

# Long Term Adequacy Metrics

## November 2011

### Introduction

The following report provides information on the long term adequacy of the Alberta electric energy market. The report contains metrics that include tables on generation projects under development and generation retirements, an annual reserve margin with a five year forecast period, a two year daily supply cushion, and a two year probabilistic assessment of the AIES. The Long Term Adequacy Metrics provide an assessment and provide information that can be used to facilitate further assessments of long term adequacy. This report is updated quarterly in February, May, August, and November. Inquires on the report can be made at [forecast@aeso.ca](mailto:forecast@aeso.ca).

As a result of the potential termination of the Sundance 1 and 2 units, a sensitivity of the Long Term Adequacy Metrics with the removal of Sundance 1 and 2 has been included at the end of this report.

### Summary of Changes since Previous Report

#### New Generation and Retirements Metric

##### *Projects completed and removed from list:*

- TransAlta / Capital Power – Keephills 3 (460 MW)
- University of Calgary – Cogeneration Unit (15 MW)
- Suncor – Wintering Hills Wind Energy Project (88 MW)

##### *Generation Projects moved to “Active Construction”:*

- ECB Enviro North America – ECB Enviro Biomass (4 MW)

##### *Generation projects moved to “Regulatory Approval”:*

- NaturEner – Wildrose Phase 2 (200 MW)

##### *Generation projects that have been added to “Announced, Applied for AESO Interconnection, and/or Applied for Regulatory Approval”:*

- Firebox Energy - John W. Murray Biomass Plant (30 MW)
- Renewable Energy Services - PC006 Wind Farm (75 MW)

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- E.ON - Kitscoty Wind Facility (120 MW)
- E.ON - Grizzly Bear Wind Facility (120 MW)
- Athabasca Oil Sands Corp. - Dover West (100 MW)
- Alberta Cogen 1 - Alberta Cogen 1 (180 MW)
- Shell - Carmon Creek Phase 1 (170 MW)

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## *Other changes to generation projects:*

Project	Change
Suncor - Firebag Stage 3	New ISD of Nov-2011 from Sep-2011
BC Hydro - Fort Nelson Generating Station Upgrades	New ISD of Nov-2011 from Oct-2011
Daishowa-Marubeni - Steam Turbo Generator	New ISD of Nov-2011 from Oct-2011
Shell - Scotford Industrial System	New ISD of Dec-2011 from Nov-2011
Enel - Castle Rock Wind Farm	New ISD of Nov-2012 from May-2012
TransAlta - Keephills 2 Uprate	New ISD of Mar-2012 from Oct-2011
Capital Power - Halkirk Wind Project	New ISD of Aug-2012 from May-2012
NRGreen Power - Windfall Compressor Station	New ISD of Oct-2012 from Sep-2012
NaturEner - Wild Rose Wind Farm	New ISD of Jul-2013 from Mar-2013
Mustus Energy - Mustus Energy Biomass Generator	New ISD of Aug-2013 from May-2013
Benign Energy Canada Inc. - Heritage Wind Farm	New ISD of Sep-2013 from Mar-2015
Pteragen - Peace Butte Wind Farm	New ISD of Oct-2012 from Feb-2012
Suncor - Firebag Stage 4	New ISD of Aug-2013 from Apr-2013
ENMAX - Bonnybrook Energy Centre	New ISD of Jan-2014 from Jul-2013
Swan Hills Synfuels Ltd - Swan Hills Sagitawah Generating Facility	New ISD of Jul-2014 from Dec-2013
Mainstream Renewable - Wainwright Wind Project	New ISD of Feb-2014 from Dec-2013
Blood Tribe - Wild Turnip Hill Wind Project	New ISD of Jun-2015 from Apr-2014
Sequoia - Oyen Wind Project	New ISD of Dec-2014 from May-2014
Geilectric Inc. - Welsch Wind Farm	New ISD of Jun-2014 from Jul-2014
TransAlta - Sundance 7	New ISD of Apr-2015 from Dec-2014
Nakoda Oil and Gas - Stoney Nakoda Power Station	New ISD of Apr-2015 from Feb-2015
Suncor - Schuler Wind Energy Project	New ISD of Aug-2014 from Jun-2015
Total E&P Joslyn Ltd. - Joslyn Mine	New ISD of Jan-2015 from 2015
Piikani Resources Development Ltd. - Piikani Wind Project	New ISD of May-2015 from Jul-2015
TransAlta - Dunvegan	New ISD of TBD from May-2013
Vindt Resources Inc. - Coyote Ridge Wind Project	Removed from the list

