ENERGY ADEQUACY ASSESSMENT PROJECTION

MARCH 2014 UPDATE

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

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EXECUTIVE SUMMARY

The March 2014 Energy Adequacy Assessment Projection (EAAP) update provides 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 determined by the Reliability Panel 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.

AEMO's March 2014 EAAP study results show that the USE forecasts fall within the required range for all regions for both years in all three scenarios.

A small increase in USE is noted for Victoria and South Australia in Year 2 of the March 2014 EAAP compared to the December 2013 EAAP update. AEMO attributes this increase to a Victoria power station restriction between January and March 2016, which was not included in the December 2013 update.

The March 2014 study results 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.

CONTENTS

TABLES

FIGURES

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 USE at an hourly resolution during the 24-month study period.

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

1.1 March 2014 EAAP

The study period[4] for this EAAP is from 1 April 2014 to 31 March 2016. "Year 1" is defined as 1 April 2014 to 31 March 2015, and "Year 2" is defined as 1 April 2015 to 31 March 2016.

The closing date for scheduled generators to submit variable Generator Energy Limitation Framework (GELF) parameters[5] was 14 February 2014. All GELF data required for studies was received.

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 March 2014 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.
- 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 the EAAP Guidelines[7] for information on the other EAAP inputs.

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[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. Viewed 26 March 2014.
[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] This is to ensure the lowest rainfall for New South Wales during this period is reflected in the low rainfall scenario.
[7] EAAP Guidelines. Available at: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx. Viewed 26 March 2014.

1.3 EAAP outputs

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

1) The EAAP Public Report, which 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 that 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 of the study period.

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

1.4 Interpretation of the USE forecasts in this report

The electricity supply estimates in this report are based on the variable GELF parameters submitted by NEM scheduled generators (as per the EAAP Guidelines) in January and February 2014. 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.

[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.

2. RESULTS SUMMARY

The following tables summarise the annual USE for each region, and compare these to the EAAP update published in December 2013.

AEMO's March 2014 EAAP study results show that the forecast USE falls within the required range determined by the Reliability Panel (which is less than 0.002% for all regions) for both years in all three scenarios covered.

A small increase in USE is noted for Victoria and South Australia in Year 2 of the March 2014 EAAP compared to December 2013. AEMO attributes this increase to a Victoria power station restriction between January and March 2016, which was not included in the December 2013 update.

Table 2-1 — Unserved energy for Scenario 1 – Low rainfall

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0002%	0.0000%	0.0002%

Table 2-2 — Unserved energy for Scenario 2 – Short-term average rainfall

Short-term average rainfall		NSW	QLD	SA	TAS	VIC
Year 1	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

Table 2-3 — Unserved energy for Scenario 3 – Long-term average rainfall

Low rainfall		NSW	QLD	SA	TAS	VIC
Year 1	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
Year 2	December 2013 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
	March 2014 Update	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%

3. NEW AND RETIRED GENERATION

3.1 New generator projects

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

Table 3-1 — New generators

Station	State	Capacity (MW)	Commercial operation 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
Nyngan Solar Farm	NSW	102	Winter 2015

Details of these new generators are available on AEMO's Generation Information Page[9], except for Nyngan Solar Farm which is a newly committed project.

3.2 Retired generation

No generation was retired in this quarter.

Swanbank E power station in Queensland was assumed to be withdrawn from service for up to three years from 1 October 2014.

Wallerawang unit 7 was assumed to be withdrawn from service from January 2014. Unit 8 was assumed to be in service until the end of March 2014, and then placed on a three-month recall.

[9] Available at: http://www.aemo.com.au/Electricity/Planning/Related-Information/Generation-Information. Viewed 26 March 2014.

4. DETAILED RESULTS

The EAAP simulation studies provide forecasts of customer load that might not be met during the study period due to 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% and 50% probability of exceedence (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 risk estimates of what could occur based on the forecast assumptions.

[10] EAAP Guidelines. Available at: http://www.aemo.com.au/Electricity/Resources/Reports-and-Documents/~/media/Files/Other/electricityops/EAAP_Guidelines.ashx. Viewed 26 March 2014.

4.1 Scenario 1: Low rainfall, forecast USE

Table 4-1 — Forecast USE in Scenario 1 – Low rainfall, GWh

	NSW	QLD	SA	TAS	VIC
April 2014	-	-	-	-	-
May 2014	-	-	-	-	-
June 2014	-	-	-	-	-
July 2014	-	-	-	-	-
August 2014	-	-	-	-	-
September 2014	-	-	-	-	-
October 2014	-	-	-	-	-
November 2014	-	-	-	-	-
December 2014	-	0.0001	0.0001	-	-
January 2015	-	0.0050	0.0001	-	0.0002
February 2015	-	0.0050	-	-	-
March 2015	-	-	-	-	0.0004
Total GWh	-	0.0101	0.0003	-	0.0005
Region %	-	-	-	-	-
April 2015	-	-	-	-	-
May 2015	-	-	-	-	-
June 2015	-	-	-	-	-
July 2015	-	-	-	-	-
August 2015	-	-	-	-	-
September 2015	-	-	-	-	-
October 2015	-	-	-	-	-
November 2015	-	-	-	-	-
December 2015	-	0.0015	-	-	-
January 2016	-	0.0154	0.0041	-	0.0134
February 2016	0.0001	0.0114	0.0180	-	0.1008
March 2016	-	0.0001	-	-	0.0081
Total GWh	0.0001	0.0284	0.0221	-	0.1223
Region %	-	-	0.0002%	-	0.0002%

4.2 Scenario 2: Short-term average rainfall, forecast USE

Table 4-2 — Forecast USE in Scenario 2 – Short-term average rainfall, GWh

	NSW	QLD	SA	TAS	VIC
April 2014	-	-	-	-	-
May 2014	-	-	-	-	-
June 2014	-	-	-	-	-
July 2014	-	-	-	-	-
August 2014	-	-	-	-	-
September 2014	-	-	-	-	-
October 2014	-	-	-	-	-
November 2014	-	-	-	-	-
December 2014	-	0.0001	0.0001	-	-
January 2015	-	0.0050	0.0001	-	0.0002
February 2015	-	0.0049	-	-	-
March 2015	-	-	-	-	0.0003
Total GWh	-	0.0100	0.0003	-	0.0005
Region %	-	-	-	-	-
April 2015	-	-	-	-	-
May 2015	-	-	-	-	-
June 2015	-	-	-	-	-
July 2015	-	-	-	-	-
August 2015	-	-	-	-	-
September 2015	-	-	-	-	-
October 2015	-	-	-	-	-
November 2015	-	-	-	-	-
December 2015	-	0.0015	-	-	-
January 2016	-	0.0154	0.0005	-	-
February 2016	0.0003	0.0115	0.0004	-	0.0012
March 2016	-	0.0001	-	-	-
Total GWh	0.0003	0.0285	0.0009	-	0.0012
Region %	-	-	-	-	-

