

Technical Meeting on Loss Factor Activities

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- Overview of 2019 loss factor calculation results
- Comparison of 2019 loss factors with 2018 loss factors
- Findings from investigation of volume discrepancies in loss factor calculations
- Status update on 2020 loss factor calculations
- Status update for Module C loss factor calculations
- Review of schedule for loss factor activities posted on AESO website

Please ask questions during presentation

AESO published corrected 2019 loss factors on July 16, 2019

- Due to unanticipated issues while preparing input data and updating software for 2019 loss factor calculations, AESO was unable to publish 2019 loss factors until June 27, 2019
 - AESO requested forbearance from the Market Surveillance Administrator (MSA) in respect of any related non-compliance with section 501.10 of the ISO rules, *Transmission Loss Factors* (“Loss Factor Rule”)
- AESO subsequently identified data misalignment resulting from certain files reflecting daylight saving time while all other files reflected standard time
 - Misalignment was identified while examining data in response to questions from the City of Medicine Hat
- AESO recalculated and posted corrected 2019 loss factors on July 16, 2019

AESO published corrected 2019 loss factors on July 16, 2019 (cont'd)

- 2019 loss factors will be effective January 1, 2019
- Related information was posted with loss factors
 - Hourly merit order data for 2019 loss factors
 - Sample of hourly load data for 2019 loss factors
 - Process for requesting access to system topologies
 - Procedure to determine transmission system losses for loss factor calculations
 - Software and scripts used to calculate hourly raw loss factors
 - Workbook showing calculations for 2019 loss factors
- 2019 average loss factor for transmission system is 2.75%
 - 2018 average loss factor was 3.61%

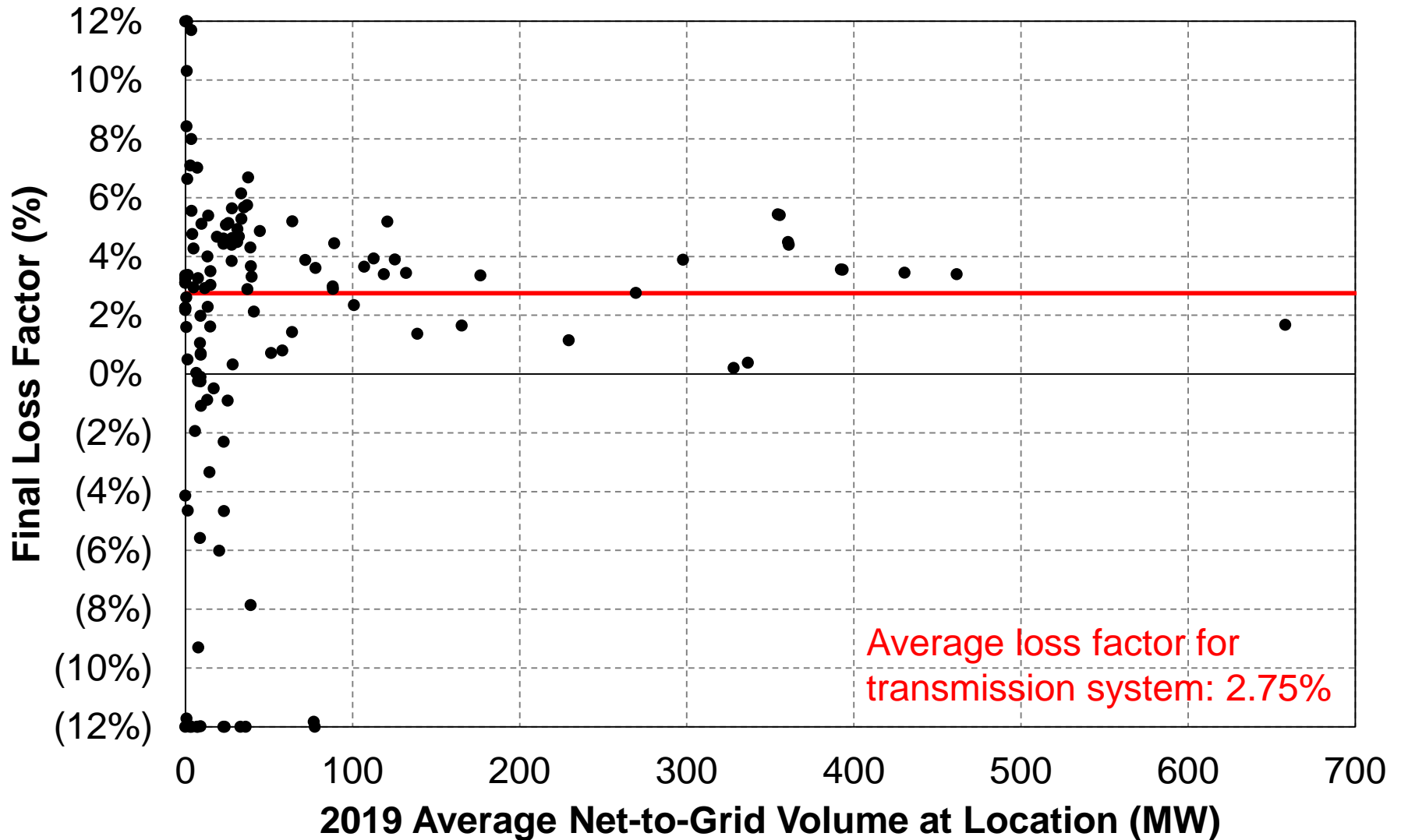
2019 loss factors will be implemented in August 2019 billing cycle