## Long Term Adequacy Metrics – November 2011

### **Reserve Margin Metric**

The forecasted reserve margin has been updated. Changes to the ISD of projects caused a majority of changes from the August report.

### **Supply Cushion Metric**

The forecasted supply cushion has been updated to reflect the new time period.

### **Two Year Probability of Supply Adequacy Shortfall Metric**

New values for the metric have been calculated with Total Energy Not Served decreasing to 8 MWh from 10 MWh. This new value is below the 1600 MWh threshold.

# Long Term Adequacy Metrics – November 2011

## New Generation Projects and Retirements Metric

The New Generation Projects and Retirements Metric is a summary of generation at various stages of development in Alberta and is shown in Tables 1 to 5 below. In Alberta’s deregulated electricity market competitive forces determine the location, magnitude and timing of new generation additions. Information on prospective generation additions and retirements provides context for the future market in Alberta. The information is drawn from a variety of public sources and includes new generation, changes to existing generation and the retirement of generating units. Changes in project in-service dates (ISDs) and regulatory stages occur as projects move forward and/or market conditions change. Current information on connection project ISDs can be found in the [AESO Project List](#) and information on power plant applications can be found at the [Alberta Utilities Commission](#) website.

Projects in the deferred category (Table 4) will be removed after four quarters.

**Table 1: Generation Projects under Construction**

Sponsor(s)	Project Name	Fuel	Unit Capacity*	ISD*
Suncor	Firebag Stage 3	Gas	170	Nov-2011
BC Hydro	Fort Nelson Generating Station Upgrades	Gas	26	Nov-2011
Daishowa-Marubeni	Steam Turbo Generator	Gas	20	Nov-2011
Shell	Scotford Industrial System	Gas	18	Dec-2011
Enel	Castle Rock Wind Farm	Wind	115	Nov-2012
ECB Enviro North America	ECB Enviro Biomass	Biomass	4	Jan-2013
NaturEner	Prairie Home Phase 1 Wind	Wind	9	Mar-2013
Imperial Oil Resources	Kearl Phase 1 Cogeneration	Gas	100	Nov-2014
ENMAX	Shepard Energy Centre	Gas	800	Jun-2015
<b>Total (MW)</b>			<b>1,262</b>	

- *Unit Capacity – Expected MW capacity; ISD – Estimated in-service date (month defaulted to July 1<sup>st</sup> in metrics if applicable)*

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**Table 2: Generation Projects with Regulatory Approval**

Sponsor(s)	Project Name	Fuel	Unit Capacity	ISD
TransAlta	Keephills 2 Uprate	Coal	23	Mar-2012
TransAlta	Keephills 1 Uprate	Coal	23	May-2012
South Pacific Resource Corp.	Fort McKay Cogeneration	Gas	17	Jul-2012
Capital Power	Halkirk Wind Project	Wind	150	Aug-2012
NRGreen Power	Windfall Compressor Station	Gas	16	Oct-2012
Alberta Wind Energy	Old Man River Wind Farm	Wind	47	Oct-2012
MEG Energy	Christina Lake Cogeneration Plant Phase 2B	Gas	85	Dec-2012
Greengate Power Corporation	Blackspring Ridge Wind	Wind	300	Dec-2012
Imperial Oil Resources	Cold Lake Expansion – Nabiye	Gas	160	Jun-2013
NaturEner	Wild Rose Wind Farm	Wind	200	Jul-2013
NaturEner	Wild Rose Phase 2	Wind	200	Jul-2013
Mustus Energy	Mustus Energy Biomass Generator	Biomass	30	Aug-2013
Benign Energy Canada Inc.	Heritage Wind Farm	Wind	350	Sep-2013
Opti/Nexen	Long Lake South	Gas	85	Sep-2014
Medicine Hat	Box Springs Wind Farm	Wind	8	Dec-2014
TransCanada	Saddlebrook Generating Station	Gas	350	Feb-2015
Maxim Power	HR Milner Expansion	Coal	500	Jul-2015
NRGreen Power	Irma Compressor Station	Other	8	TBD
NRGreen Power	Morinville Compressor Station	Other	8	TBD
Imperial Oil Resources	Kearl Phase 2 & 3 Cogeneration	Gas	135	TBD
TransAlta	Dunvegan	Hydro	100	TBD
<b>Total (MW)</b>			<b>2,795</b>	

