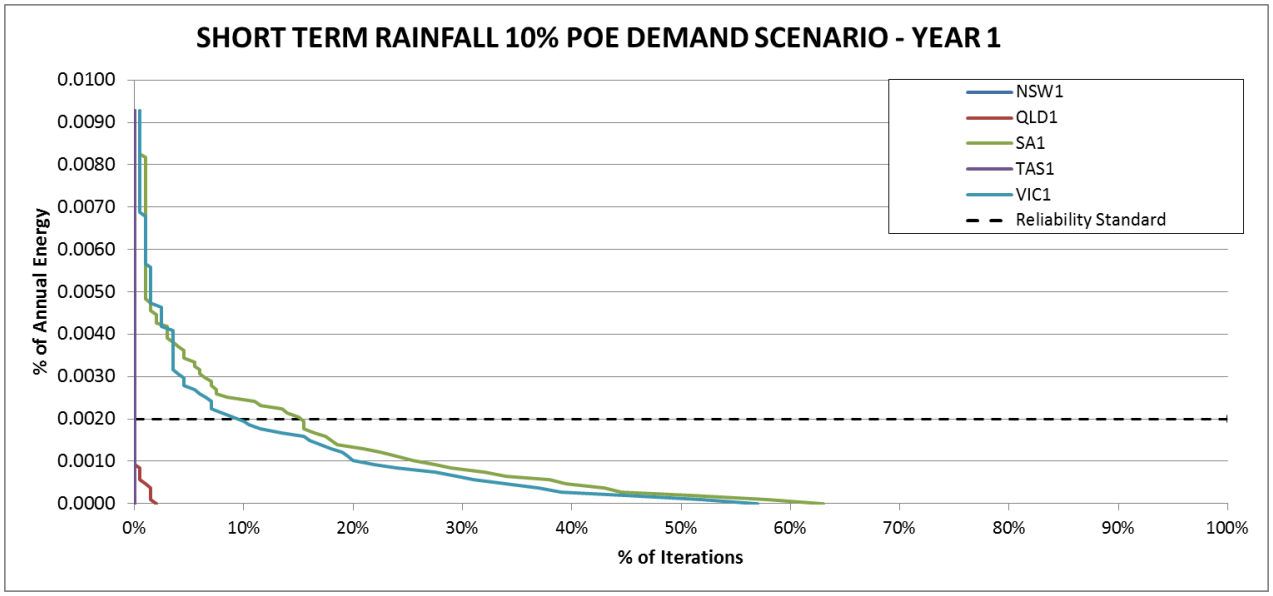
Reliability Standard


SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1
% of Annual Energy
0.0100
0.0090
0.0080
0.0070
0.0060
0.0050
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0.0030
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% of Iterations
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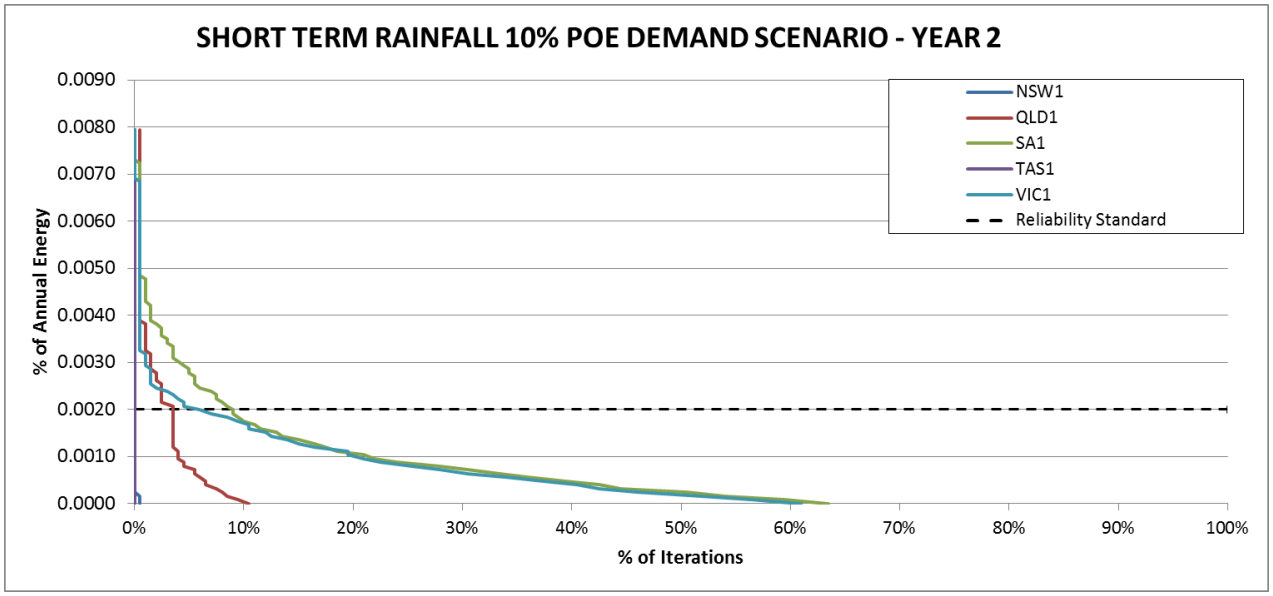
Reliability Standard