- In August 2019 billing cycle, 2019 loss factors will be applied to:
 - July 2019 initial settlement
 - May 2019 interim settlement
 - March 2019 final settlement
- In September 2019 billing cycle, 2019 loss factors will be applied to:
 - August 2019 initial settlement
 - June 2019 interim settlement
 - April 2019 final settlement
- AESO is considering options for billing adjustments for January and February 2019

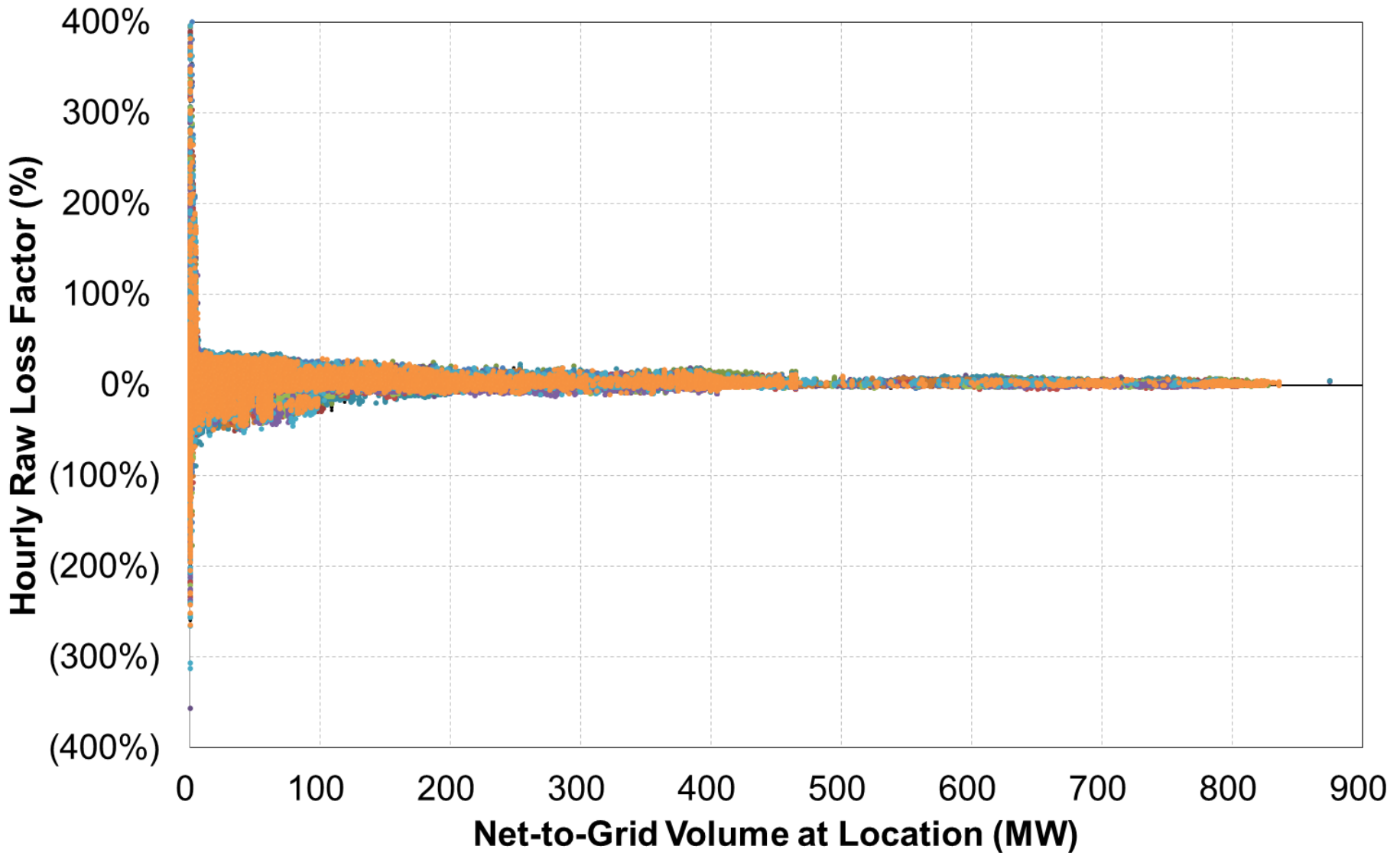
2019 loss factors were calculated using applied-for rule amendments