# Long Term Adequacy Metrics – November 2011

**Table 3: Generation Projects that have been Announced, Applied for AESO Connection, and/or Applied for Regulatory Approval**

Sponsor(s)	Project Name	Fuel	Unit Capacity	ISD*
AltaGas	Harmattan Cogeneration Plant Unit 2	Gas	15	Apr-2012 (P)
TransAlta	Sundance 3 Uprate	Coal	15	Jul-2012 (C)
Pteragen	Peace Butte Wind Farm	Wind	116	Oct-2012 (A)
Alberta-Pacific Forest Industries Inc.	Al-Pac Pulp Mill	Gas	13	Nov-2012 (P)
Plasco Energy Group Inc.	Plasco Waste Conversion Facility	Gas	15	Nov-2012 (C)
Alberta Wind Energy	Windy Point Wind Farm	Wind	61	Jan-2013 (P)
Vindt Resources Inc.	Willowridge Wind Farm	Wind	100	Mar-2013 (A)
Nexen / Joss	Hand Hills Wind Power Project	Wind	80	Apr-2013 (P)
Firebox Energy	John W. Murray Biomass plant	Biomass	30	Apr-2013 (C)
Renewable Energy Services	PC006 Wind Farm	Wind	75	Jul-2013 (A)
E.ON	Kitscoty Wind Facility	Wind	120	Jul-2013 (A)
E.ON	Grizzly Bear Wind Facility	Wind	120	Jul-2013 (A)
Athabasca Oil Sands Corp.	Dover West	Gas	100	Jul-2013 (A)
Suncor	Firebag Stage 4	Gas	160	Aug-2013 (A)
AltaGas	Glenridge Wind Development	Wind	100	Nov-2013 (A)
Suncor	Hand Hills Wind Energy Project	Wind	80	Dec-2013 (A)
Windlab	Bull Creek Wind Project	Wind	130	Dec-2013 (A)
ENMAX	Bonnybrook Energy Centre	Gas	165	Jan-2014 (P)
Mainstream Renewable	Wainwright Wind Project	Wind	150	Feb-2014 (A)

# Long Term Adequacy Metrics – November 2011

**Table 3: Generation Projects that have been Announced, Applied for AESO Connection, and/or Applied for Regulatory Approval**

