

Technical Meeting to Present 2018 Loss Factors Determined Under Loss Factor Rule

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- Summary of loss factors and related information posted on the AESO website on March 22
- Comparisons of 2018 loss factors with 2017 loss factors
- Loss factor results, including exclusion rates and causes
- Shift factor results
- Schedule for future loss factor work, including Module C loss factor recalculations for 2006-2016 and development of 2019 loss factors

Please ask questions during presentation

AESO requested forbearance related to publishing of 2018 loss factors



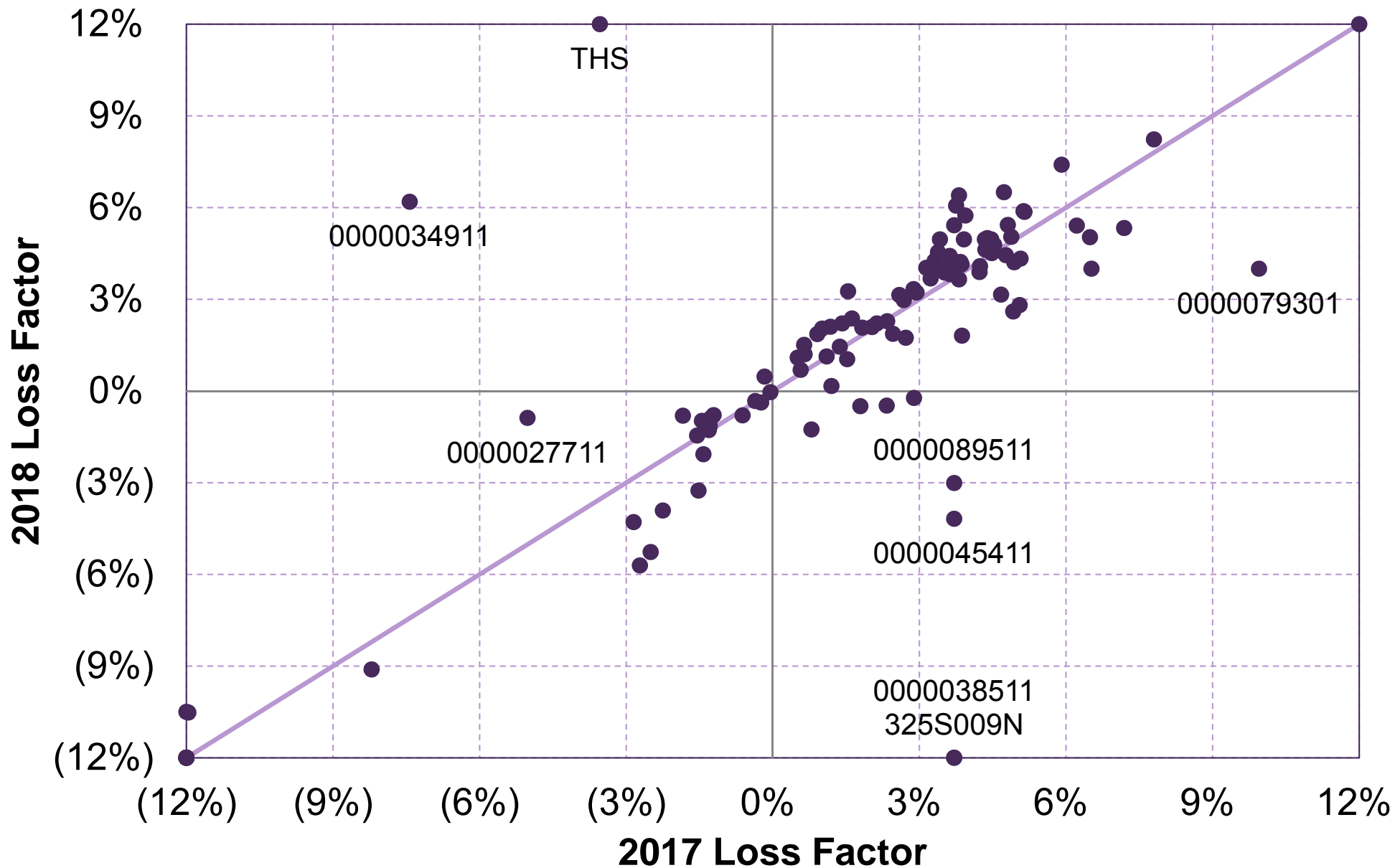
- In October 2017, the AESO requested and received forbearance from the MSA in respect of non-compliance with the Loss Factor Rule while the AESO consulted on revisions to requirements for system topologies to be used for loss factor calculations
- In December 2017, the AESO requested further forbearance from the MSA in anticipation of publishing 2018 loss factors no later than the end of March 2018 while the AESO addressed unanticipated complexity encountered in preparing 2016 energy market merit order data to be used for 2018 loss factor calculations
- 2018 loss factors will apply back to January 1, 2018
 - Will be implemented through normal financial settlement process