4.3 Scenario 3: Long-term average rainfall, forecast USE

Table 4-3 — Forecast USE in Scenario 3 – Long-term average rainfall, GWh

	NSW	QLD	SA	TAS	VIC
April 2014	-	-	-	-	-
May 2014	-	-	-	-	-
June 2014	-	-	-	-	-
July 2014	-	-	-	-	-
August 2014	-	-	-	-	-
September 2014	-	-	-	-	-
October 2014	-	-	-	-	-
November 2014	-	-	-	-	-
December 2014	-	0.0001	0.0001	-	-
January 2015	-	0.0050	0.0001	-	-
February 2015	-	0.0049	-	-	-
March 2015	-	-	-	-	0.0005
Total GWh	-	0.0099	0.0002	-	0.0005
Region %	-	-	-	-	-
April 2015	-	-	-	-	-
May 2015	-	-	-	-	-
June 2015	-	-	-	-	-
July 2015	-	-	-	-	-
August 2015	-	-	-	-	-
September 2015	-	-	-	-	-
October 2015	-	-	-	-	-
November 2015	-	-	-	-	-
December 2015	-	0.0015	-	-	-
January 2016	-	0.0153	0.0006	-	0.0001
February 2016	-	0.0114	0.0003	-	0.0011
March 2016	-	0.0001	-	-	-
Total GWh	-	0.0283	0.0009	-	0.0012
Region %	-	-	-	-	-

4.4 Forecast NEM-wide monthly energy generation

Table 4-4 — Forecast monthly NEM-wide energy generation, GWh

	Low rainfall	Short-term average rainfall	Long-term average rainfall
April 2014	15,313	15,316	15,334
May 2014	16,775	16,769	16,759
June 2014	16,510	16,510	16,514
July 2014	17,710	17,736	177,25
August 2014	17,215	17,236	17,197
September 2014	15,981	15,975	15,952
October 2014	16,363	16,357	16,355
November 2014	16,009	16,028	16,018
December 2014	16,749	16,761	16,734
January 2015	17,809	17,797	17,788
February 2015	16,145	16,173	16,156
March 2015	17,223	17,186	17,225
Total GWh	199,803	199,843	199,757
April 2015	15,799	15,808	15,813
May 2015	17,209	17,279	17,215
June 2015	17,106	17,112	17,111
July 2015	18,018	18,069	18,040
August 2015	17,429	17,492	17,438
September 2015	16,135	16,174	16,163
October 2015	16,549	16,582	16,559
November 2015	16,363	16,422	16,395
December 2015	16,964	17,025	16,990
January 2016	18,038	18,066	18,051
February 2016	16,989	16,994	16,978
March 2016	17,488	17,498	17,498
Total GWh	204,087	204,522	204,251

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.

The annual USE for each rainfall scenario is the weighted average USE results across the 400 Monte Carlo simulations of the 10% and 50% POE simulations. For this reason, USE that is higher than 0.002% in some simulation studies of a particular POE simulation case may not result in an average annual USE exceeding 0.002%.