Sponsor(s)	Project Name	Fuel	Unit Capacity	ISD*
Acciona	New Dayton Wind Energy Project	Wind	99	Mar-2014 (A)
Gelectric Inc.	Welsch Wind Farm	Wind	69	Jun-2014 (P)
Swan Hills Synfuels Ltd	Swan Hills Sagitawah Generating Facility	Gas	344	Jul-2014 (A)
Shell	Wild Steer Butte Wind Farm	Wind	75	Jul-2014 (A)
Shell	Wild Steer Butte Wind Farm	Wind	700	Jul-2014 (A)
Suncor	Schuler Wind Energy Project	Wind	80	Aug-2014 (A)
Enel	Alberta HWY 785 Wind Farm	Wind	235	Oct-2014 (A)
Enel	Riverview Wind Farm	Wind	115	Oct-2014 (A)
Sequoia	Oyen Wind Project	Wind	100	Dec-2014 (A)
Total E&P Joslyn Ltd.	Joslyn Mine	Gas	85	Jan-2015 (P)
Alberta Cogen 1	Alberta Cogen 1	Gas	180	Mar-2015 (A)
TransAlta	Sundance 7	Gas	850	Apr-2015 (A)
Nakoda Oil and Gas	Stoney Nakoda Power Station	Gas	285	Apr-2015 (A)
Piikani Resources Development Ltd.	Piikani Wind Project	Wind	210	May-2015 (A)
MEG Energy	Christina Lake Cogeneration Phase 3A	Gas	67	May-2015 (A)
Athabasca Oil Sands Corp.	Dover North Facility Expansion	Gas	85	Jun-2015 (A)
Blood Tribe	Wild Turnip Hill Wind Project	Wind	100	Jun-2015 (A)
TransCanada	Provost Wind Farm	Wind	150	Jun-2015 (A)
Shell	Carmon Creek - Phase 1	Gas	170	2015 (C)
Alberta Wind Energy	Old Elm & Pothole Creek	Wind	300	Dec-2016 (A)
Athabasca Oil Sands Corp.	MacKay	Gas	85	Jun-2017 (A)

# Long Term Adequacy Metrics – November 2011

**Table 3: Generation Projects that have been Announced, Applied for AESO Connection, and/or Applied for Regulatory Approval**

Sponsor(s)	Project Name	Fuel	Unit Capacity	ISD*
TransCanada	Neutral Hills Wind Project	Wind	150	Jun-2017 (A)
Bruce Power Alberta	Alberta nuclear power project	Nuclear	4,000	TBD
NRGreen Power	Windfall Power Generating Station	Gas	82	TBD
<b>Total (MW)</b>			<b>10,261</b>	

\* - (P):Power Plant application filed with AUC, (A): AESO application in process, (C): Corporate announcement

**Table 4: Generation Projects that have been Deferred**

Sponsor(s)	Project Name	Fuel	Unit Capacity	Status
N/A				

**Table 5: Generation Projects that have Announced to Retired**

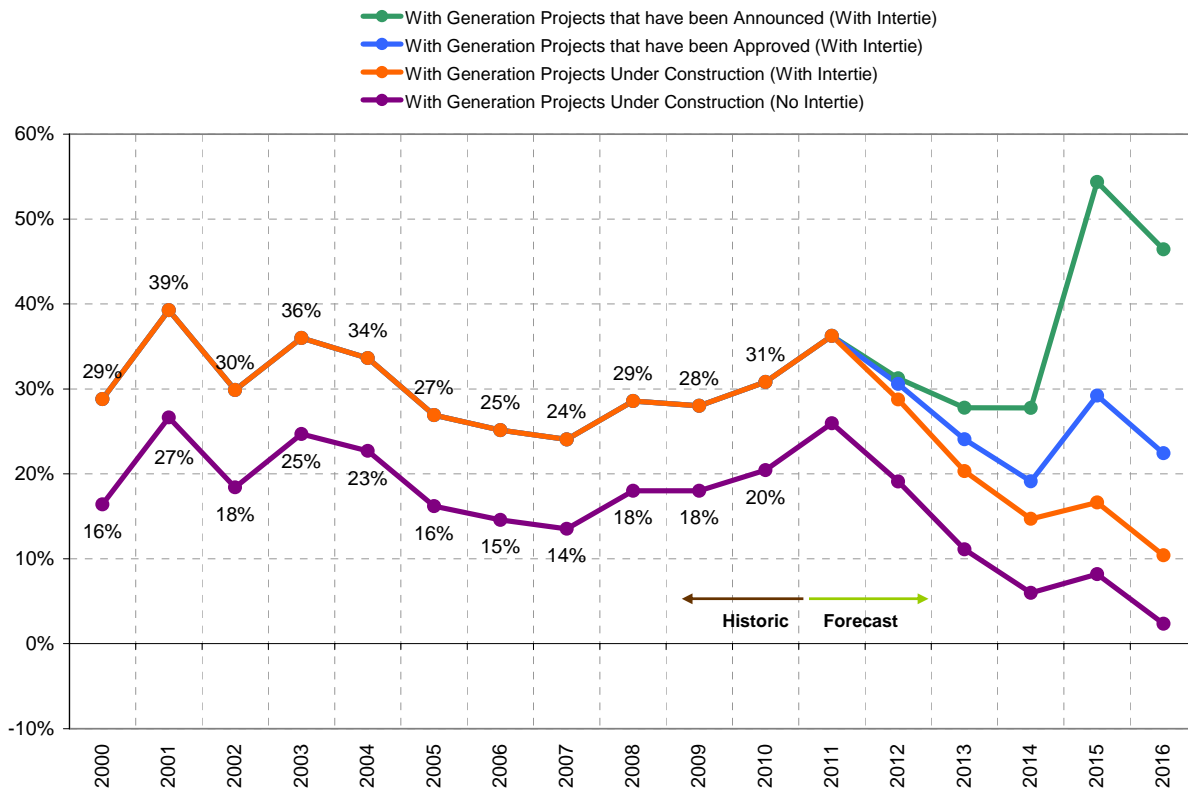
Sponsor(s)	Project Name	Fuel	Unit Capacity	Retire Date	Status
N/A					
<b>Total (MW)</b>			<b>0</b>		