AESO published 2018 loss factors and related information on March 22, 2018

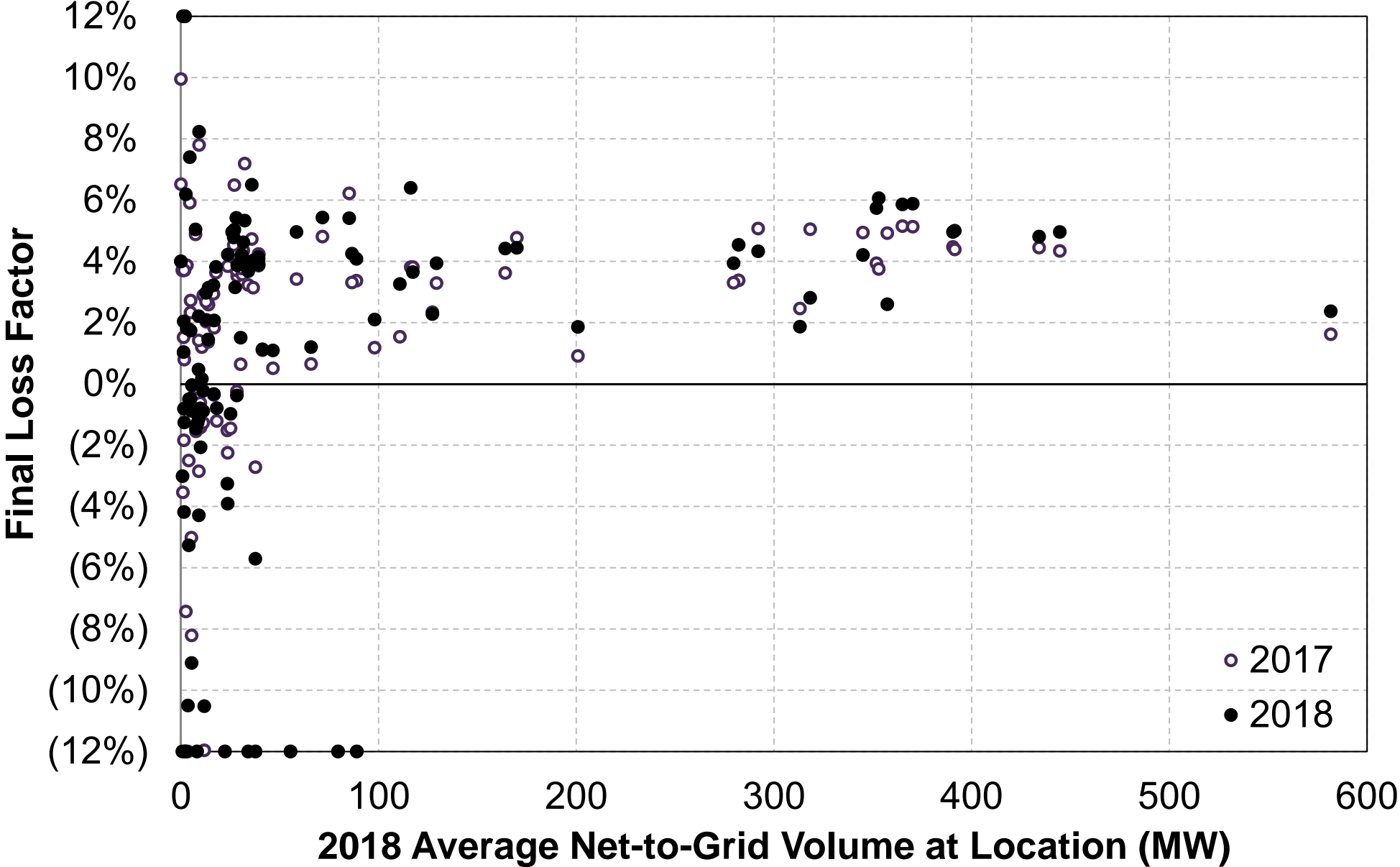


- 2018 loss factors effective January 1, 2018
- Hourly merit order data for 2018 loss factors
- Sample of hourly load data for 2018 loss factors
- Process for requesting access to system topologies
- Procedure to determine transmission system losses for loss factor calculations
 - No change from 2017 procedure
- Software and scripts used to calculate hourly raw loss factors
- Workbook showing calculations for 2018 loss factors
- 2018 average loss factor for the transmission system is 3.61%
 - 2017 average loss factor was 3.60%