SHORT TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
% of Annual Energy
0.0090
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% of Iterations
NSW1
QLD1
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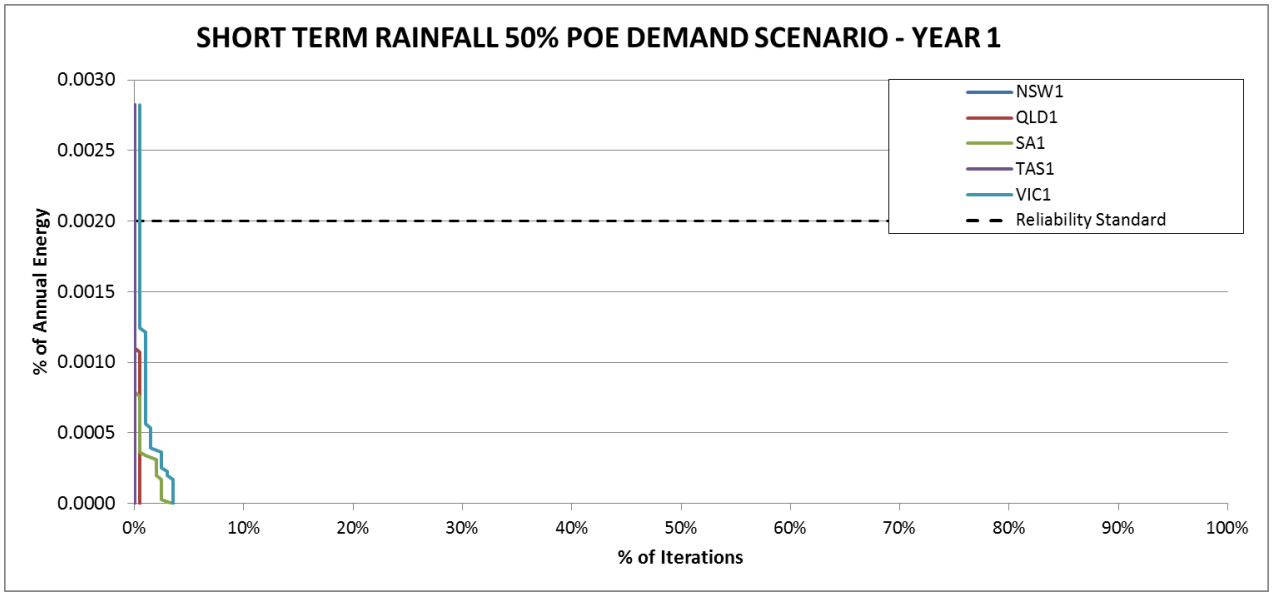
VIC1
Reliability Standard


SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
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0.0025
0.0020
