Technical Meeting on Loss Factor Activities
December 13, 2019 — Calgary, Alberta
John Martin, Senior Advisor
Milton Castro-Núñez, Senior Engineer
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Topics

• Introductions
• Overview of 2020 loss factor calculation results
• Status update on investigation of volume discrepancies in loss factor calculations
• Status update on recalculation of 2017 and 2018 loss factor recalculations
• Status update for Module C loss factor calculations
• Overview of “pay-as-you-go” review and variance application
• Overview of Module C payment plan compliance filing
• Review of schedule for loss factor activities

Please ask questions during presentation
AESO published 2020 loss factors on November 21, 2019

- Updates to load and merit order data to reflect new projects delayed completion of 2020 loss factors beyond “best efforts” deadline of first business day of October
  - Loss factors were published prior to “final” deadline of first business day of December

- Two “reversing POD” sites were added using average annual loss factor for the transmission system without hourly calculations in the workbook
  - Sites did not satisfy project inclusion criteria of Loss Factor Rule when loss factors were being determined
  - Sites have since progressed and will be in service in Q1 2020
• 2020 loss factors will be effective January 1, 2020
  – Will be implemented in February 2020 billing cycle for January 2020 initial settlement

• Related information was posted with loss factors
  – Hourly merit order data for 2020 loss factors
  – Sample of hourly load data for 2020 loss factors
  – Process for requesting access to system topologies
  – Updated procedure to determine transmission system losses for loss factor calculations
  – Software and scripts used to calculate hourly raw loss factors
  – Workbook showing calculations for 2020 loss factors

• 2020 average loss factor for transmission system is 2.85%
  – 2019 average loss factor was 2.75%
2020 loss factors were calculated using amended Loss Factor Rule

- Commission approved rule amendments in Decision 24637-D01-2019, issued on September 17, 2019
  - Historical volumes were increased or decreased in proportion to change in maximum capability or contract capacity, as appropriate, of source asset and to change in contract capacity of sink asset
  - Net demand was reduced before net supply offer block was dispatched to balance system when calculating hourly loss factors
  - All locations were excluded in an hour in which losses could not be calculated for a single location
- 2019 loss factors were calculated on the same basis
Annual loss factors continue to show greater dispersion for smaller volumes.

Average loss factor for transmission system: 2.85%
Hourly raw loss factors continue to show high dispersion for small volumes.
8,760 simulations were attempted for calculation of losses in initial state.

Two hours (0.02%) were excluded due to missing data.

No hours could not solve due to insufficient source assets to balance load in initial state.

54 hours (0.6%) could not solve due to insufficient source assets to balance load in redispatched state.

Hour is excluded for all assets if any simulation in hour fails to solve due to insufficient source assets.

Total of 54 hours (0.6%) were excluded due to insufficient source assets to balance load.
Exclusions due to insufficient assets are attributed to retirements and outages

- Sundance Unit 2 (280 MW) retired as of August 2018
- Sundance Unit 3 (368 MW) and Unit 5 (406 MW) began mothball outages as of April 2018
- H. R. Milner (144 MW) expected to begin extended outage as of April 2020
11.8% of hours were unsolvable in 2020

Reason for Exclusion of Hours

- Missing Data
- Insufficient Initial
- Insufficient Rescheduled
- No Dispatch
- Not Yet in Service
- Unsolvable Initial
- Unsolvable Rescheduled
- Unsolvable Elsewhere
About 59% of all hours and locations had dispatch and sufficient assets to solve