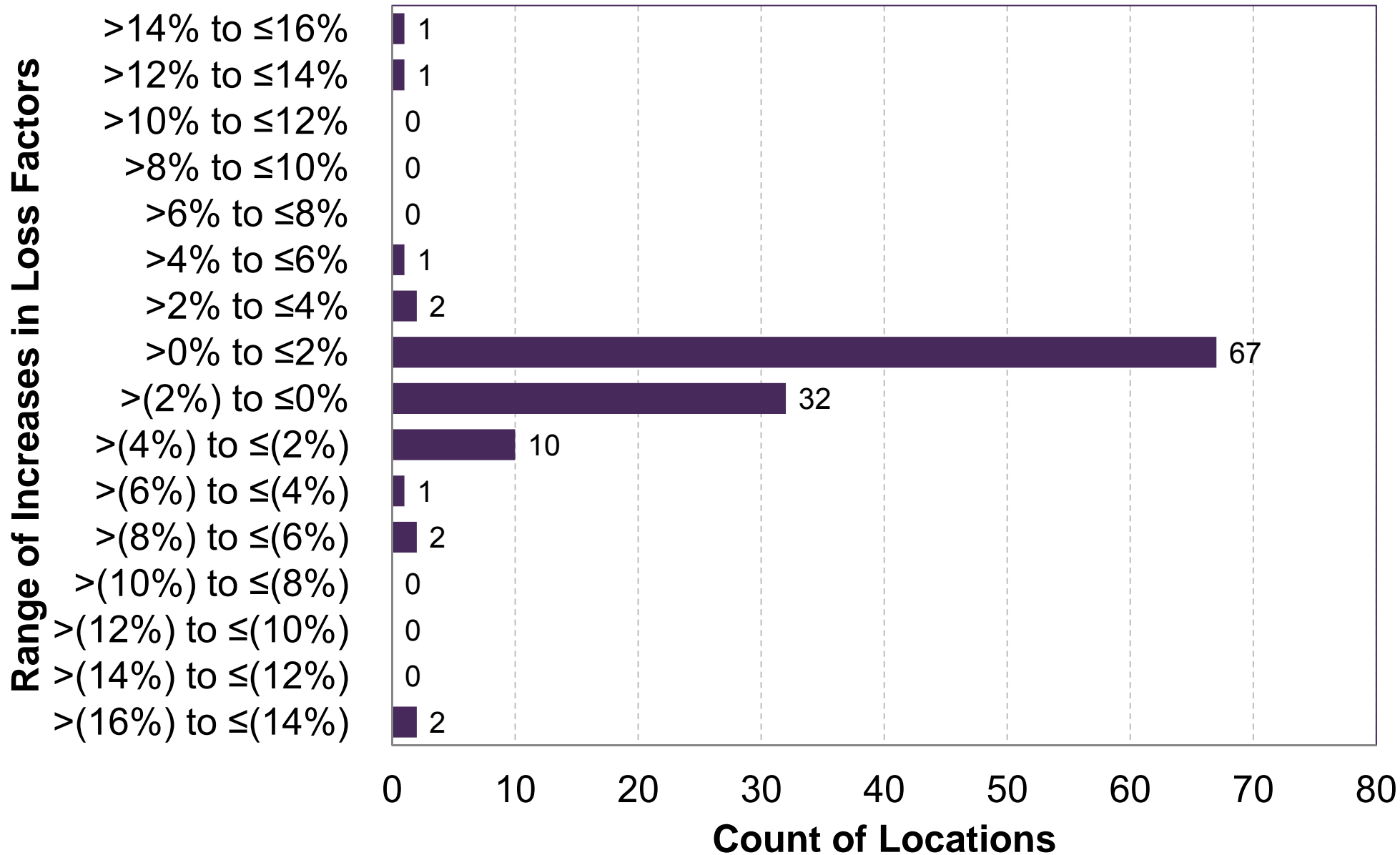
2018 loss factors are similar to 2017 loss factors except for very small generators



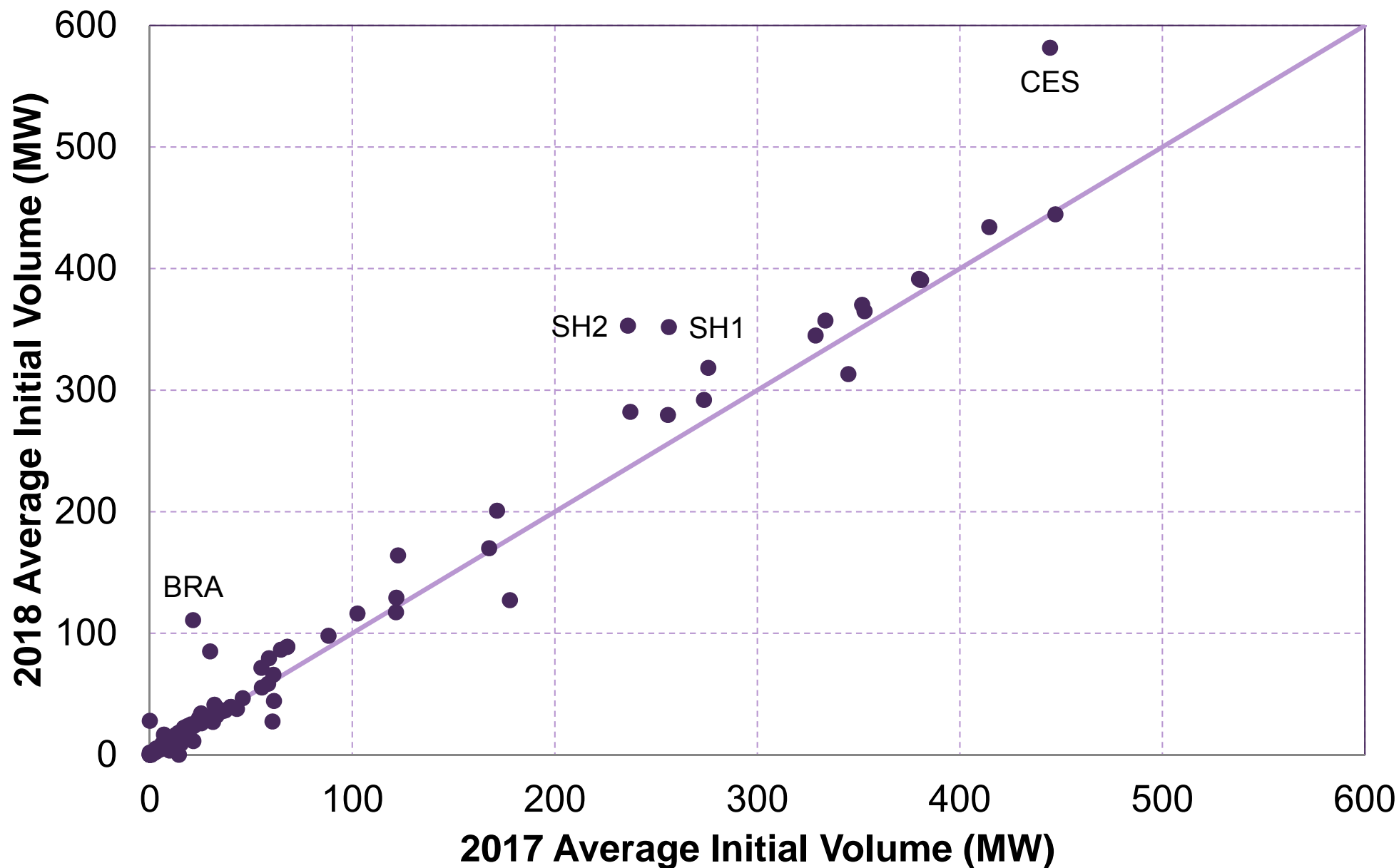
Changes to loss factors from 2017 to 2018 are greatest for smaller generators