- 2019 loss factors were calculated based on applied-for amendments to Loss Factor Rule currently before Alberta Utilities Commission in Proceeding 24637
- 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

Annual loss factors continue to show greater dispersion for smaller volumes



Hourly raw loss factors continue to show high dispersion for small volumes



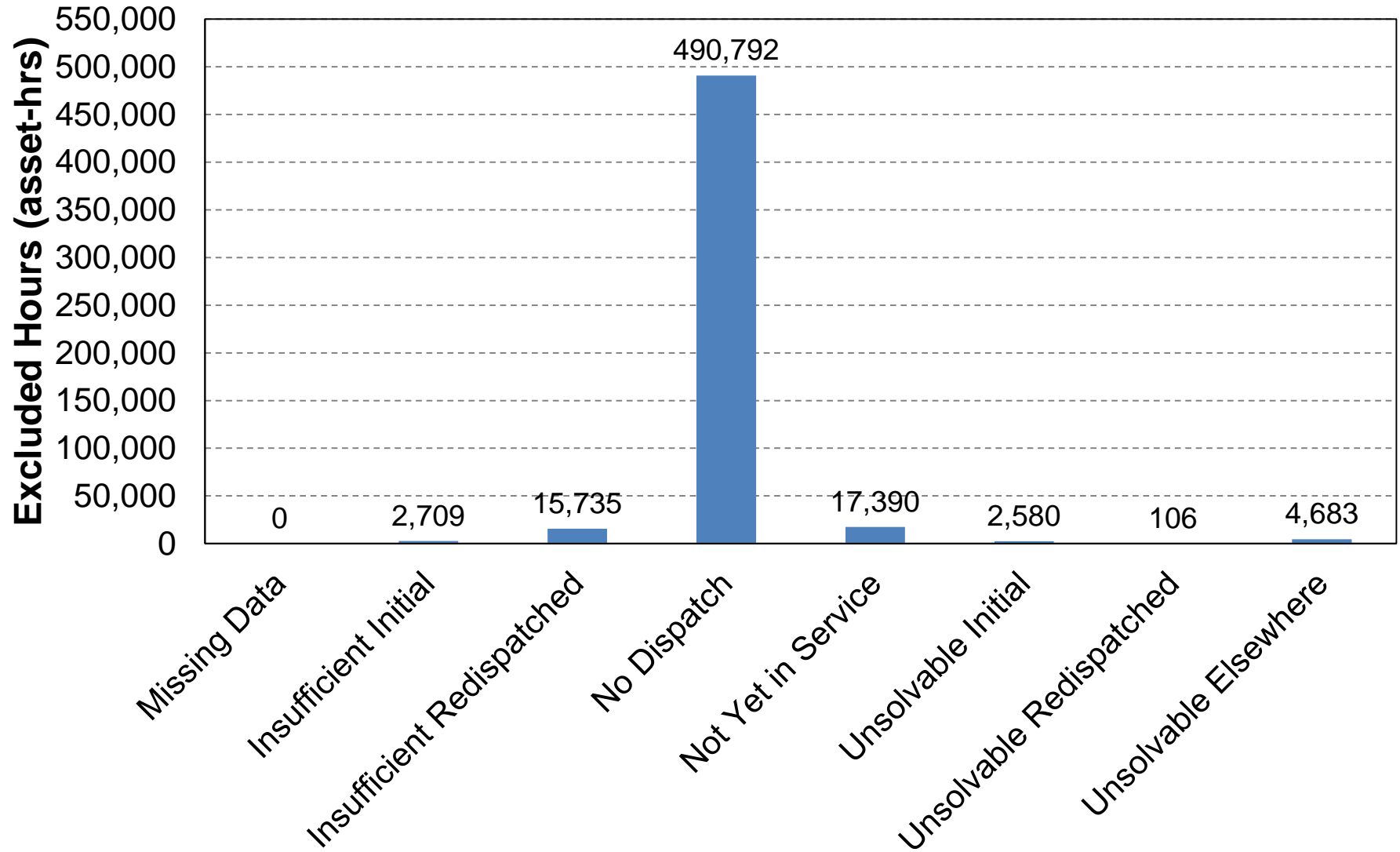
2.7% of hours were excluded due to insufficient source assets