0.0015
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% of Annual Energy
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10%
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% of Iterations
NSW1
QLD1
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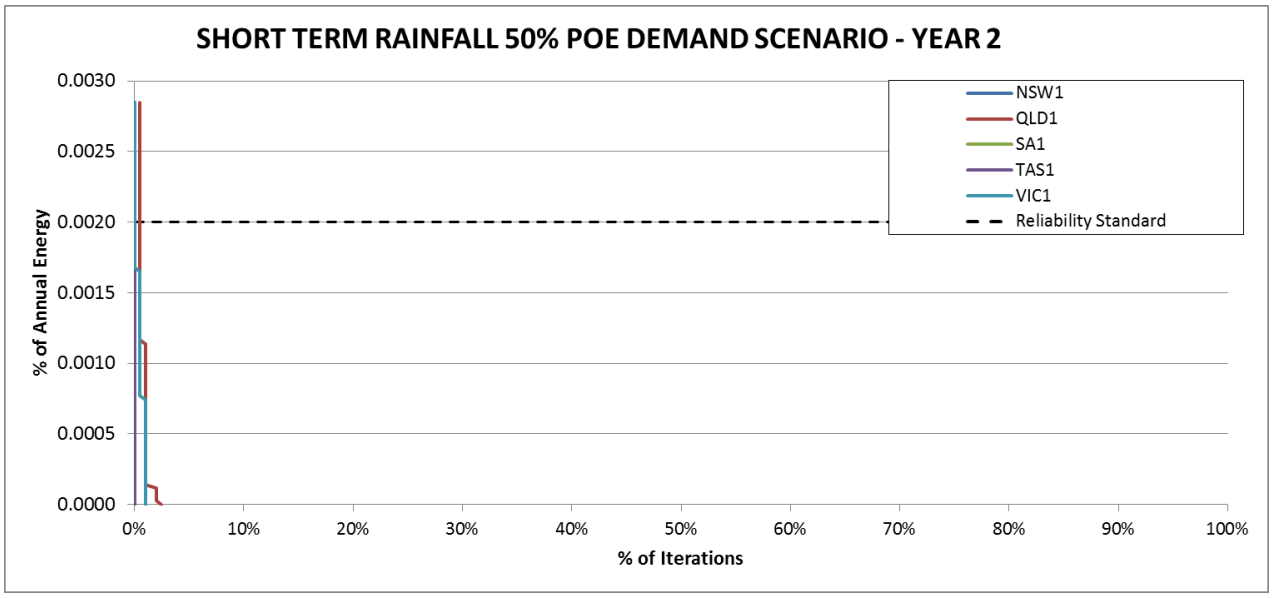
SHORT TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