<table>
<thead>
<tr>
<th>Hours (×132)</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
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<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hours</td>
<td>98,208</td>
<td>88,704</td>
<td>98,076</td>
<td>95,040</td>
<td>98,208</td>
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<td>98,208</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(264)</td>
</tr>
<tr>
<td>Insufficient redispatched</td>
<td>(1,207)</td>
<td>(1,014)</td>
<td>0</td>
<td>0</td>
<td>(780)</td>
<td>(534)</td>
<td>(84)</td>
<td>(362)</td>
<td>(80)</td>
<td>(76)</td>
<td>0</td>
<td>0</td>
<td>(4,137)</td>
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<tr>
<td>No dispatch</td>
<td>(38,528)</td>
<td>(34,914)</td>
<td>(40,362)</td>
<td>(36,395)</td>
<td>(36,543)</td>
<td>(33,979)</td>
<td>(36,680)</td>
<td>(36,636)</td>
<td>(37,110)</td>
<td>(37,979)</td>
<td>(37,636)</td>
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<td>(2,972)</td>
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<td>Potential hours</td>
<td>55,501</td>
<td>50,088</td>
<td>54,742</td>
<td>55,765</td>
<td>57,913</td>
<td>57,647</td>
<td>58,468</td>
<td>57,978</td>
<td>54,978</td>
<td>57,177</td>
<td>56,092</td>
<td>62,497</td>
<td>678,846</td>
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<table>
<thead>
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<th>Percentages</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
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<tbody>
<tr>
<td>Total hours</td>
<td>100.0%</td>
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<tr>
<td>Missing data</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>0.0%</td>
<td>(0.3%)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>(0.02%)</td>
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<tr>
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<td>(1.2%)</td>
<td>(1.1%)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>(0.8%)</td>
<td>(0.6%)</td>
<td>(0.1%)</td>
<td>(0.4%)</td>
<td>(0.1%)</td>
<td>(0.1%)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>(0.4%)</td>
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<td>(41.2%)</td>
<td>(38.3%)</td>
<td>(37.2%)</td>
<td>(35.8%)</td>
<td>(37.3%)</td>
<td>(37.3%)</td>
<td>(39.0%)</td>
<td>(38.7%)</td>
<td>(39.5%)</td>
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<td>(38.3%)</td>
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<tr>
<td>Not yet in service</td>
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<td>(3.0%)</td>
<td>(1.5%)</td>
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<tr>
<td>Potential hours</td>
<td>56.5%</td>
<td>56.5%</td>
<td>55.8%</td>
<td>58.7%</td>
<td>59.0%</td>
<td>60.7%</td>
<td>59.5%</td>
<td>59.0%</td>
<td>57.8%</td>
<td>58.2%</td>
<td>58.9%</td>
<td>63.6%</td>
<td>58.7%</td>
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</table>
Over 99% of potential hours solved, with about 11% more excluded in same hours

<table>
<thead>
<tr>
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<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
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<td>54,978</td>
<td>57,177</td>
<td>56,092</td>
<td>62,497</td>
<td>678,846</td>
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<tr>
<td>Unsolved initial</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>(132)</td>
<td>0</td>
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<td>(264)</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>Unsolved redispatched</td>
<td>(245)</td>
<td>(116)</td>
<td>(497)</td>
<td>(361)</td>
<td>(258)</td>
<td>(166)</td>
<td>(167)</td>
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<td>(165)</td>
<td>(218)</td>
<td>(150)</td>
<td>(129)</td>
<td>(2,815)</td>
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<tr>
<td>Solved hours</td>
<td>47,965</td>
<td>46,318</td>
<td>47,452</td>
<td>45,299</td>
<td>49,736</td>
<td>50,946</td>
<td>51,501</td>
<td>52,229</td>
<td>48,819</td>
<td>49,874</td>
<td>51,005</td>
<td>57,305</td>
<td>598,449</td>
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<table>
<thead>
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<th>Jan</th>
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<th>Apr</th>
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<th>Jul</th>
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<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential hours</td>
<td>100.0%</td>
<td>100.0%</td>
<td>100.0%</td>
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<td>100.0%</td>
</tr>
<tr>
<td>Unsolved initial</td>
<td>(0.2%)</td>
<td>0.0%</td>
<td>0.0%</td>
<td>(0.2%)</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>(0.5%)</td>
<td>0.0%</td>
<td>0.0%</td>
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<td>(0.1%)</td>
</tr>
<tr>
<td>Unsolved redispatched</td>
<td>(0.4%)</td>
<td>(0.2%)</td>
<td>(0.9%)</td>
<td>(0.6%)</td>
<td>(0.4%)</td>
<td>(0.3%)</td>
<td>(0.3%)</td>
<td>(0.6%)</td>
<td>(0.3%)</td>
<td>(0.4%)</td>
<td>(0.3%)</td>
<td>(0.2%)</td>
<td>(0.4%)</td>
</tr>
<tr>
<td>Unsolved elsewhere</td>
<td>(12.9%)</td>
<td>(7.3%)</td>
<td>(12.4%)</td>
<td>(18.1%)</td>
<td>(13.4%)</td>
<td>(11.3%)</td>
<td>(11.6%)</td>
<td>(9.3%)</td>
<td>(10.4%)</td>
<td>(12.4%)</td>
<td>(8.8%)</td>
<td>(8.1%)</td>
<td>(11.4%)</td>
</tr>
<tr>
<td>Solved hours</td>
<td>86.4%</td>
<td>92.5%</td>
<td>86.7%</td>
<td>81.2%</td>
<td>85.9%</td>
<td>88.4%</td>
<td>88.1%</td>
<td>90.1%</td>
<td>88.8%</td>
<td>87.2%</td>
<td>90.9%</td>
<td>91.7%</td>
<td>88.2%</td>
</tr>
</tbody>
</table>
About 93% of hourly shift factors were between 1% and 7%
Most 2020 loss factors are similar to 2019 loss factors.