Figure 4-1 — Low rainfall 10% POE demand scenario – Year 1

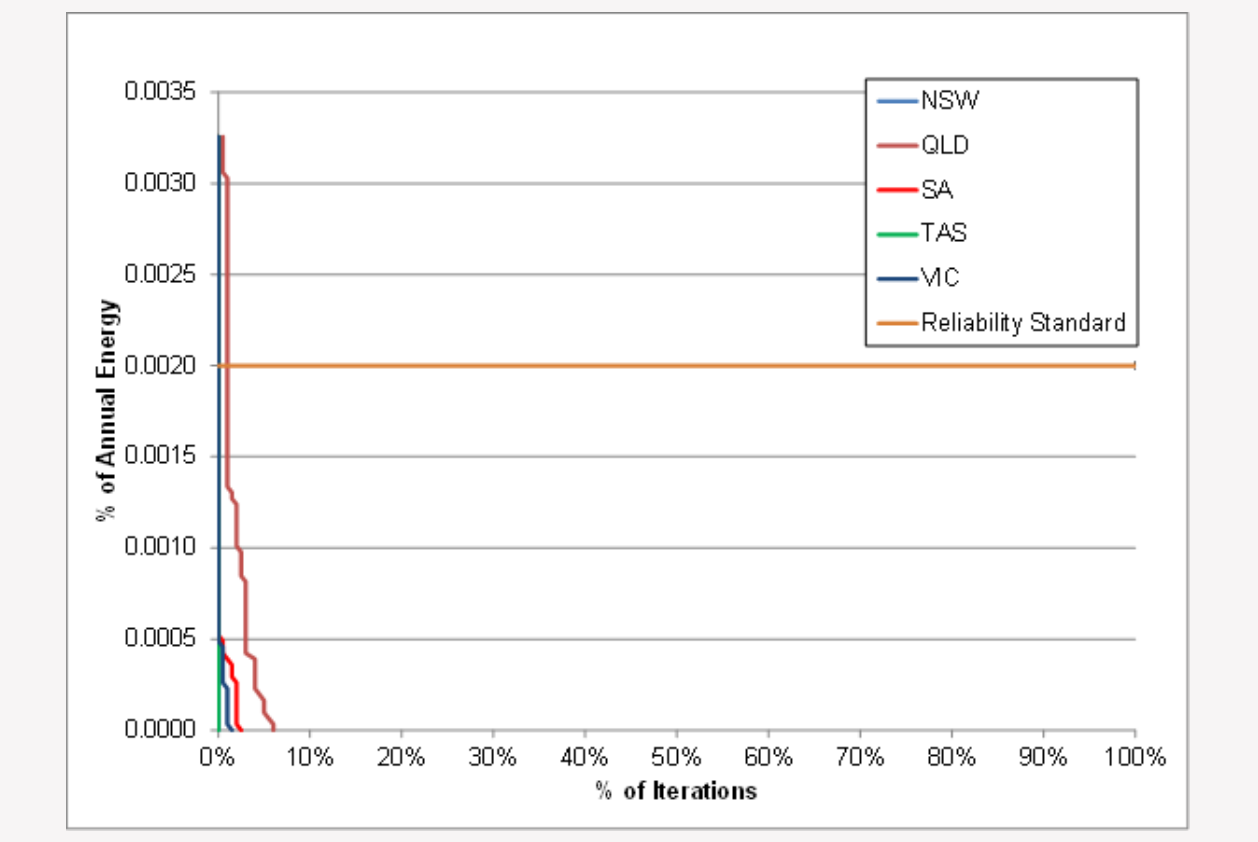


Figure 4-2 — Low rainfall 10% POE demand scenario – Year 2

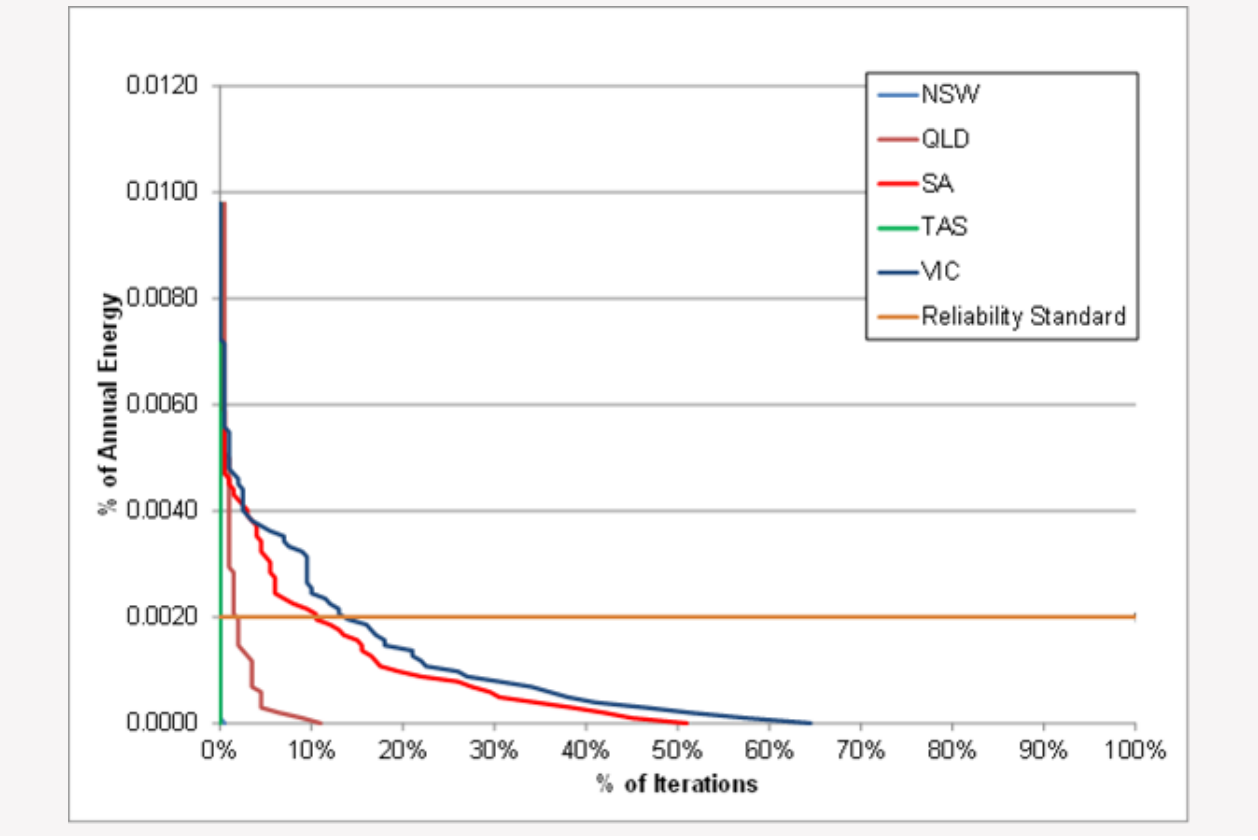


Figure 4-3 — Low rainfall 50% POE demand scenario – Year 1