- 8,760 simulations were attempted for calculation of losses in initial state
- No hours were excluded due to missing data
- 21 hours (0.2%) could not solve due to insufficient source assets to balance load in initial state
- 214 hours (2.4%) 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 235 hours (2.7%) were excluded due to insufficient source assets to balance load

Exclusions due to insufficient assets are attributed to retirements and mothballing

- Sundance Unit 1 (280 MW) retired as of January 2018
- Sundance Unit 2 (280 MW) mothballed to July 2018 and retired as of August 2018
- Sundance Unit 3 (368 MW) and Unit 5 (406 MW) mothballed as of April 2018
- H. R. Milner (144 MW) mothballed from August 2017 to May 2018

Few unsolvable hours occurred in 2019



About 53% of all hours and locations had dispatch and sufficient assets to solve



Hours (x129)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total hours	95,976	86,688	95,847	92,880	95,976	92,880	95,976	95,976	92,880	95,976	93,009	95,976	1,130,040
Insufficient initial	0	0	0	0	0	0	(129)	(129)	(2,451)	0	0	0	(2,709)
Insufficient redispached	(245)	(264)	(1,110)	(2,464)	(905)	(1,373)	(1,983)	(307)	(2,683)	(2,768)	(1,360)	(273)	(15,735)
No dispatch	(41,719)	(37,873)	(40,081)	(41,155)	(40,196)	(40,338)	(41,074)	(42,896)	(40,476)	(42,225)	(41,083)	(41,676)	(490,792)
Not yet in service	(3,720)	(2,664)	(2,972)	(2,880)	(2,972)	(1,438)	(743)	(1)	0	0	0	0	(17,390)
Potential hours	50,292	45,887	51,684	46,381	51,903	49,731	52,047	52,643	47,270	50,983	50,566	54,027	603,414

Percentages	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total hours	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Insufficient initial	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	(0.1%)	(0.1%)	(2.6%)	0.0%	0.0%	0.0%	(0.2%)
Insufficient redispached	(0.3%)	(0.3%)	(1.2%)	(2.7%)	(0.9%)	(1.5%)	(2.1%)	(0.3%)	(2.9%)	(2.9%)	(1.5%)	(0.3%)	(1.4%)
No dispatch	(43.5%)	(43.7%)	(41.8%)	(44.3%)	(41.9%)	(43.4%)	(42.8%)	(44.7%)	(43.6%)	(44.0%)	(44.2%)	(43.4%)	(43.4%)
Not yet in service	(3.9%)	(3.1%)	(3.1%)	(3.1%)	(3.1%)	(1.5%)	(0.8%)	(0.0%)	0.0%	0.0%	0.0%	0.0%	(1.5%)
Potential hours	52.4%	52.9%	53.9%	49.9%	54.1%	53.5%	54.2%	54.9%	50.9%	53.1%	54.4%	56.3%	53.4%

