

# Attachment A – Index of Resource Adequacy Model Consultation Materials



Section 207.1 RAM Characteristics	References to RAM Data, Inputs and Assumptions presented during the Capacity Market Design and ISO rule Consultation
4(1)(a) load forecast <sup>1</sup>	<p>Please see the following links to the AESO's consultation materials on the load forecast for the RAM:</p> <ul style="list-style-type: none"><li>• February 15, 2018 – Capacity Market Load Forecast Model, Process, and Preliminary 2021 Results: <a href="https://www.aeso.ca/assets/Uploads/Capacity-Market-Load-Forecast-Process-Technical-WG-S1-Feb-15-2018.pdf">https://www.aeso.ca/assets/Uploads/Capacity-Market-Load-Forecast-Process-Technical-WG-S1-Feb-15-2018.pdf</a></li><li>• February 15, 2018 – Load Forecast Methodology &amp; Resource Adequacy Modeling Update (see PDF pp. 30-52): <a href="https://www.aeso.ca/assets/Uploads/Presentation-Technical-WG-S1-Feb-15-2018.pdf">https://www.aeso.ca/assets/Uploads/Presentation-Technical-WG-S1-Feb-15-2018.pdf</a></li><li>• July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF pp. 7-9): <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li><li>• August 16, 2018 – Preliminary peak and average load for 2021/2022 obligation period (see PDF p. 50) <a href="https://www.aeso.ca/assets/Uploads/Demand-Curve-Working-Group-5-August-17.pdf">https://www.aeso.ca/assets/Uploads/Demand-Curve-Working-Group-5-August-17.pdf</a></li><li>• September 13, 2018 – Updates to historic load data using most recent Conference Board of Canada economic forecast data were discussed with the consultation group at the AESO's September 13, 2018 stakeholder consultation session. Webinar Recording: <a href="https://www.youtube.com/watch?v=AFnBFAtnkvl&amp;feature=youtu.be">https://www.youtube.com/watch?v=AFnBFAtnkvl&amp;feature=youtu.be</a></li><li>• November 28, 2018 – Gross Minimum Procurement Volume Input and Methodology review (see Tables 4 and 5 for peak and average load for 2021/22 and 2022/2023, respectively): <a href="https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf">https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf</a></li></ul>

<sup>1</sup> The AESO has provided the 150 load profiles used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachment C – Load Profiles, which accompanies the AESO's December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.

Section 207.1 RAM Characteristics	References to RAM Data, Inputs and Assumptions presented during the Capacity Market Design and ISO rule Consultation
<p>4(1)(b) the available capability or available generation from all individual generating units and aggregated generating facilities in Alberta that the ISO anticipates will have, for the obligation period, a: (i) maximum capability greater than or equal to 5 MW; or (ii) uniform capacity value that is greater than or equal to 1 MW<sup>2</sup></p>	<p>Please see the following links to the AESO's consultation materials on generation availability data used in the RAM:</p> <ul style="list-style-type: none"> <li>• August 31, 2018 –Section 207.1, <i>Gross Minimum Procurement Volume</i> (see Appendix 1 &amp; 2 for maximum capability of units modeled within the RAM) [note: available capability or available generation is taken into account through 4(1)(c) through (j)]: <a href="https://www.aeso.ca/assets/Uploads/Section-207.1-Gross-Minimum-Procurement-Volume-final-for-consultation-2018-08-31.pdf">https://www.aeso.ca/assets/Uploads/Section-207.1-Gross-Minimum-Procurement-Volume-final-for-consultation-2018-08-31.pdf</a></li> <li>• November 28, 2018 – <ul style="list-style-type: none"> <li>○ Section 207.2, <i>Gross Minimum Procurement Volume</i> (see Appendix 1 &amp; 2 for updated maximum capability of units modeled within the RAM).</li> <li>○ Gross Minimum Procurement Volume Input and Methodology review (see Summary of the AESO's Resource Adequacy Model Review on PDF p. 2) <a href="https://www.aeso.ca/assets/Uploads/Section-207.2-Gross-Minimum-Procurement-Volume.pdf">https://www.aeso.ca/assets/Uploads/Section-207.2-Gross-Minimum-Procurement-Volume.pdf</a> <a href="https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf">https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf</a></li> </ul> </li> </ul>
<p>4(1)(c) historical outages of thermal assets, including automatic forced outages, delayed forced outages, planned outages and ambient temperature derates, and any projected changes as applicable;<sup>3</sup></p>	<p>Please see the following links to the AESO's consultation materials on the outage data and assumptions in the RAM:</p> <ul style="list-style-type: none"> <li>• April 6, 2018 – Resource Adequacy Modeling presentation (see PDF pp. 42-46 for the assumptions and summary data regarding thermal planned outages, forced outages and seasonal derates) <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>• July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF pp. 10-14) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> <li>• August 17, 2018 – Resource Adequacy Modeling update presentation (see PDF pp. 46-48 for updated assumptions and summary data regarding thermal planned outage and forced outages)</li> </ul>

<sup>2</sup> The AESO has provided the availability capability and available generation data used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachment B – Resource Adequacy Model Inputs, which accompanies the AESO's December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.

<sup>3</sup> The AESO has provided summary statistics for outages based on technology type in Attachment B – Resource Adequacy Model Inputs, which accompanies the AESO's December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*. The AESO has not provided data on asset-specific outage rates due to the commercial sensitivity of the data.