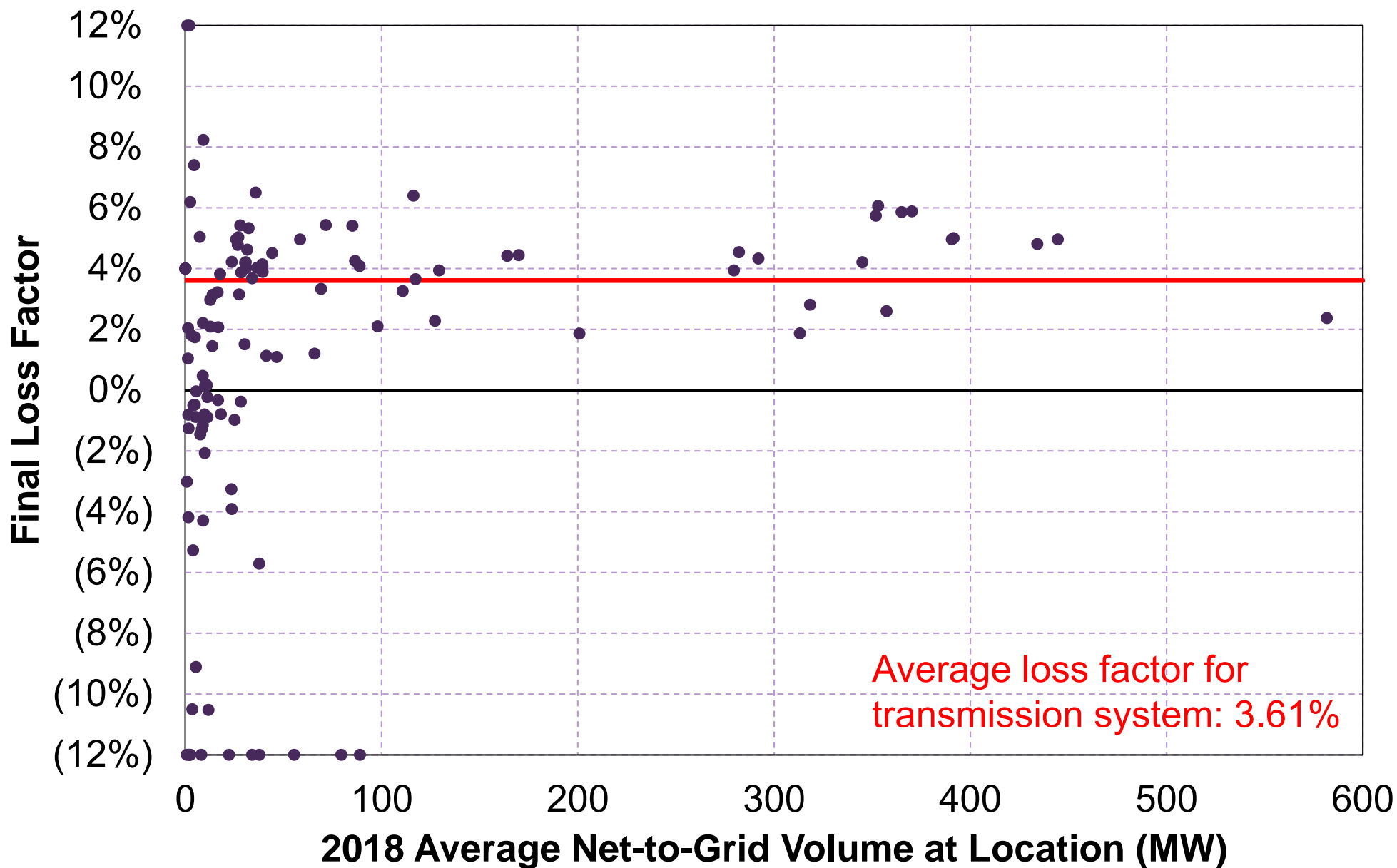
Over 80% of loss factors changed by less than $\pm 2\%$, compared to 2017