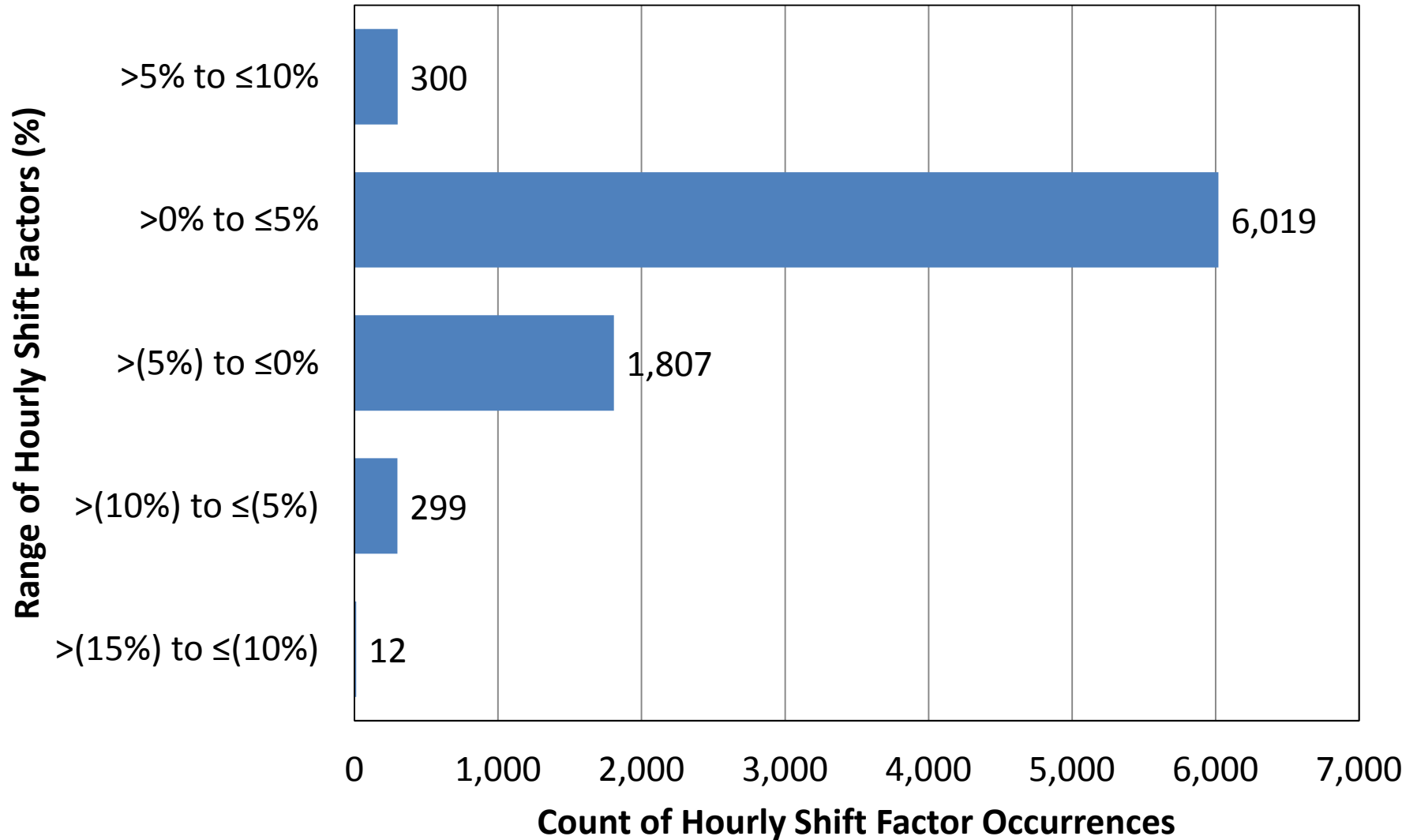
Over 99% of potential hours solved, with about 1% more excluded in same hours



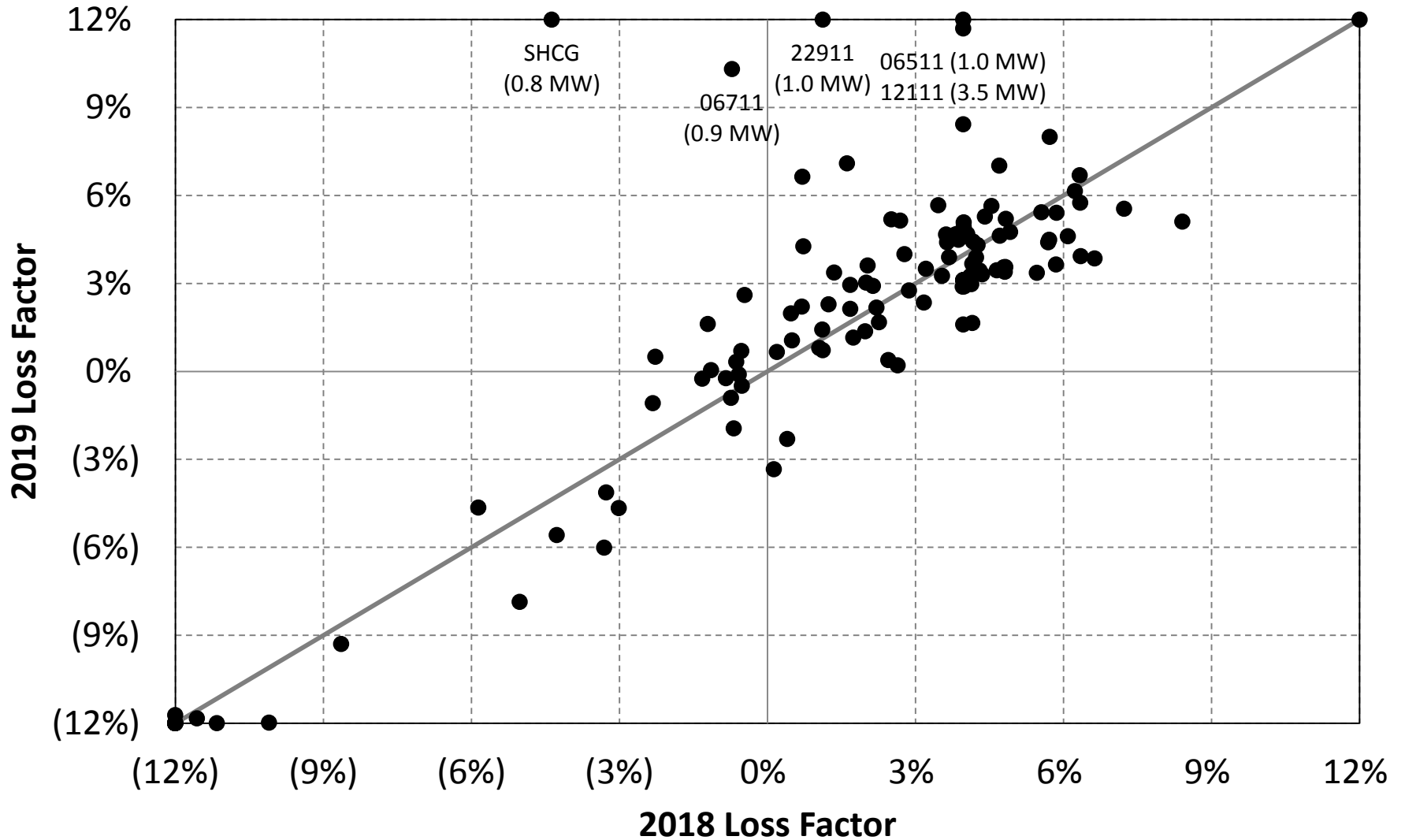
Hours (x129)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Potential hours	50,292	45,887	51,684	46,381	51,903	49,731	52,047	52,643	47,270	50,983	50,566	54,027	603,414
Unsolved initial	0	(774)	0	0	(129)	(258)	(129)	0	(258)	(129)	(387)	(516)	(2,580)
Unsolved redispached	(45)	(1)	(3)	(2)	(18)	(1)	(1)	(1)	(5)	(23)	0	(6)	(106)
Unsolved elsewhere	(1,851)	(65)	(141)	(132)	(557)	(78)	(73)	(60)	(218)	(1,157)	0	(351)	(4,683)
Solved hours	48,396	45,047	51,540	46,247	51,199	49,394	51,844	52,582	46,789	49,674	50,179	53,154	596,045