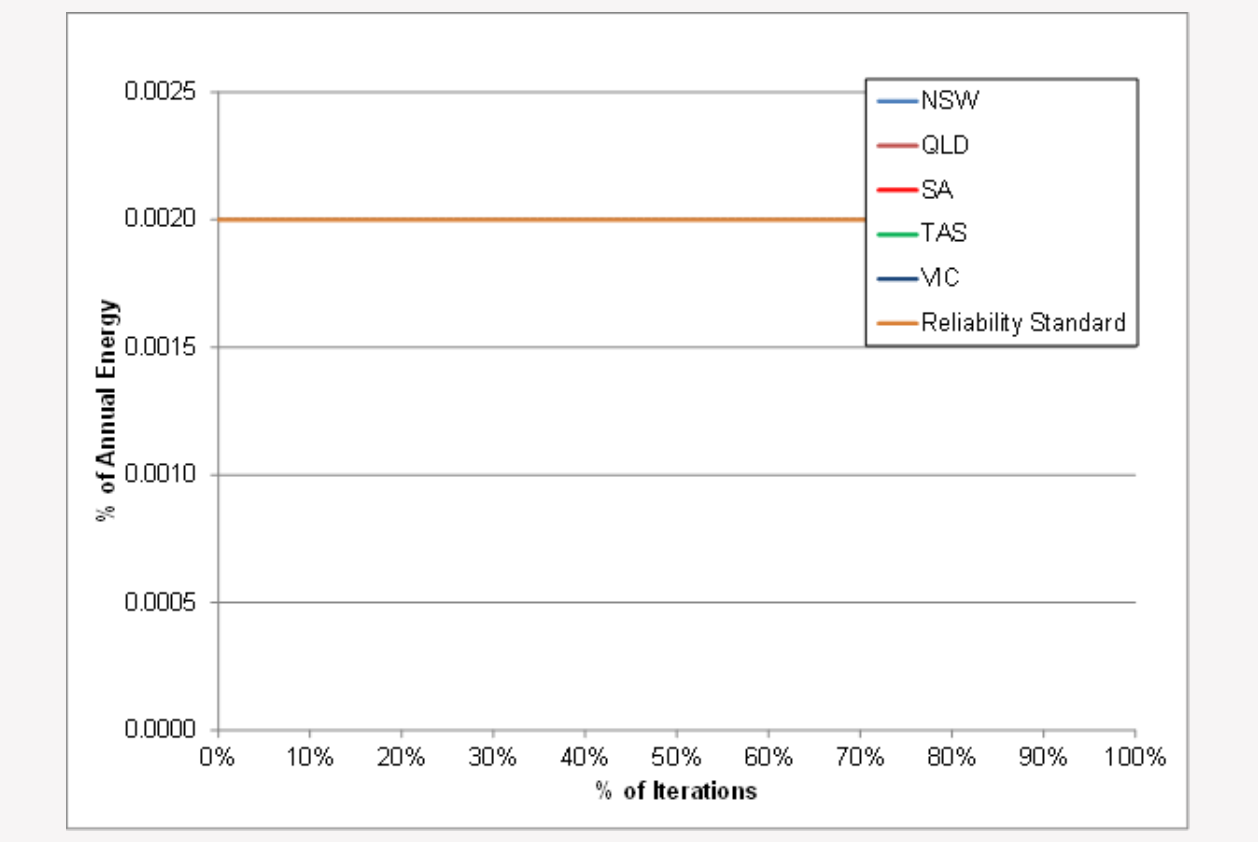


Figure 4-4 — Low rainfall 50% POE demand scenario – Year 2

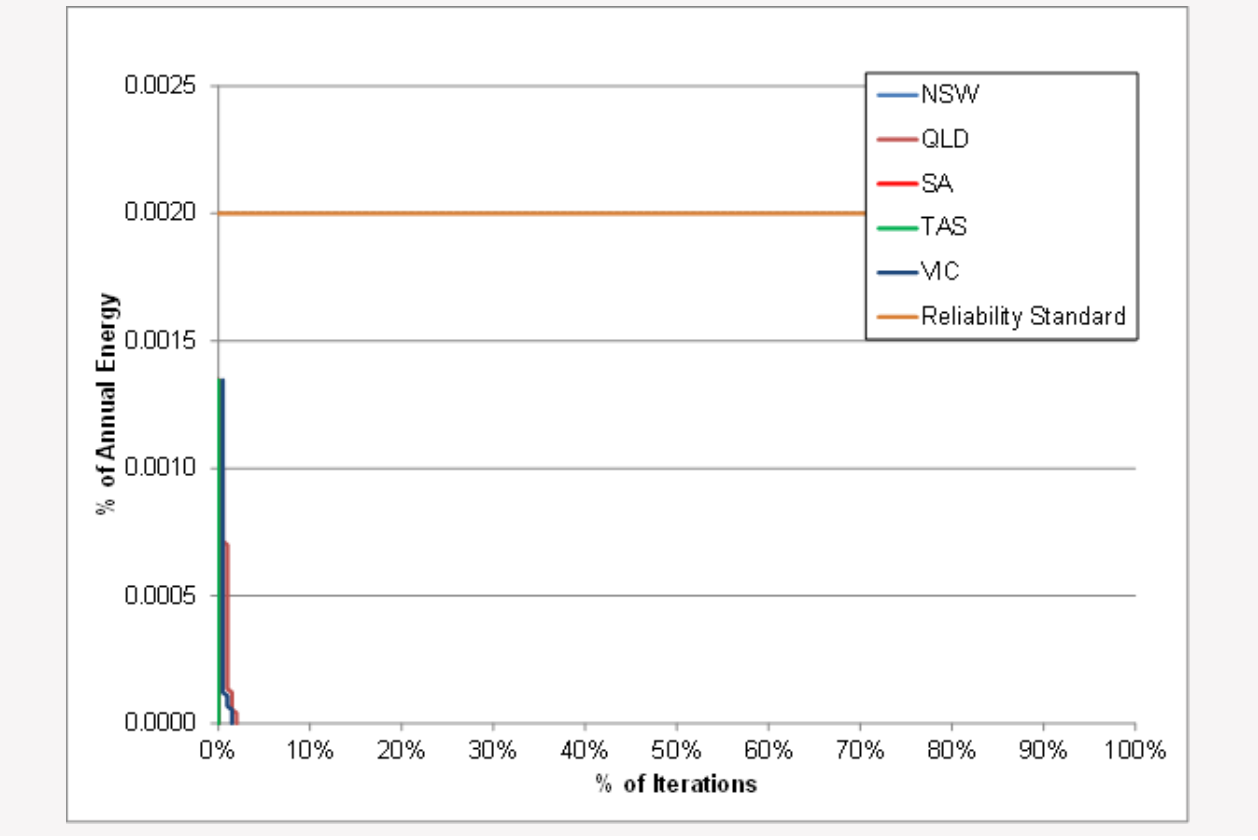


Figure 4-5 — Short-term rainfall 10% POE demand scenario – Year 1