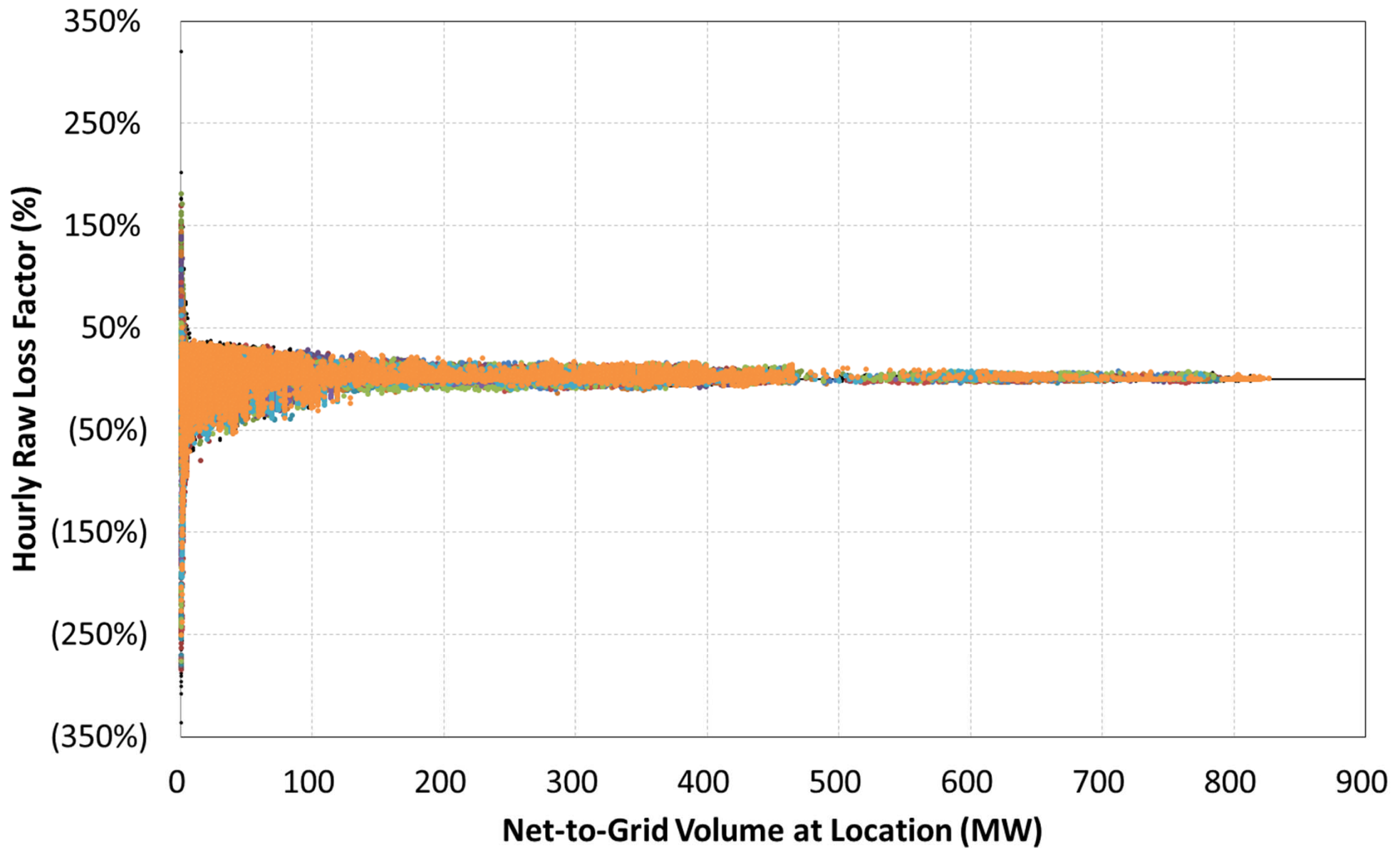
Average volumes remain similar from 2017 to 2018 for almost all generators



Final loss factors continue to show greater dispersion for smaller net-to-grid volumes



Hourly raw loss factors show high dispersion for small volumes: (337%) to +320%



Almost 4% of hours were excluded due to missing data or insufficient source assets

- 8,760 simulations were attempted for calculation of losses in initial state
- 9 hours (0.1%) could not solve due to missing data
 - Identified as XA-INSUF1 in Workbook
- 67 hours (0.8%) could not solve due to insufficient source assets to balance load in initial state
- 252 hours (2.9%) 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 328 hours (3.7%) excluded due to missing data or insufficient source assets to balance load

Failures due to insufficient source assets are attributed to retirements and mothballing