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	<p><a href="https://www.aeso.ca/assets/Uploads/Demand-Curve-Working-Group-5-August-17.pdf">https://www.aeso.ca/assets/Uploads/Demand-Curve-Working-Group-5-August-17.pdf</a></p> <ul style="list-style-type: none"> <li>November 28, 2018 – Gross Minimum Procurement Volume Input and Methodology review (see PDF pp. 2 of for information on how assumptions for biomass unit planned and forced outages were updated): <a href="https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf">https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf</a></li> </ul>
<p>4(1)(d) historical performance of existing intermittent resources, including wind and solar, and any projected changes;<sup>4</sup></p> <p>4(1)(e) anticipated performance of new intermittent resources, including wind and solar;</p>	<p>Please see the following links to the AESO’s consultation materials on the wind and solar profiles used in the RAM:</p> <ul style="list-style-type: none"> <li>April 6, 2018 – Resource Adequacy Modeling presentation (see PDF pp. 63-66 for methodology and profile example regarding wind and solar resources) <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF pp. 18-21) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> </ul>
<p>4(1)(f) historical performance of hydroelectric generation and any projected changes;<sup>5</sup></p>	<p>Please see the following links to the AESO’s consultation materials on the treatment of and assumptions relating to hydro in the RAM:</p> <ul style="list-style-type: none"> <li>April 6, 2018 – Resource Adequacy Modeling presentation (see PDF pp. 67-69 for parameters and assumptions regarding hydro resources) <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF pp. 22-24) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> </ul>
<p>4(1)(g) historical performance of cogeneration</p>	<p>Please see the following links to the AESO’s consultation materials on the treatment of hydro in the RAM:</p>

<sup>4</sup> The AESO has provided the wind and solar profiles used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachments D – Wind Profiles and Attachment E – Solar Profiles, which accompany the AESO’s December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*. Capacity factors for wind align with historical observations for existing sites. Future sites are grossed up to represent improved capacity factors from new technology.

<sup>5</sup> The AESO has provided the hydro data used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachments B – Resource Adequacy Model Inputs, which accompanies the AESO’s December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.

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sites in Alberta and any projected changes; <sup>6</sup>  4(1)(i) the correlation of load and generation at cogeneration sites in Alberta, as applicable;	<ul style="list-style-type: none"> <li>April 6, 2018 – Resource Adequacy Modeling presentation (see PDF pp. 47-49 for summary distributions and assumptions regarding cogeneration) <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>June 14, 2018 – Resource Adequacy Modeling update presentation (see PDF p.4 for updated cogeneration seasonality assumptions and distributions) <a href="https://www.aeso.ca/assets/Uploads/Resource-Adequacy-WG-Update-Jun-14-V5.pdf">https://www.aeso.ca/assets/Uploads/Resource-Adequacy-WG-Update-Jun-14-V5.pdf</a></li> <li>July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF pp. 15-17) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> </ul>
4(1)(h) historical performance of a load asset supplying capacity in the capacity market and any projected changes; <sup>7</sup>	Please see the following link to the AESO’s presentation on the treatment of price responsive load to the Demand Curve Working Group. <ul style="list-style-type: none"> <li>April 6, 2018 – Price Responsive Load in the Resource Adequacy Model <a href="https://www.aeso.ca/assets/Uploads/Price-Responsive-Load-presentation-for-TWG2v3.pdf">https://www.aeso.ca/assets/Uploads/Price-Responsive-Load-presentation-for-TWG2v3.pdf</a></li> </ul>
4(1)(j) the available transfer capability and gross import offers on the interties; <sup>8</sup>	Please see the following links to the AESO’s consultation materials on the treatment of and assumptions relating to interties in the RAM: <ul style="list-style-type: none"> <li>April 6, 2018 – Resource Adequacy Modeling presentation (see PDF p. 62 for data and assumptions regarding interties): <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF p. 26) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> <li>November 28, 2018 - Gross Minimum Procurement Volume Input and Methodology review (see PDF pp. 2-4 for updated intertie assumptions and distributions): <a href="https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf">https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf</a></li> </ul>

<sup>6</sup> The AESO has provided the cogeneration data used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachments B – Resource Adequacy Model Inputs, which accompanies the AESO’s December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.

<sup>7</sup> There are no load assets supplying capacity in Alberta at this time and therefore none are modeled in the RAM for the 2021/2022 and 2022/2023 procurement volumes.

<sup>8</sup> The AESO has provided the intertie data used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachments B – Resource Adequacy Model Inputs, which accompanies the AESO’s December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.

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4(1)(k) capacity to maintain regulating reserve <sup>9</sup>	<p>Please see the following links to the AESO's consultation materials on the assumptions related to emergency operations in the RAM:</p> <ul style="list-style-type: none"> <li>• April 6, 2018 – Resource Adequacy Modeling presentation (see PDF p. 50 regarding assumptions on the percentage of generation allocated to spinning and supplemental reserves): <a href="https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf">https://www.aeso.ca/assets/Uploads/TechnicalWorkgroup-2-April6-2018.pdf</a></li> <li>• July 27, 2018 – Modeling and Assumptions to Support the Development of the Capacity Market Design Rules Session (see PDF p. 25) <a href="https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf">https://www.aeso.ca/assets/Uploads/July-27-Stakeholder-Session-Presentation.pdf</a></li> <li>• November 28, 2018 - Gross Minimum Procurement Volume Input and Methodology review (see PDF p. 3 regarding updates to assumption on how much regulating reserve to maintain during load shed events): <a href="https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf">https://www.aeso.ca/assets/Uploads/Attachment-1-Procurement-VolumeFINAL.pdf</a></li> </ul>

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<sup>9</sup> The AESO has provided the emergency operations assumptions used in the RAM to model the procurement volumes for the 2021/22 and 2022/23 obligation periods in Attachments B – Resource Adequacy Model Inputs, which accompanies the AESO's December 20, 2018 replies to stakeholders on Section 207.2, *Gross Minimum Procurement Volume*.