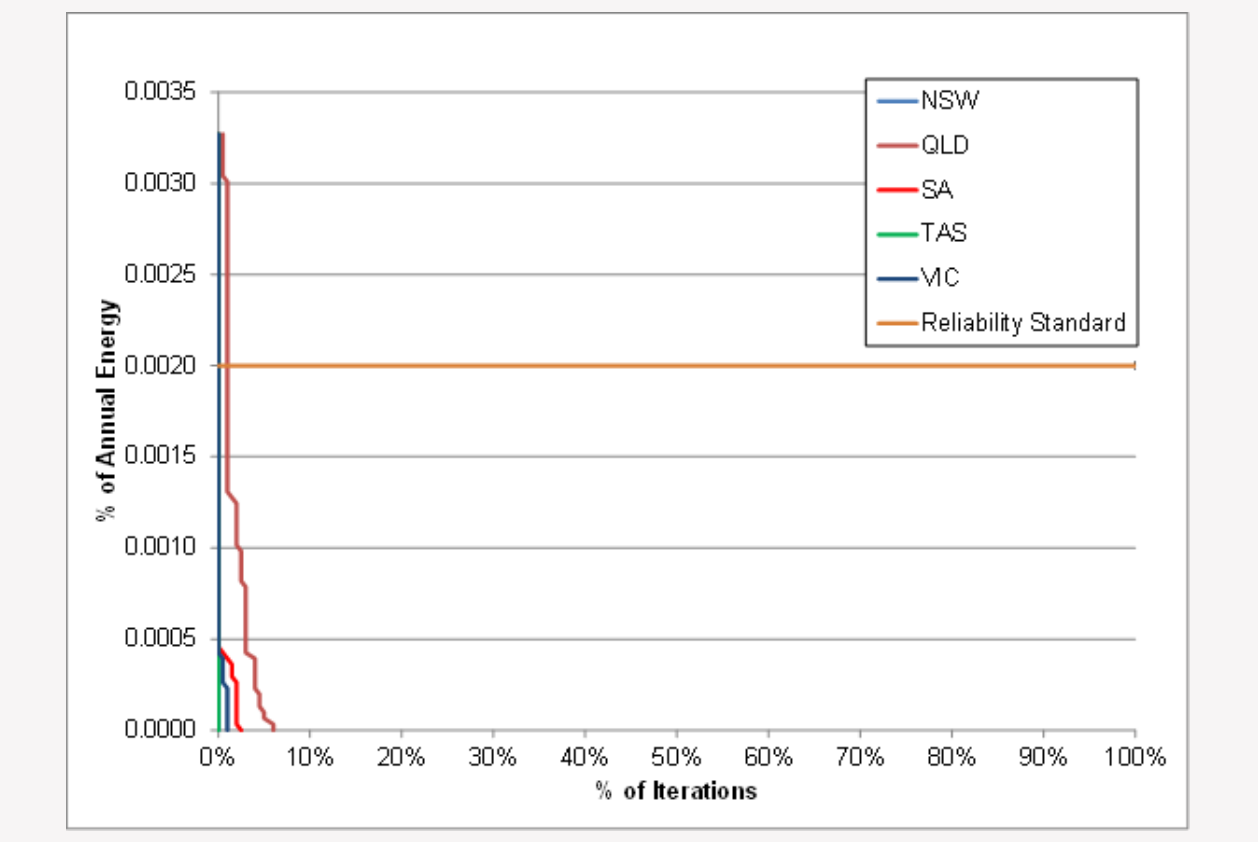


Figure 4-6 — Short-term rainfall 10% POE demand scenario – Year 2

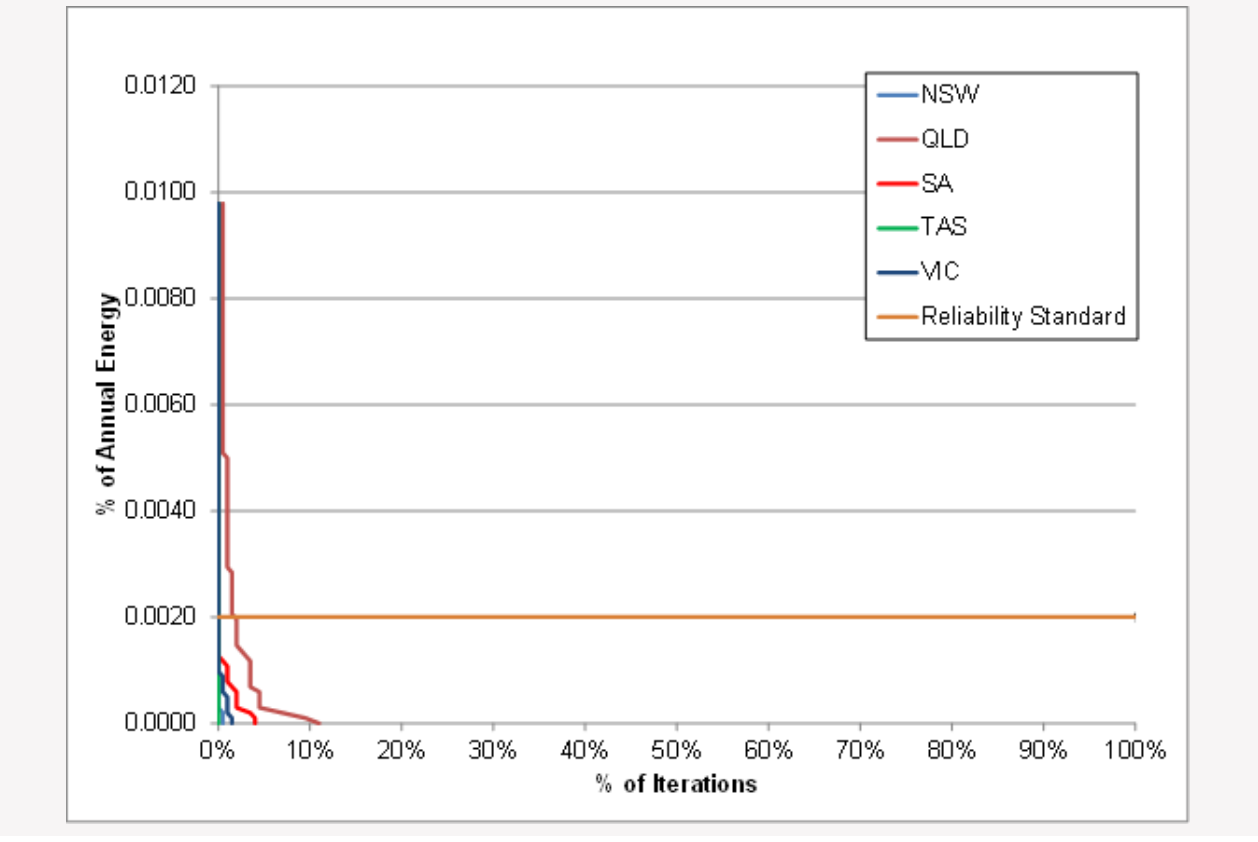


Figure 4-7 — Short-term rainfall 50% POE demand scenario – Year 1