Percentages	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Potential hours	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Unsolved initial	0.0%	(1.7%)	0.0%	0.0%	(0.2%)	(0.5%)	(0.2%)	0.0%	(0.5%)	(0.3%)	(0.8%)	(1.0%)	(0.4%)
Unsolved redispached	(0.1%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	(0.0%)	0.0%	(0.0%)	(0.0%)
Unsolved elsewhere	(3.7%)	(0.1%)	(0.3%)	(0.3%)	(1.1%)	(0.2%)	(0.1%)	(0.1%)	(0.5%)	(2.3%)	0.0%	(0.6%)	(0.8%)
Solved hours	96.2%	98.2%	99.7%	99.7%	98.6%	99.3%	99.6%	99.9%	99.0%	97.4%	99.2%	98.4%	98.8%

Over 92% of hourly shift factors were within $\pm 5\%$ of zero



2019 loss factors vary from 2018 loss factors due to implementation updates



Seven implementation issues have been resolved through software revision

1. Incorrect modelling of net-to-grid loads when on-site generation is offered on a gross basis
 - Resolution: Hold gross load (not net-to-grid load) constant when moving from two-year-prior data to forecast loss factor year
2. Incorrect approach to calculating hourly raw loss factors for imports
 - Resolution: Reduce only imports (not net flow) on intertie when calculating hourly raw loss factors for imports
3. Incorrect dispatch of exports within PSS/E simulation
 - Resolution: Dispatch scheduled exports whenever load and losses can be balanced without curtailing exports

Seven implementation issues have been resolved through software revision (cont'd)

4. Incorrect modelling of self-supply sites

- Resolution: Correct modelling of five sites to reflect energy market merit order offers on a gross basis (rather than on a net-to-grid basis)
- Offer basis information has been added to Master Loss Factor Location List workbook posted on AESO website

