

MANITOBA HYDRO

INTEROFFICE MEMORANDUM

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DATE 2016 10 15

FILE

SUBJECT 2016 MANITOBA HYDRO AVERAGE SYSTEM LOSS FACTOR (ASLF)

This memo presents the results of the calculation of the 2016 Manitoba Hydro Average System Loss Factor. The study incorporates the methodologies described in Attachment M of the Manitoba Hydro Open Access Transmission Tariff. The study was performed utilizing the 2015 MRO summer and winter peak models and the Manitoba Hydro hourly load readings for 2015 calendar year.

Excluded from the 2016 Manitoba Hydro Average System Loss Factor study are the effects of parallel flows involving Manitoba Hydro on the loss factor calculation. The parallel flows are determined by MISO and therefore cannot be calculated by Manitoba Hydro. The parallel flow impact is expected to be minimal increasing the Manitoba Hydro Average System Loss Factor by a factor of approximately 0.133% based upon the 2001 study results.

The 2016 calculated Manitoba Hydro Average System Loss Factor is 3.47%. The attached documentation outlines the results of the 2016 Manitoba Hydro Average System Loss Factor study.

MISO Loss Study Loss Calculation Spreadsheet

utility: Manitoba Hydro

date edited: October 15, 2016

Transmission Zone Load-Losses (MW)
Transformer No-Load, Aux. Power, Synch. Cond. Losses (MW)
Corona and Insulator Losses (MW)
Company Total Transmission Losses (MW) [numerator]

Summer Cases
100% of Peak 75% of Peak 50% of Peak

166.0	127.5	112.5
8.1	8.1	8.1
0.8	0.8	0.8
174.9	136.3	121.3

Winter Cases
100% of Peak 75% of Peak 50% of Peak

159.9	140.7	110.0
8.1	8.1	8.1
0.8	0.8	0.8
168.8	149.5	118.9

Generation (MW)
Net Interchange (MW)
GSU Load Losses (MW)
Transmission Zone Load-Losses (MW)
Non-Transmission Load (MW)
Total Company Transmission Load (MW)

5,109.8	4,188.2	3,290.5
1,475.0	1,475.0	1,475.2
0.0	0.0	0.0
166.0	127.5	112.5
0.0	0.0	0.0
3,468.8	2,585.7	1,702.9

5,699.2	4,516.2	3,266.7
845.9	846.2	846.2
0.0	0.0	0.0
159.9	140.7	110.0
0.0	0.0	0.0
4,693.4	3,529.4	2,310.5

Export and Parallel Flow (MW)
Company Total (MW) [denominator]

1,475.0	1,475.0	1,475.2
4,943.8	4,060.7	3,178.1

845.9	846.2	846.2
5,539.3	4,375.6	3,156.7

Discrete Loss Factors

3.5372%	3.3575%	3.8178%
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3.0477%	3.4174%	3.7656%
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Seasonal Loss Factors
of Hours

3.4701%
4416

3.4749%
4344

Annual Loss Factor

3.4724%

The "Total Company Transmission Load" = "Generation" - "Net Interchange" - "GSU Load Losses" - "Transmission Zone Load-Losses" - "Non-Transmission Load"

The "Discrete Loss Factors" are calculated from the equation:

(Company Total Transmission Losses)/(Total Company Transmission Load + Export and Parallel Flows with T.P. Factors > 3%)

The "Seasonal Loss Factors" are determined by using a piecewise-linear function of the "Discrete Loss Factors" to calculate hourly loss factors based upon the 2007 annual load profile of each utility.

The "Annual Loss Factor" is calculated by using a weighted average of the two "Seasonal Loss Factors" based upon the number of hours in each season.

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High Voltage Corona and Insulator Losses

Voltage Level (kV)	Corona and Insulator Losses (kW/mi)	Line Miles (mi)	Total Corona and Insulator Losses (MW)
345	3	0	0.0
500	6	130.07	0.8
765	13	0	0.0
Total:			0.8

Corona and insulator losses per mile (kW/mi) were obtained from Table 7.7.1 on page 327 of the "Transmission Line Reference Book -345kV and Above (second edition)" published by the Electric Power Research Institute in 1987.

Transmission Transformers No-Load Loss (MW) **8.1**

Transmission Transformers Auxiliary Power Use (MW) **0.0**

Synchronous Condenser Power Use (MW) **0.0** (summer) **0.0** (winter)