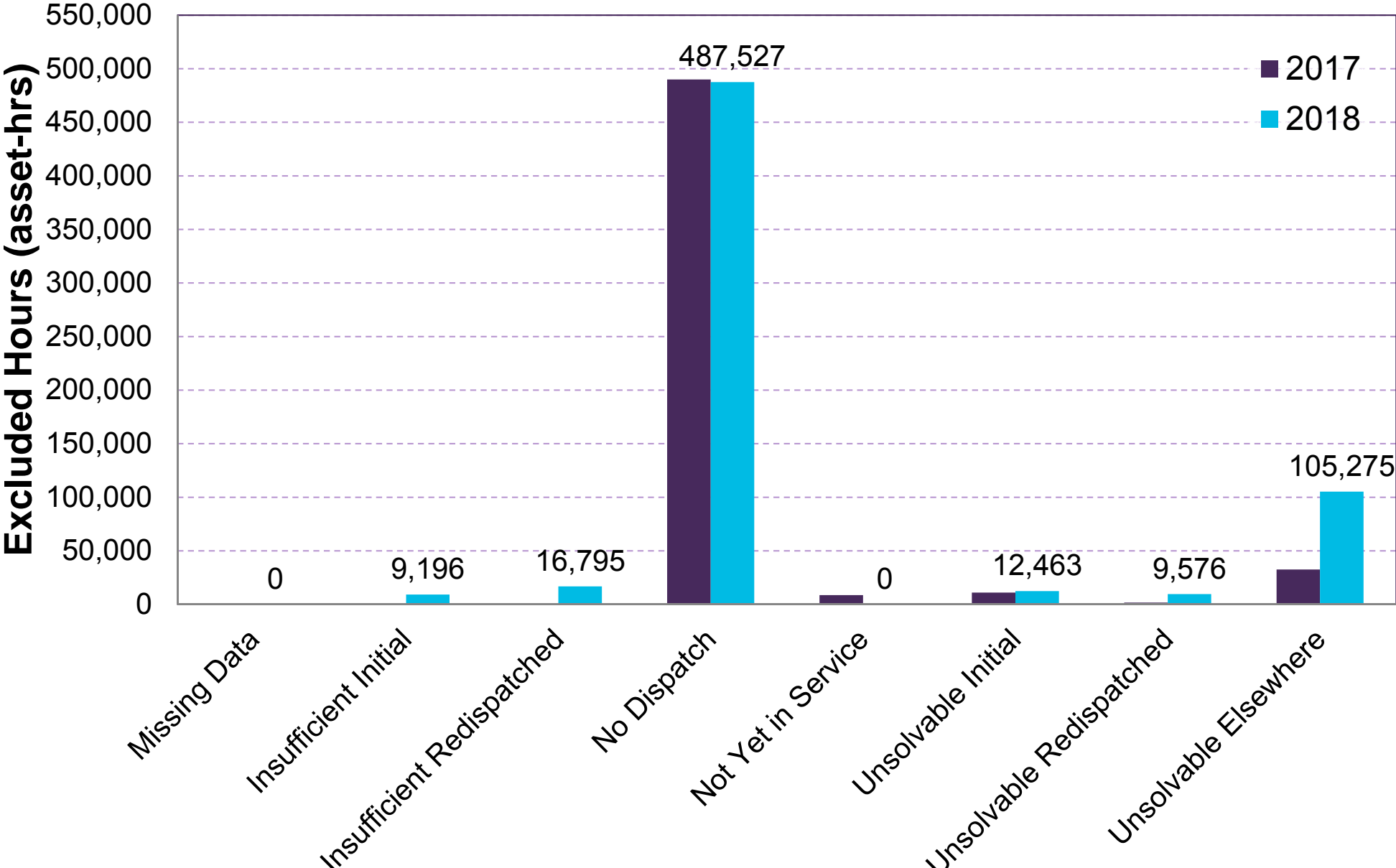
- Sundance Unit 1 (280 MW) retired as of January 2018
- Sundance Unit 2 (280 MW) mothballed as of January 2018
- Sundance Unit 3 (368 MW) and Unit 5 (406 MW) mothballed as of April 2018
- H. R. Milner (144 MW) mothballed from January to May 2018

Insufficient source assets occurred under a variety of conditions

- Load did not have to be at system peak

Description	Aug 30 15:00 h	Oct 17 12:00 h
Gross supply available from source assets	9,780 MW	9,091 MW
Net-to-grid load	7,887 MW	7,382 MW
Behind-the-fence load	1,507 MW	1,492 MW
Exports	153 MW	100 MW
Supply less loads and exports	232 MW	118 MW
Losses in adjacent hours	230 MW	195 MW

Unsolvable hours in redispached state increased from 2017 to 2018



About 52% of all hours and locations had dispatch and sufficient assets to solve



Hours (×121)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total hours	90,024	81,312	89,903	87,120	90,024	87,120	90,024	90,024	87,120	90,024	87,241	90,024	1,059,960
Insufficient initial	0	0	0	(121)	(2,662)	(968)	0	(1,089)	(2,541)	(1,452)	(121)	(242)	(9,196)
Insufficient redispached	0	0	0	(459)	(2,220)	(1,178)	(1,513)	(4,881)	(2,482)	(3,405)	(475)	(182)	(16,795)
No dispatch	(40,939)	(36,509)	(41,274)	(41,533)	(39,920)	(38,682)	(40,539)	(40,898)	(40,447)	(43,677)	(42,230)	(40,879)	(487,527)
Potential hours	49,085	44,803	48,629	45,007	45,222	46,292	47,972	43,156	41,650	41,490	44,415	48,721	546,442

Percentages	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Total hours	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Insufficient initial	0.0%	0.0%	0.0%	(0.1%)	(3.0%)	(1.1%)	0.0%	(1.2%)	(2.9%)	(1.6%)	(0.1%)	(0.3%)	(0.9%)
Insufficient redispached	0.0%	0.0%	0.0%	(0.5%)	(2.5%)	(1.4%)	(1.7%)	(5.4%)	(2.8%)	(3.8%)	(0.5%)	(0.2%)	(1.6%)
No dispatch	(45.5%)	(44.9%)	(45.9%)	(47.7%)	(44.3%)	(44.4%)	(45.0%)	(45.4%)	(46.4%)	(48.5%)	(48.4%)	(45.4%)	(46.0%)
Potential hours	54.5%	55.1%	54.1%	51.7%	50.2%	53.1%	53.3%	47.9%	47.8%	46.1%	50.9%	54.1%	51.6%