- FNG1 (29.3 MW)
- RB5 (43.5 MW)

- Most 2020 loss factors are similar to 2019 loss factors.
Almost all loss factor changes are within ±3% between 2020 and 2019.
Marginal block offer price reached $999 in only 1% of hours in 2020 simulation.
Marginal units are materially different between 2020 and 2019 simulations

<table>
<thead>
<tr>
<th>Location (MPID)</th>
<th>2020 Marginal Units</th>
<th>2019 Marginal Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Frequency</td>
<td>Average (MW)</td>
</tr>
<tr>
<td>Sheerness #1</td>
<td>1,071</td>
<td>229</td>
</tr>
<tr>
<td>Sundance #4</td>
<td>755</td>
<td>124</td>
</tr>
<tr>
<td>Battle River #5</td>
<td>737</td>
<td>175</td>
</tr>
<tr>
<td>Keephills #1</td>
<td>678</td>
<td>168</td>
</tr>
<tr>
<td>Sundance #6</td>
<td>667</td>
<td>133</td>
</tr>
<tr>
<td>Keephills #2</td>
<td>633</td>
<td>169</td>
</tr>
<tr>
<td>Sheerness #2</td>
<td>546</td>
<td>190</td>
</tr>
<tr>
<td>Keephills #3</td>
<td>490</td>
<td>90</td>
</tr>
<tr>
<td>Genesee #2</td>
<td>409</td>
<td>171</td>
</tr>
<tr>
<td>Genesee #1</td>
<td>325</td>
<td>167</td>
</tr>
<tr>
<td>Battle River #4</td>
<td>306</td>
<td>27</td>
</tr>
<tr>
<td>Shepard</td>
<td>289</td>
<td>82</td>
</tr>
<tr>
<td>City of Medicine Hat</td>
<td>250</td>
<td>28</td>
</tr>
<tr>
<td>Genesee #3</td>
<td>217</td>
<td>78</td>
</tr>
<tr>
<td>Brazeau Hydro</td>
<td>159</td>
<td>60</td>
</tr>
<tr>
<td>Calgary Energy Centre</td>
<td>149</td>
<td>44</td>
</tr>
<tr>
<td>Alberta Newsprint</td>
<td>113</td>
<td>30</td>
</tr>
<tr>
<td>Joffre Industrial System</td>
<td>112</td>
<td>44</td>
</tr>
</tbody>
</table>
• As previously discussed, seven implementation issues have been resolved through software revision
• AESO is completing a report describing implementation issues and their resolution
• AESO will also provide validation information based on 2016 loss factor calculations
• Report is expected to be posted in January 2020
2018 loss factor recalculation are underway

- Input data has been prepared for revised software and initial state calculations are being completed
- Current recalculation is using same input data as used for April 2018 calculation
  - One anomaly was discovered and corrected in merit order data, where import volumes were positioned too high in merit order
- Some historic data (used by revised software for specific location configurations) requires updates to accommodate revised software methodology
- AESO expects to publish recalculated 2018 loss factors by end of year
2017 loss factors will be recalculated in first quarter of 2020

- Recalculation will use same input data as used for October 2017 calculation
- AESO expects to publish recalculated 2017 loss factors in March 2020
- Is technical meeting required on 2018 and 2017 loss factor recalculations?
Billing of adjustments from 2018 and 2017 loss factors will occur in 2020

- AESO is investigating options for billing of adjustments resulting from implementation of 2018 and 2017 loss factors.
- AESO is currently considering spreading the billing of adjustments over two billing cycles for each year.