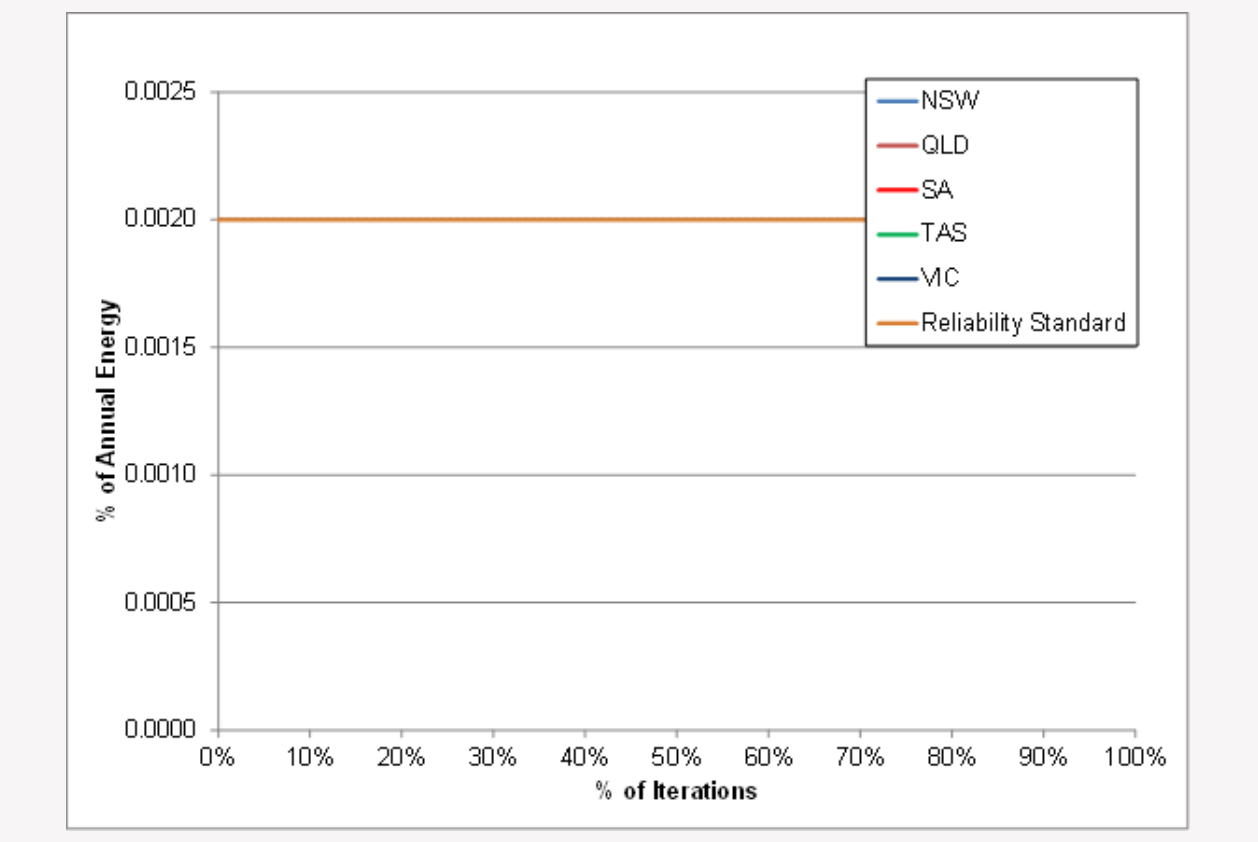


Figure 4-8 — Short-term rainfall 50% POE demand scenario – Year 2

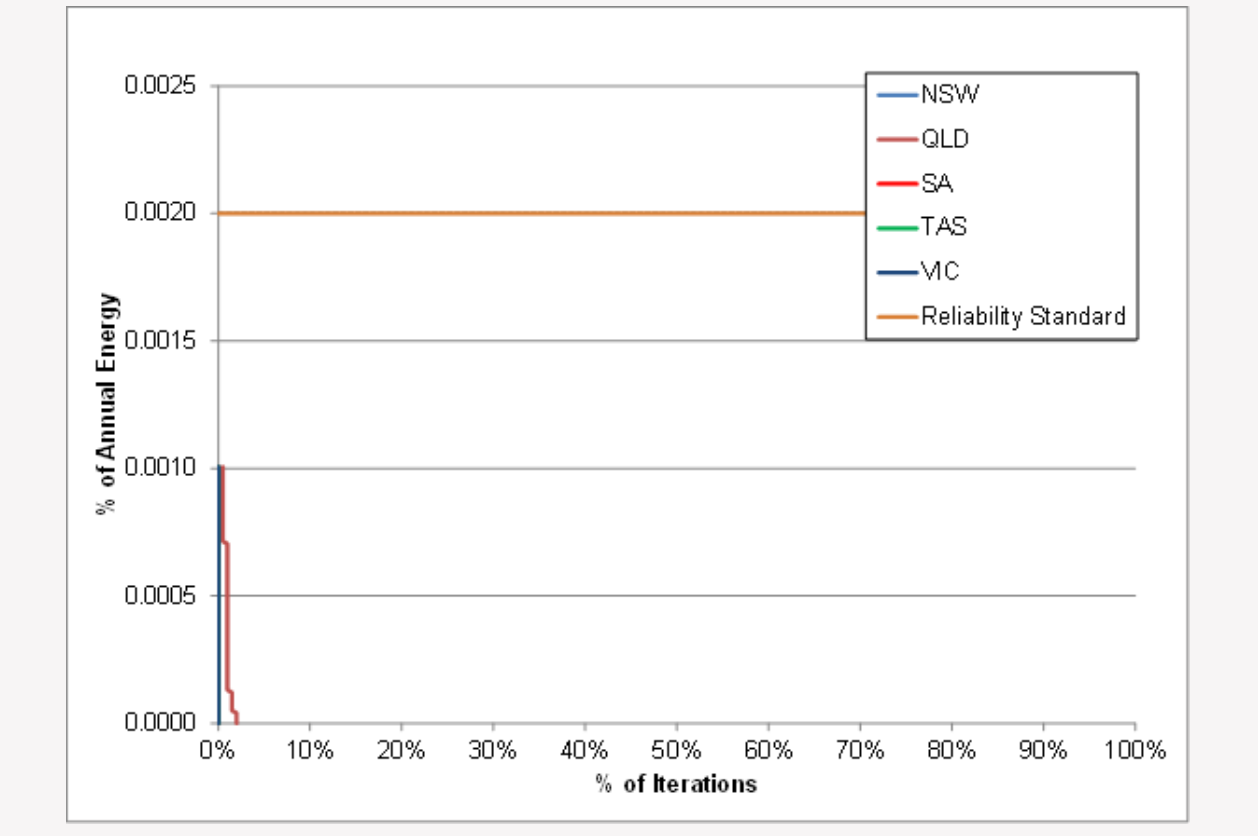


Figure 4-9 — Long-term rainfall 10% POE demand scenario – Year 1

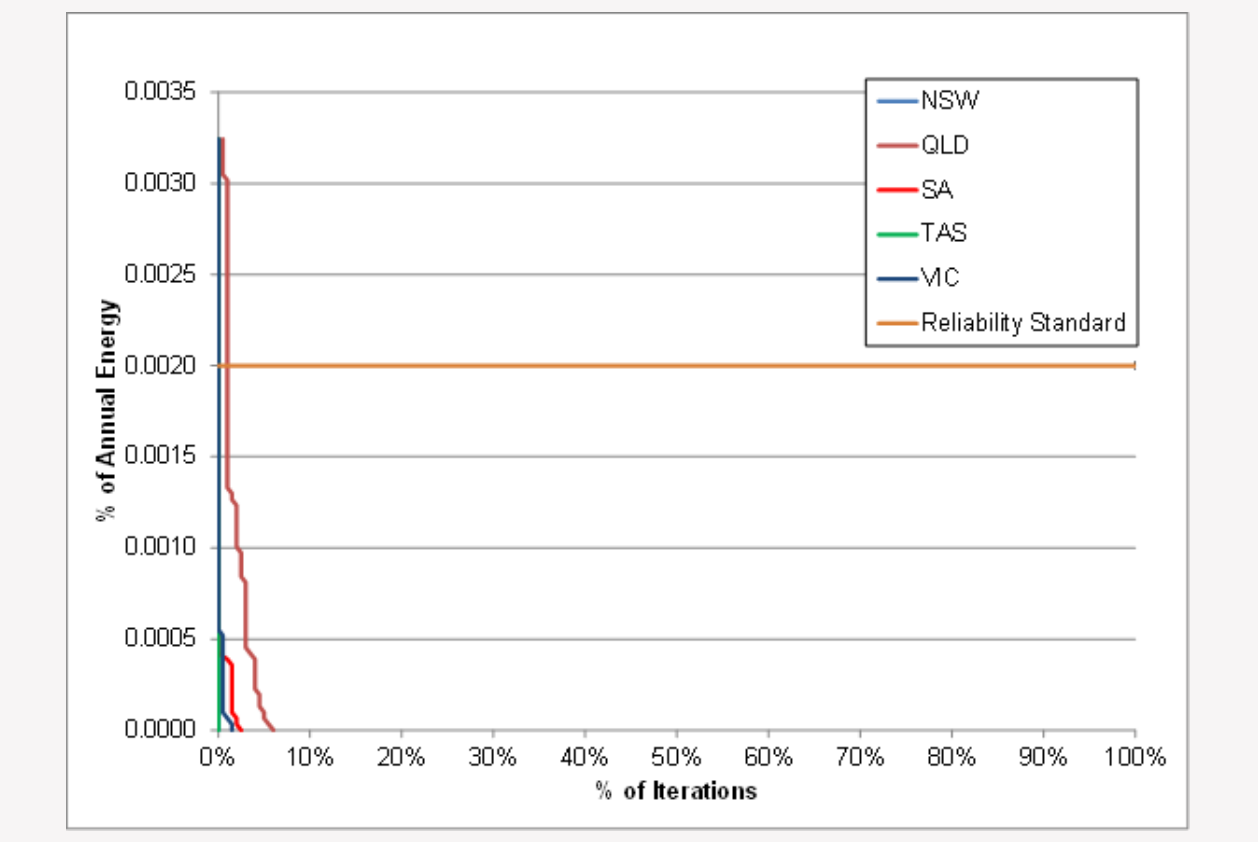