# Long Term Adequacy Metrics – November 2011

## Reserve Margin Metric

The Reserve Margin Metric, shown in Figure 1, presents a comparison of generation supply and demand in Alberta. It is a calculation of the firm generation capacity at the time of system peak that is in excess of the system annual peak demand, expressed as a percentage of the system peak. Information on the annual peak demand within the reserve margin can be found at [Load Forecasting](#). Firm generation is defined as installed and future generation capacity, adjusting for seasonal hydro capacity and behind-the-fence demand and generation, and excludes wind capacity. Three forecast reserve margins are presented, each with different future supply additions. The supply additions correspond to the stage of the generation projects in the New Generation Projects and Retirements Metric. The metric is graphed with and without intertie capacity in one reserve margin since full import capability may not always be available at the time of system peak demand. In November 2010, the AESO updated capacity values on the Current Supply & Demand page to reflect maximum capability capacities. The Reserve Margin Metric values from 2010 & onward incorporate these new values.

**Figure 1: Alberta Interconnected Electric System Reserve Margin, 2000 - 2016**

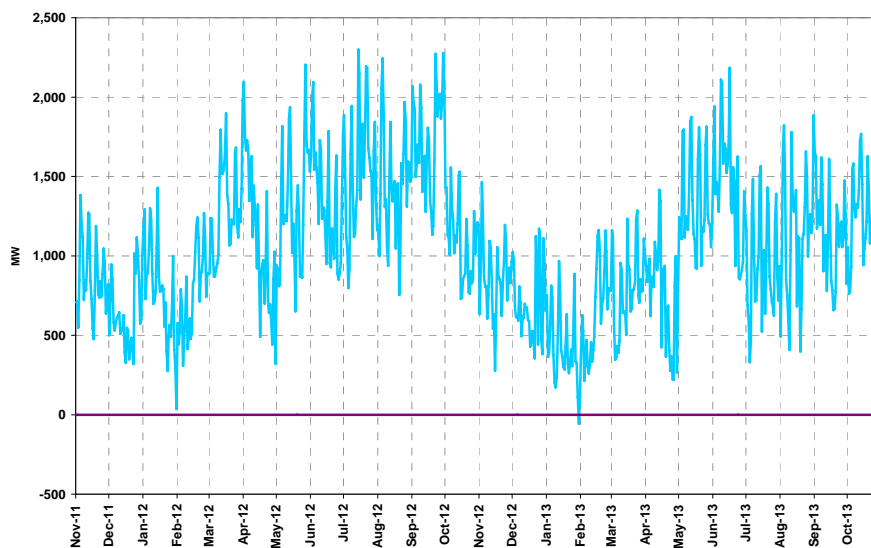


# Long Term Adequacy Metrics – November 2011

## Supply Cushion Metric

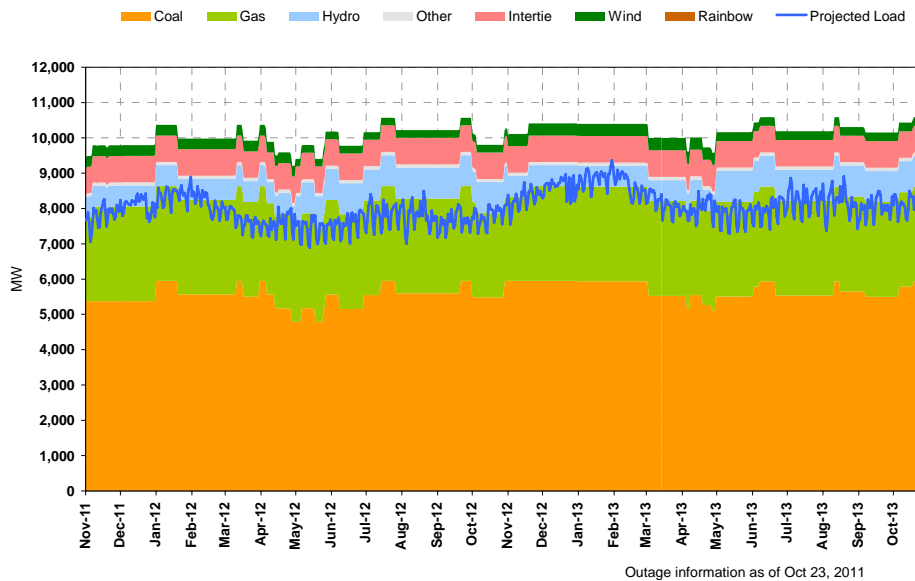
The Supply Cushion Metric provides visibility of the Alberta Interconnected Electric System’s ability to meet peak demand on a daily basis. The supply cushion is the difference between the daily available firm supply minus daily peak demand. Only existing generation and generation under construction are used within the metric. The supply cushion refines the reserve margin calculation by using daily system peak rather than annual and incorporates planned outages. Figure 2 presents the estimated daily supply cushion for the next two years. Figure 3 presents daily peak demand and firm supply by fuel type, as well as interties, wind and back up generation (Rainbow) which are not included in the supply cushion calculation due to the intermittent or uncertain nature of the supply. When the supply cushion is negative in Figure 2, there is an increased level of reliance on interties, wind and back up generation, as indicated in Figure 3.