<table>
<thead>
<tr>
<th>Loss Charge Adjustments</th>
<th>Billing Cycle</th>
<th>Concurrent Initial Settlement</th>
</tr>
</thead>
<tbody>
<tr>
<td>January – June 2018</td>
<td>March 2020</td>
<td>February 2020</td>
</tr>
<tr>
<td>July – December 2018</td>
<td>April 2020</td>
<td>March 2020</td>
</tr>
<tr>
<td>January – June 2017</td>
<td>May 2020</td>
<td>April 2020</td>
</tr>
<tr>
<td>July – December 2017</td>
<td>June 2020</td>
<td>May 2020</td>
</tr>
</tbody>
</table>

- Would allow all 2018 and 2017 adjustment to be billed before any Module C adjustments are billed.
- AESO interested in stakeholder feedback on options for billing of adjustments.
Module C recalculation is complete for 2016 and in progress for 2015

- Processing of Module C loss factor recalcuations for 2016 and 2015 concurrent with 2018 and 2017 loss factor recalculations
- Preparation of additional input data has been restarted following completion of software revisions
  - System topologies are expected to be complete back to 2006 in first quarter of 2020
  - Merit order data is complete back to 2006
  - Load data is complete back to 2006
  - Additional support data is complete back to 2006, including actual system losses and actual metered energy data
- Payment plan compliance filing was submitted to Commission on December 6, 2019
In Decision 790-D06-2017, Commission approved the use of single settlement approach, with one net charge collected or reimbursed to a market participant only after all loss factors have been calculated for the Module C historical period of 2006-2016.

AESO applied for review of that decision and approval to use pay-as-you-go settlement, with charges or reimbursements made to market participants once loss factors have been calculated for one or more years and repeated sequentially until all historical years have been settled.

- Reflected the time needed to complete calculations of Module C Loss Factors and conduct single settlement being materially longer than expected when Decision 790-D06-2017 was issued.
Commission will establish process in Proceedings 25150 and 790

- Commission issued filing announcement on December 4, 2019, in Proceeding 25150
- Commission issued letter on December 11 saying process would be established shortly in each of Proceeding 25150 and 790
AESO also requested interim order and reversed sequence of recalculation

- In its application, AESO requested that Commission grant leave for AESO to make application more than 60 days after Decision 790-D06-2017 was issued
- AESO also requested interim order to implement pay-as-you-go settlement
- Under pay-as-you-go settlement, AESO considers loss factors should be recalculated starting with 2006 and working forward to later years
  - Under single settlement, AESO planned to recalculate loss factors starting with 2016 and working backward to 2006
- Earlier years in the historical period experienced higher costs of losses than later years, and more interest has accumulated on earlier-year amounts
AESO submitted Module C payment plan compliance filing on December 6, 2019

• In Decision 790-D07-2019, Commission approved the AESO’s Module C methodology compliance filing and ordered the AESO to file a payment plan compliance filing

• AESO submitted its payment plan compliance filing on December 6, 2019
  – AESO included two versions of the Module C payment plan application and agreement to accommodate alternative outcomes of its application for review of Module C “single settlement” approach

• Commission has not yet established a process for review of the payment plan compliance filing
Compliance filing describes process for participation in payment plan

- Participation in payment plan will occur through an application process
- Market participant must meet specific criteria to establish financial hardship
  - insufficient liquidity
  - lack of available financing
  - inability to obtain financing
- Market participant must provide specified financial information and calculations to allow AESO to assess eligibility to participate in payment plan
- If eligible to participate in payment plan, market participant must accept form of credit agreement
Form of credit agreement establishes key terms of payment plan

- Form of credit agreement establishes key terms
  - Indicative interest rate consisting of 30-day bankers’ acceptance rate plus 80 basis points
  - Commitment fee equal to 8 basis points on loan amount
  - Term of 2 years
  - Repayments in equal consecutive monthly payments

- AESO proposes that settlement will occur monthly throughout the term of the credit agreement on the 20th business day of a month, to align with AESO’s regular tariff billing cycle

- AESO proposes that settlement implementation details be addressed in procedure document to be provided for settlement activities
AESO is updating schedule of loss factor activities for posting in January

*2017 loss factors*
*2015 loss factors*
*Module C input data*
*Module C calculations*
*Module C invoicing*
*Module C settlement*
*Module C default collections*
*Compliance: payment plan*
*Settlement R&V application*
*2021 loss factors*
*2022 loss factors*
Questions and discussion
For more information

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  403-539-2465

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  Senior Engineer, Transmission Program Support  
  milton.castro-nunez@aeso.ca  
  403-539-2537

- Loss factors, stakeholder consultation information, and related documents are posted on AESO website
  - Grid ➤ Loss factors ➤ 2020 loss factors
  - Grid ➤ Loss factors ➤ Stakeholder engagement
  - Grid ➤ Loss factors ➤ Loss factors recalculation for 2006-2016
Thank you