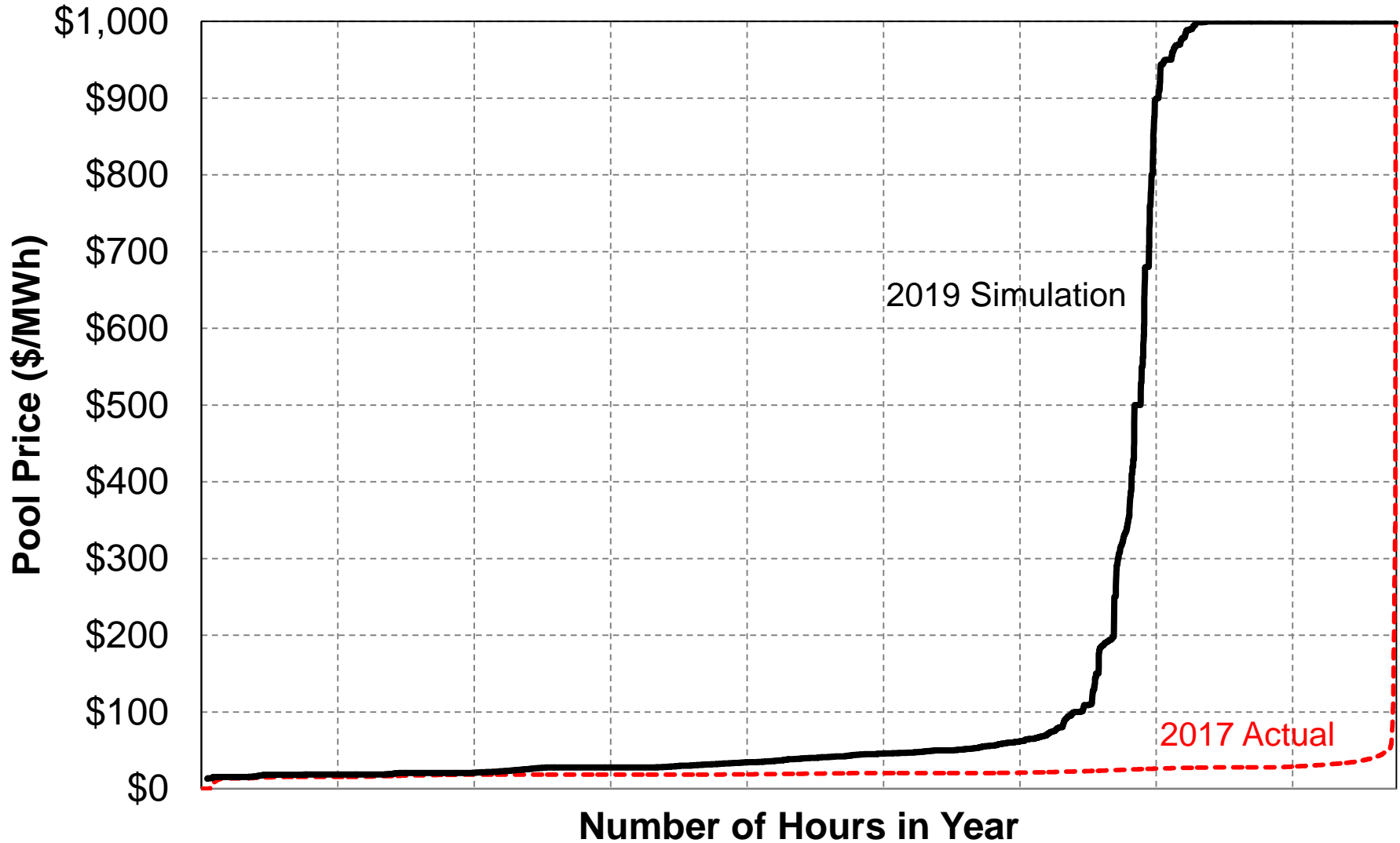
5. Disconnecting generators when undispached

- Resolution: Initialization leaves all available generators connected
- Exception: If generating facility submits gross offers in energy market and has no offer blocks in merit order, then generators is assumed unavailable and is disconnected

Seven implementation issues have been resolved through software revision (cont'd)

6. Assuming load was zero when net-to-grid offers not dispatched at self-supply sites
 - Resolution: Use load data if net-to-grid generator is not dispatched
7. Dispatching net-to-grid offers when net-to-grid load exists at self-supply sites
 - Resolution: Reduce net-to-grid load to enable dispatch of net-to-grid offer

Validation of software revisions was not practical with 2019 simulation



Validation using 2016 simulation is being completed

- AESO is preparing a report describing implementation issues and their resolution
- AESO will also provide validation information based on 2016 loss factor calculations