**Figure 2: Alberta Interconnected Electric System Daily Supply Cushion, November 1, 2011 to October 31, 2013**



# Long Term Adequacy Metrics – November 2011

**Figure 3: Alberta Interconnected Electric System Daily Peak Demand and Available Supply, November 1, 2011 to October 31, 2013**



# Long Term Adequacy Metrics – November 2011

## Two Year Probability of Supply Adequacy Shortfall Metric

The Two Year Probability of Supply Adequacy Shortfall Metric is a probabilistic assessment of encountering a supply shortfall over the next two years. It builds on the Supply Cushion Metric by incorporating the probability of wind production, forced generation outages and generation derates into the calculation of hourly firm supply. The calculation estimates, on a probabilistic basis, how much load may go without supply over the next two year period. Based on extensive consultation with stakeholders, when this unserved energy exceeds 1,600 MWh in any two year period (equivalent to one hour 800 MW shortfall in each of the two years), the AESO may take certain actions to bridge the temporary supply adequacy gap without impacting investor confidence in the market. The total energy not served shown in Table 6 does not reach the threshold.

**Table 6: Two Year Probability of Supply Adequacy Shortfall, November 1, 2011 to October 31, 2013**

Worst Shortfall Hour (MW)	# of Hours in Shortfall	Total Energy Not Served (MWh)
4	0	8

*Note: Values are rounded and represent average outputs*

# Long Term Adequacy Metrics November 2011 – Sensitivity analysis for SD 1 and 2 Termination

## Introduction

In a [February 17, 2011 letter](#) to market participants, the AESO assessed the impact to the February 2011 Long Term Adequacy Metrics of a possible reduction in provincial generation capacity due to the potential early termination of the Sundance 1 and 2 units as a result of an announcement made by TransAlta on February 8, 2011. That assessment focused on the annual Reserve Margin Metric to 2016 and the Supply Cushion Metric and the Probability of Supply Adequacy Shortfall (PSAS) Metric over the two year time frame February 2011 to January 2013.