About 96% of all potential hours solved, with about 19% more excluded in same hours



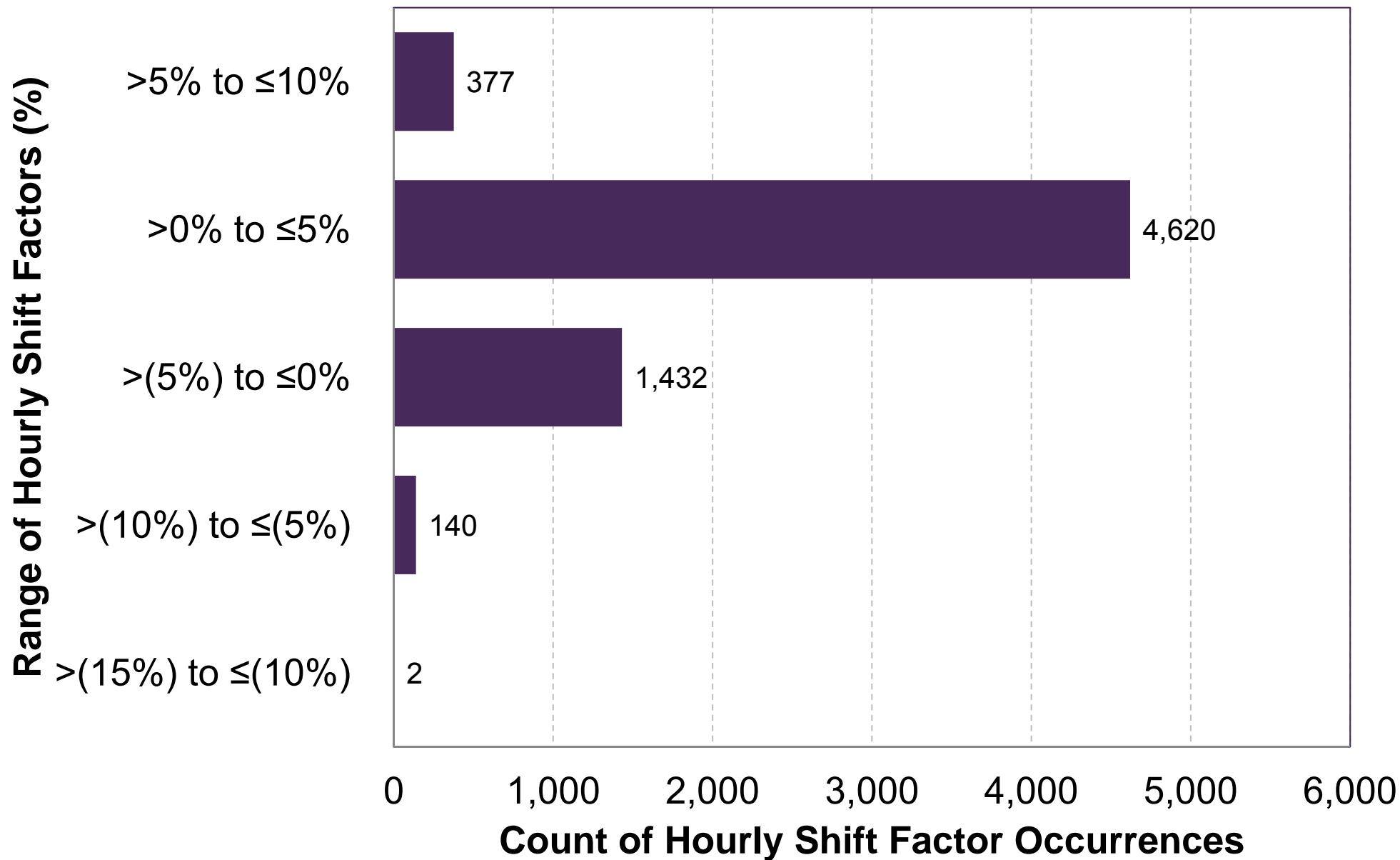
Hours (×121)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Potential hours	49,085	44,803	48,629	45,007	45,222	46,292	47,972	43,156	41,650	41,490	44,415	48,721	546,442
Unsolved initial	(3,509)	(2,299)	(1,089)	(968)	(605)	(1,089)	(484)	(363)	(726)	(121)	(1,089)	(121)	(12,463)
Unsolved redispatched	(317)	(496)	(191)	(167)	(957)	(869)	(1,643)	(1,225)	(537)	(1,146)	(1,353)	(675)	(9,576)
Unsolved elsewhere	(4,899)	(5,604)	(3,925)	(2,776)	(8,444)	(12,275)	(14,552)	(12,438)	(9,761)	(12,620)	(9,776)	(8,205)	(105,275)
Solved hours	40,360	36,404	43,424	41,096	35,216	32,059	31,293	29,130	30,626	27,603	32,197	39,720	419,128

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	(7.1%)	(5.1%)	(2.2%)	(2.2%)	(1.3%)	(2.4%)	(1.0%)	(0.8%)	(1.7%)	(0.3%)	(2.5%)	(0.2%)	(2.3%)
Unsolved redispatched	(0.6%)	(1.1%)	(0.4%)	(0.4%)	(2.1%)	(1.9%)	(3.4%)	(2.8%)	(1.3%)	(2.8%)	(3.0%)	(1.4%)	(1.8%)
Unsolved elsewhere	(10.0%)	(12.5%)	(8.1%)	(6.2%)	(18.7%)	(26.5%)	(30.3%)	(28.8%)	(23.4%)	(30.4%)	(22.0%)	(16.8%)	(19.3%)
Solved hours	82.2%	81.3%	89.3%	91.3%	77.9%	69.3%	65.2%	67.5%	73.5%	66.5%	72.5%	81.5%	76.7%