Figure 4-10 — Long-term rainfall 10% POE demand scenario – Year 2

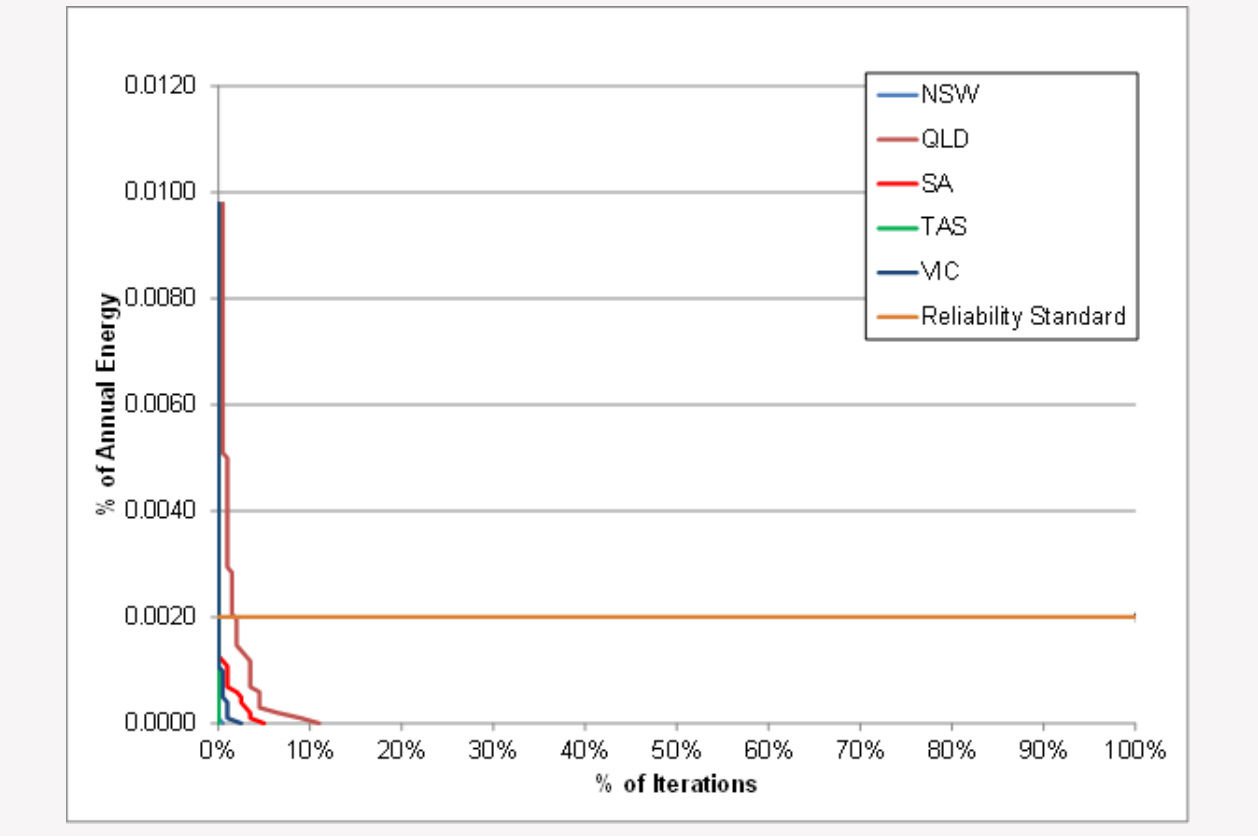


Figure 4-11 — Long-term rainfall 50% POE demand scenario – Year 1

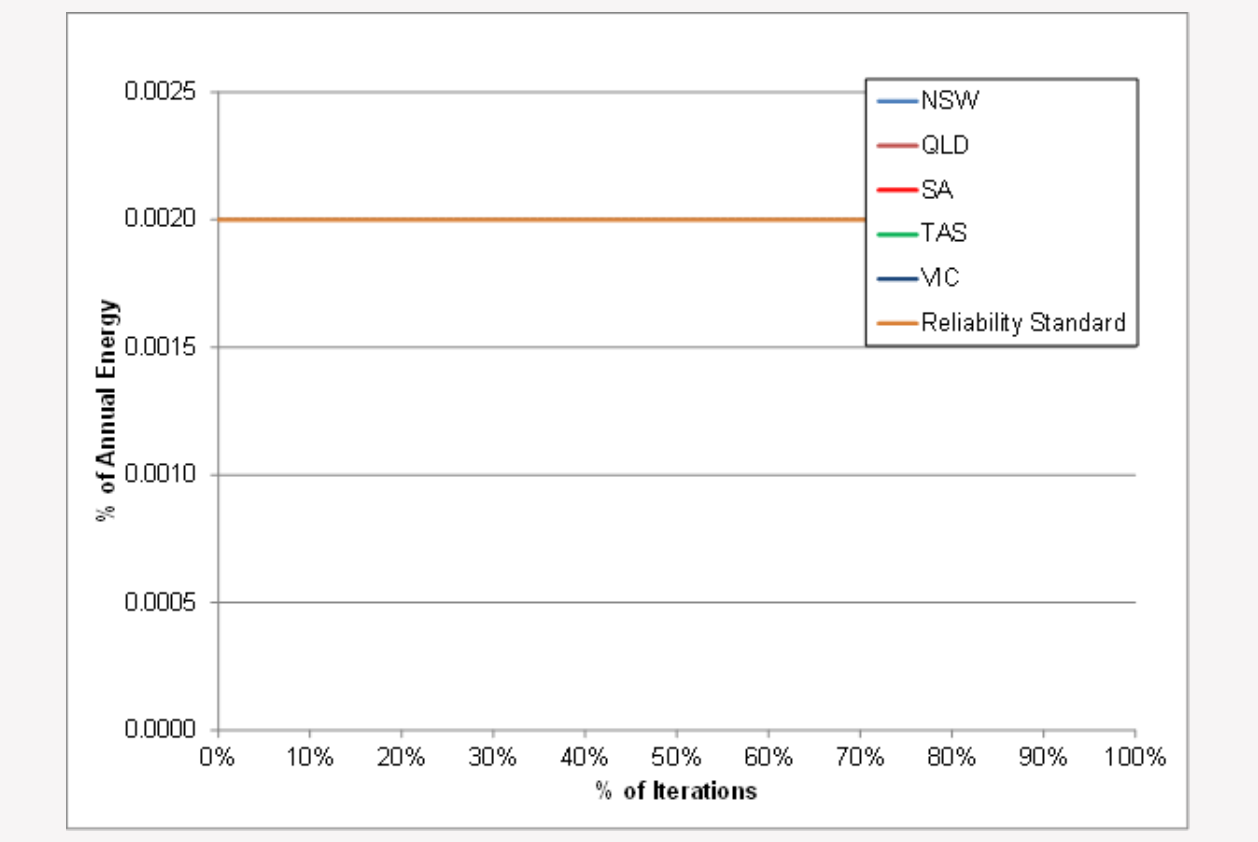