As part of the AESO's quarterly process of updating the Long Term Adequacy Metrics, this sensitivity has again been reassessed for the impact of the potential early termination of the Sundance 1 and 2 units. This assessment looks at the annual Reserve Margin Metric to 2016 and the Supply Cushion Metric and the PSAS Metric over the two year time frame of November 2011 to October 2013.

Sundance 1 and 2 units have a combined Maximum Capability (MC) of 576 MW which represents approximately 10 per cent of the current Alberta coal fleet (Keephills 3 excluded).

The PSAS Total Energy Not Served calculated to be 8 MWh in the November 2011 assessment, shows a sensitivity of 408 MWh when Sundance 1 and 2 are completely removed from provincial generation capacity.

The Long Term Adequacy Metrics provide an assessment and information that can be used to facilitate further analysis of long term adequacy. This report is updated quarterly in February, May, August, and November. Inquires on the report can be made to [forecast@aeso.ca](mailto:forecast@aeso.ca).

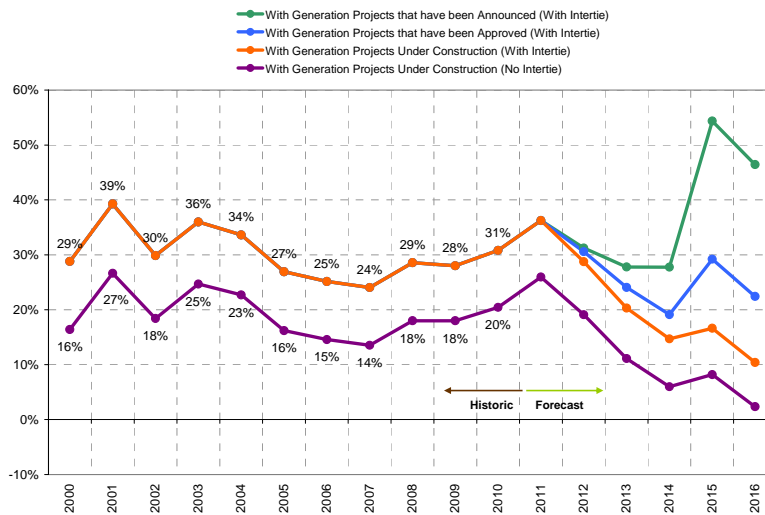
# Sensitivity of Long Term Adequacy Metrics – November 2011

## Reserve Margin Metric Sensitivity Analysis

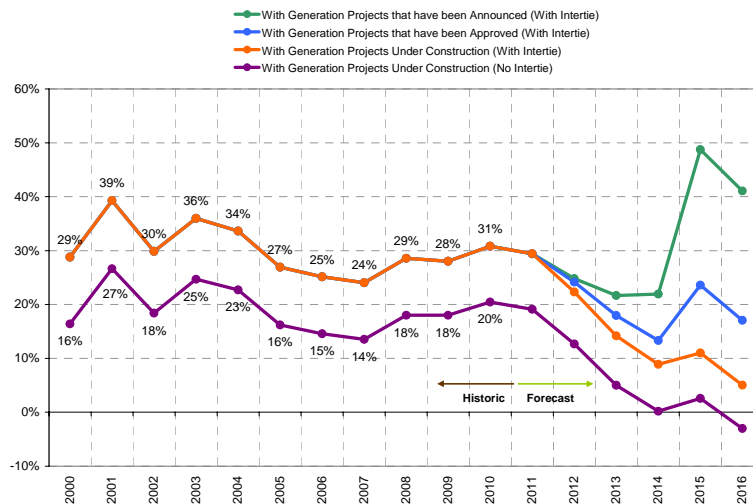
A comparison of the November 2011 LTA reserve margin and the sensitivity analysis reserve margin with no Sundance 1 and 2 can be found below.