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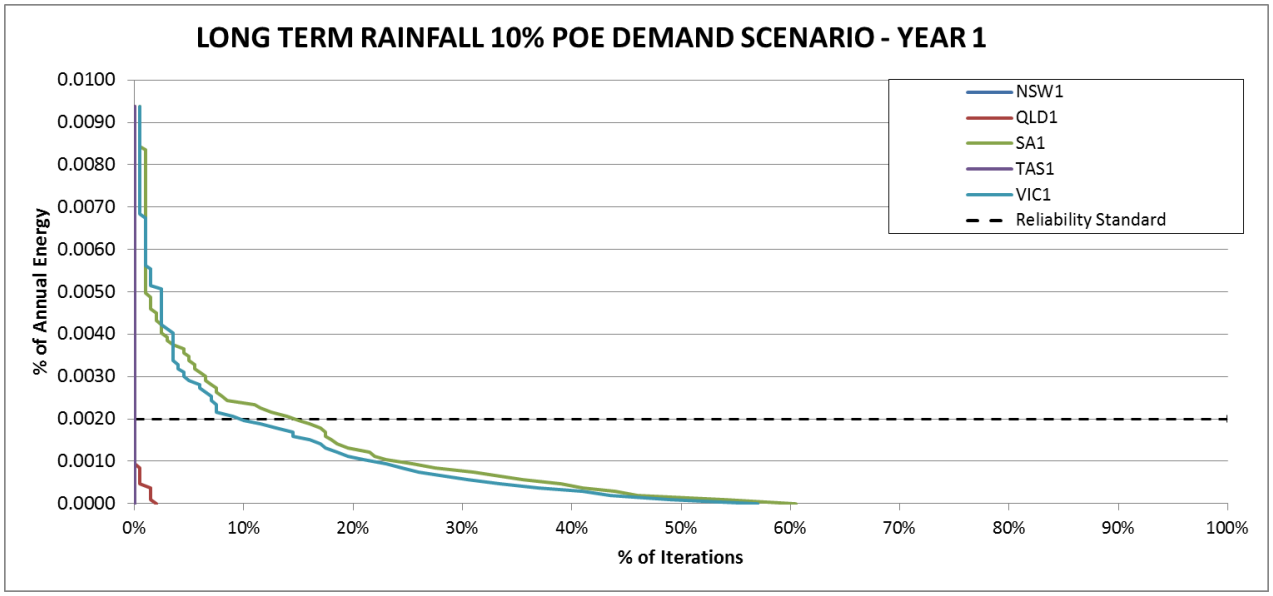
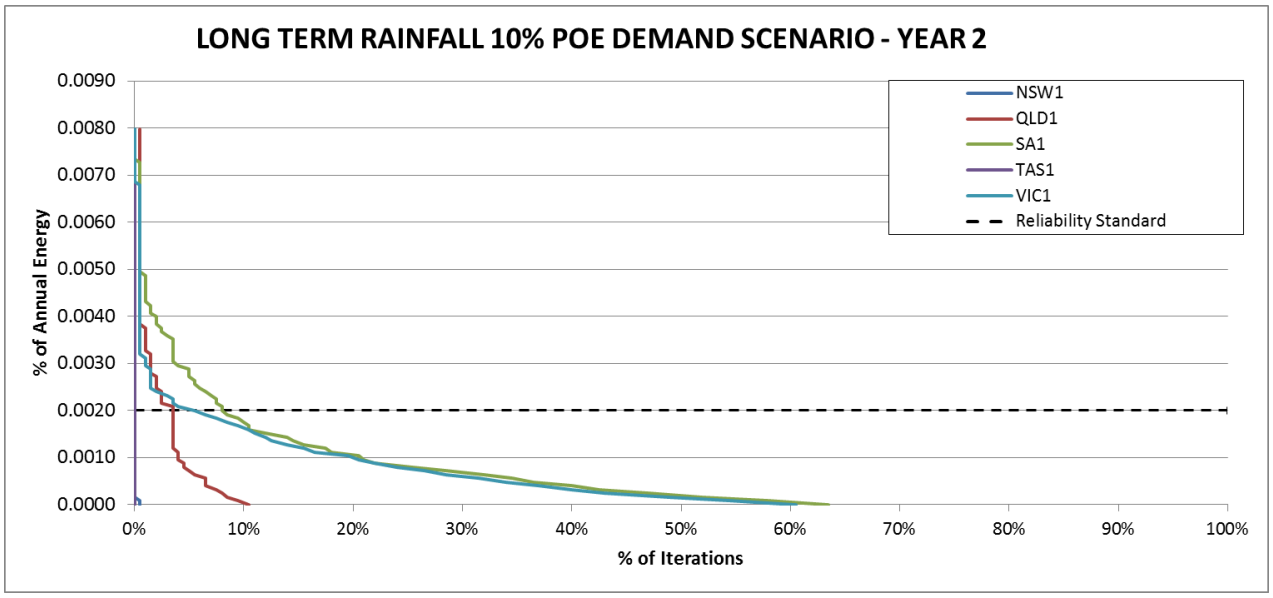
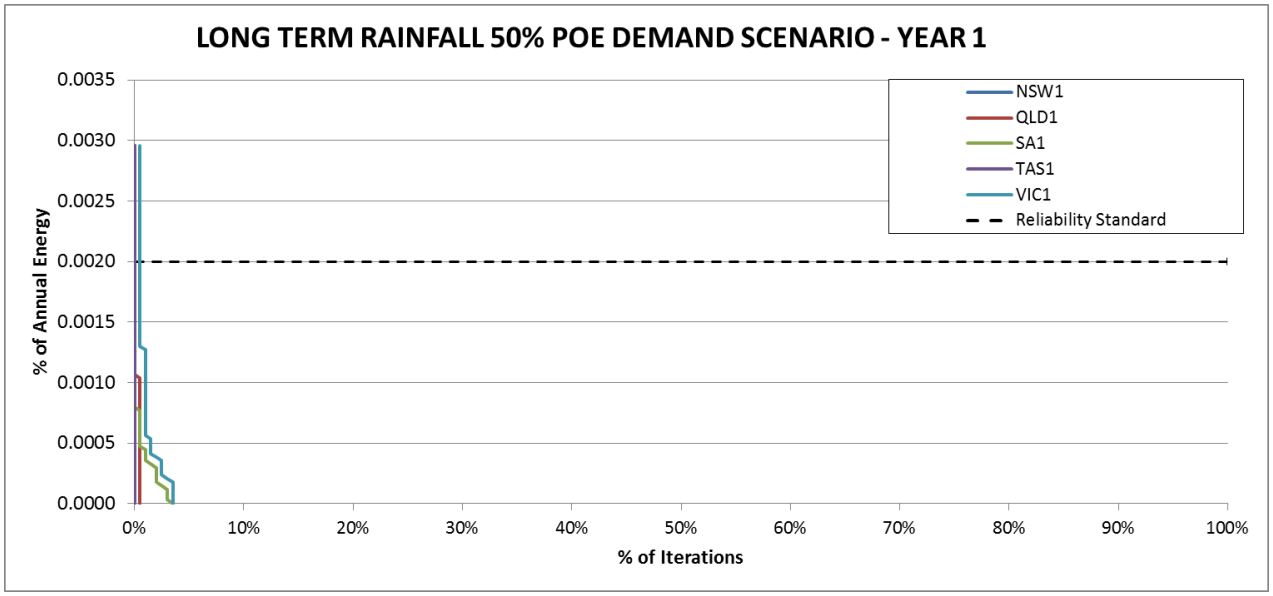
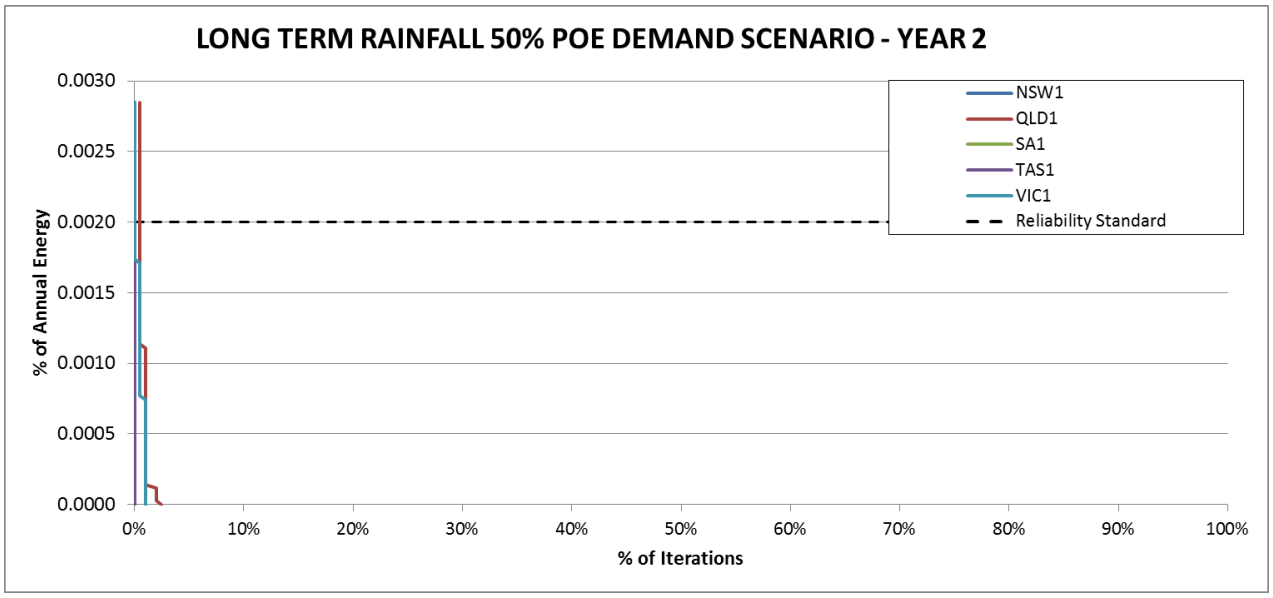
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
% of Annual Energy
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
% of Iterations
NSW1
QLD1
SA1
TAS1
VIC1
Reliability Standard


LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 1
0.0100
0.0090
0.0080
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


LONG TERM RAINFALL 10% POE DEMAND SCENARIO - YEAR 2
0.0090
0.0080
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


LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 1
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


LONG TERM RAINFALL 50% POE DEMAND SCENARIO - YEAR 2
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