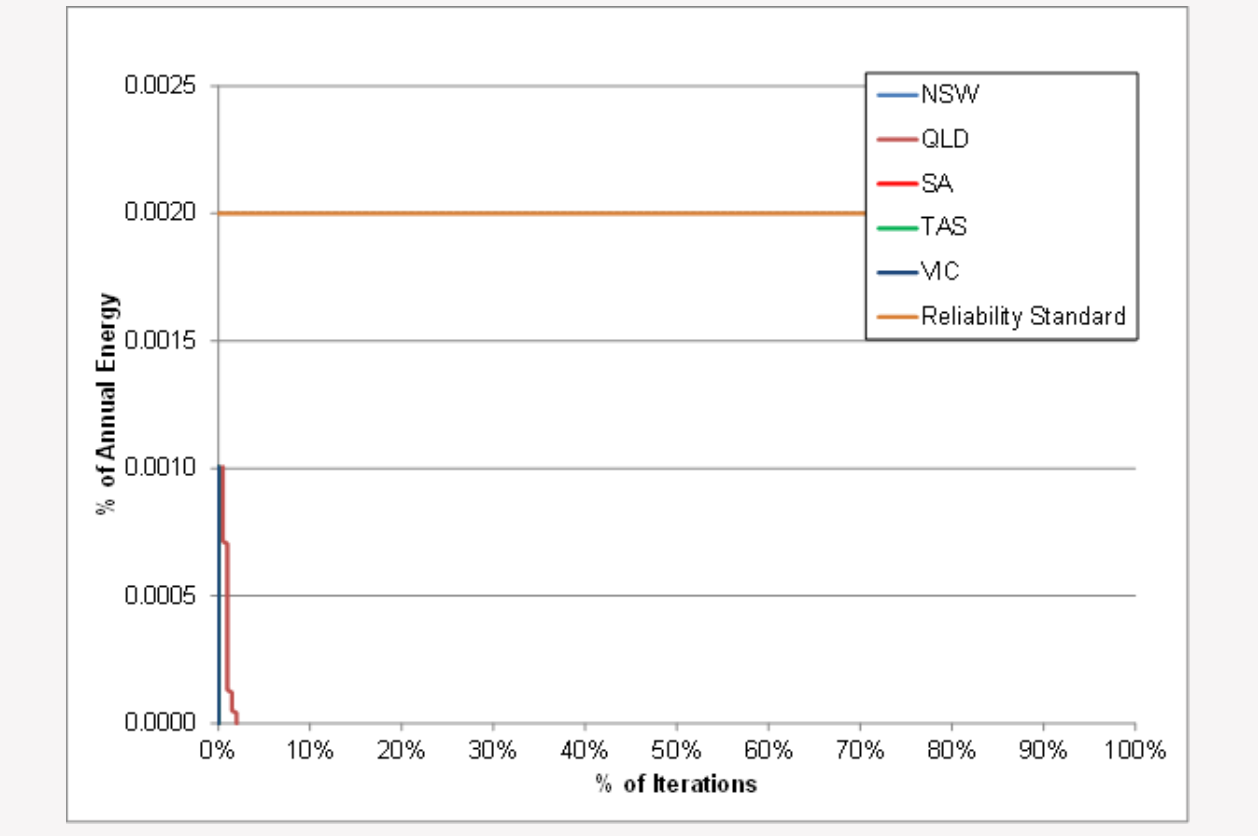


Figure 4-12 — Long-term rainfall 50% POE demand scenario – Year 2



ABBREVIATIONS

Abbreviation	Expanded name
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
POE	Probability of exceedence
USE	Unserved energy