**Figure 4: Change in Forecast Alberta Interconnected Electric System Reserve Margin, 2000 – 2016**

November 2011 LTA posting:



November 2011 sensitivity analysis reserve margin with no Sundance 1 and 2:



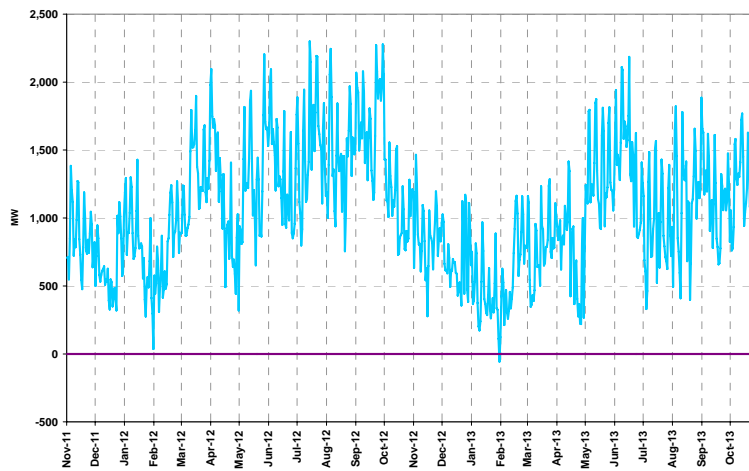
# Sensitivity of Long Term Adequacy Metrics – November 2011

## Supply Cushion Metric Sensitivity Analysis

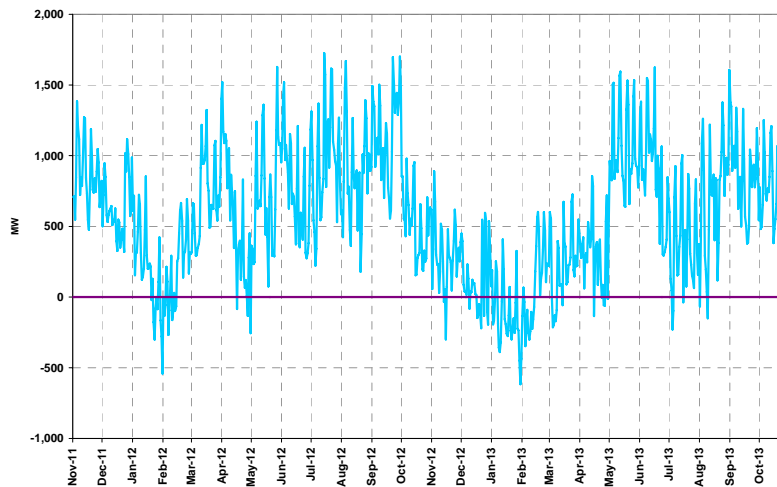
A comparison of the November 2011 LTA supply cushion and the sensitivity analysis supply cushion with no Sundance 1 and 2 can be found below.

**Figure 5: Change in Alberta Interconnected Electric System Daily Supply Cushion, November 1, 2011 to October 31, 2013**

2011 November LTA posting:



2011 November sensitivity analysis supply cushion with no Sundance 1 and 2:



# Sensitivity of Long Term Adequacy Metrics – November 2011

## Two Year Probability of Supply Adequacy Shortfall Metric

A comparison of the Two Year Probability of Supply Adequacy Shortfall metric results from the November 2011 LTA and the sensitivity analysis with no Sundance 1 and 2 can be found below.

**Table 7: Change in Two Year Probability of Supply Adequacy Shortfall, November 1, 2011 to October 31, 2013**

November 2011 LTA posting:

Worst Shortfall Hour (MW)	# of Hours in Shortfall	Total Energy Not Served (MWh)
4	0	8

*Note: Values are rounded and represent average outputs*

November 2011 sensitivity analysis of Two Year Probability of Supply Adequacy Shortfall with no Sundance 1 and 2:

Worst Shortfall Hour (MW)	# of Hours in Shortfall	Total Energy Not Served (MWh)
114	3	408

*Note: Values are rounded and represent average outputs*