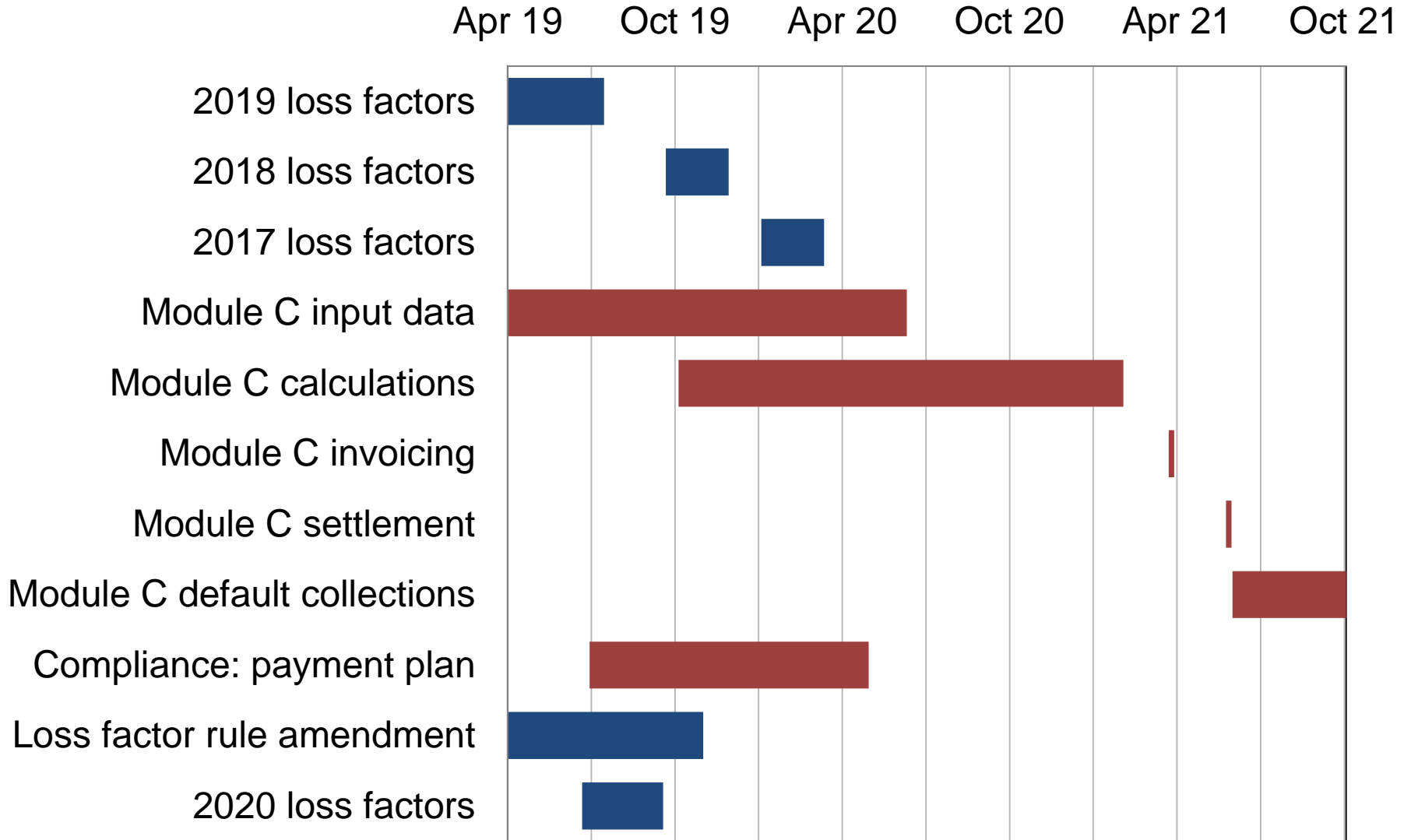
Initial preparation of input data has been completed for 2020 loss factor process

- 2020 loss factors will be calculated based on applied-for amendments to Loss Factor Rule
- Master loss factor location list for 2020 has been prepared
- System topologies have been prepared
- Merit order data for 2020 has been prepared
 - Adjustment of historical volumes to be provided for review to owner of assets returning from extended outage
- Load data has been prepared
- 2020 loss factors are on track to be published by October 1

Module C loss factor activities were paused during implementation updates

- 2016 loss factors have been recalculated as part of validation process
- Work on loss factors for 2015 and earlier years will be restarted after calculation of 2020 loss factors
- Preparation of additional input data was paused during implementation investigation and software revisions
 - System topologies complete back to 2012
 - Merit order data complete back to 2009
 - Load data complete back to 2012
- Payment plan compliance filing will be submitted to Commission in Q4 of this year

AESO posted updated schedule of loss factor activities on June 3, 2019



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- Loss factors, stakeholder consultation information, and related documents are posted on AESO website
 - [Grid](#) ▶ [Loss factors](#) ▶ [2019 loss factors](#)
 - [Grid](#) ▶ [Loss factors](#) ▶ [Stakeholder engagement](#)
 - [Grid](#) ▶ [Loss factors](#) ▶ [Loss factors recalculation for 2006-2016](#)

Thank you