Hours fail to solve for a variety of reasons

- Cases do not solve when PSS/E numerical iteration attempts do not converge
- Solutions must maintain voltages and reactive power within tolerance thresholds

Over 90% of hourly shift factors were within $\pm 5\%$ of zero



AESO implemented two changes to input data for loss factor calculations

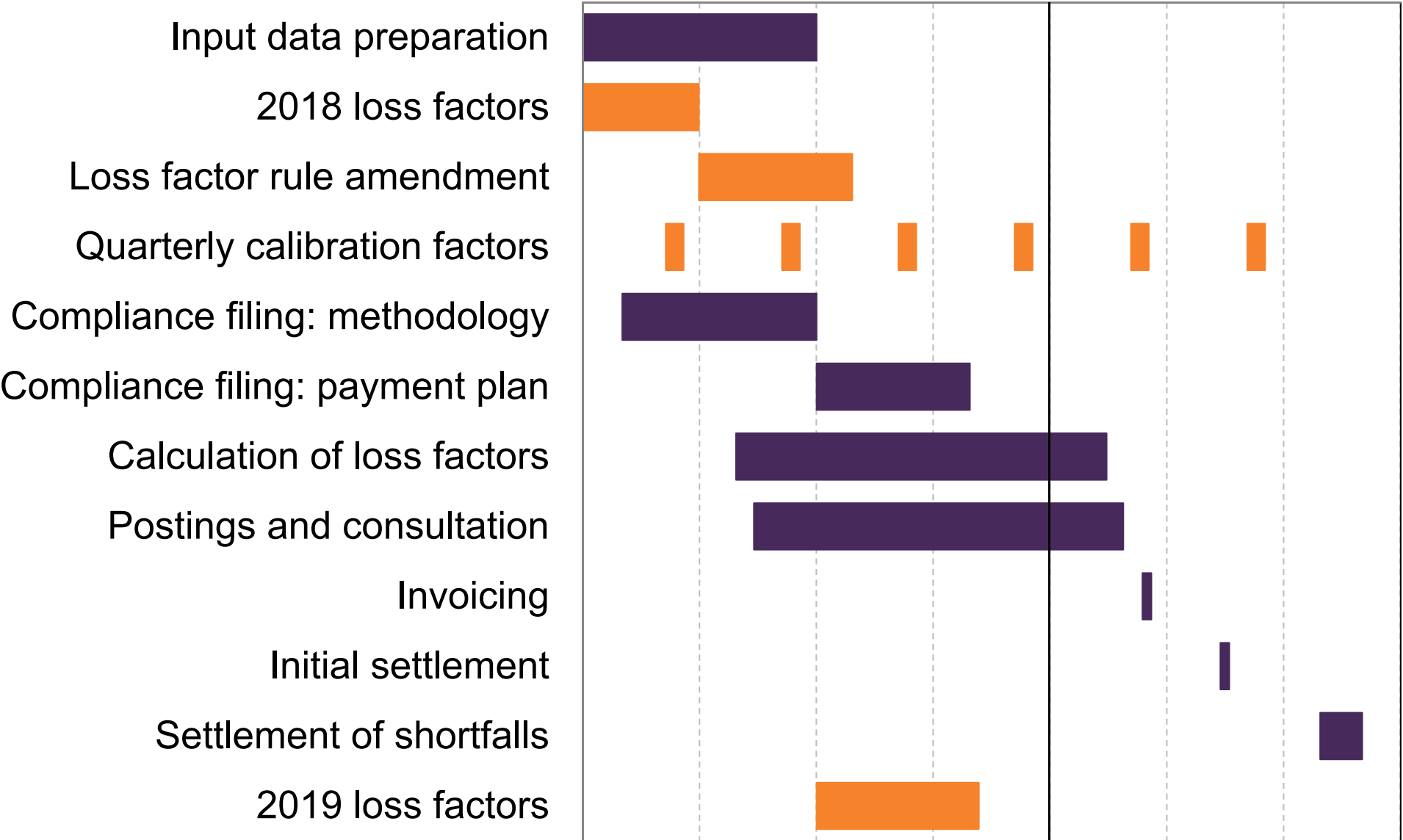


- February 29 was deleted from 2016 data when used for 2018 loss factors calculations
 - 2016 was a leap year while 2018 is not
 - Reduced complexity in loss factor calculations
- All data was based on Mountain Standard Time rather than Local Time
 - Eliminated 23-hour and 25-hour days when transitioning from standard time to daylight saving time
 - Reduced complexity in loss factor calculations

Module C methodology compliance filing has been delayed



Jan 18 Apr 18 Jul 18 Oct 18 Jan 19 Apr 19 Jul 19 Oct 19



- The AESO does not expect to provide written responses to questions asked during meeting

For more information

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- Loss factors, stakeholder consultation information, and related documents are posted on AESO website
 - Grid ► Loss factors ► 2018 loss factors
 - Grid ► Loss factors ► 2017-2018 loss factor development
 - Grid ► Loss factors ► Loss factors recalculation for 2006-2016

Thank you