Information Document
Northeast Area Transmission Constraint Management
ID #2011-008R

Information Documents are not authoritative. Information Documents are for information purposes only and are intended to provide guidance. In the event of any discrepancy between an Information Document and any Authoritative Document(s)[1] in effect, the Authoritative Document(s) governs.

1 Purpose

This Information Document relates to the following Authoritative Document:

- Section 302.1 of the ISO rules, *Real Time Transmission Constraint Management* ("Section 302.1")

The purpose of this Information Document is to provide information regarding the unique operating characteristics and resulting constraint conditions and limits in the northeast area of the interconnected electric system. In this Information Document the AESO has defined the northeast area as the area illustrated by the maps in Appendix 2 and 3.

Section 302.1 sets out the general transmission constraint management protocol steps the AESO uses to manage constraints in real time on the interconnected electric system. These steps are referenced in Table 1 of this Information Document as they are applied to the northeast area.

2 General

The northeast area is connected to the interconnected electric system by: (i) the Fort McMurray 500kV West transmission path (12L41/12L44); (ii) three long 240 kV bulk transmission line paths consisting of multiple 240 kV line segments; and (iii) several 144 kV transmission lines.

The transfer-in and transfer-out limits for the northeast area are dependent on the status of the Fort McMurray 500 kV West transmission path (12L41/12L44) and line segments of the three 240kV bulk transmission line paths. Loss of the Fort McMurray 500 kV West transmission path (12L41/12L44) or any of the 240 kV line segments affects the volume of MW that can be transferred in and out of the Fort McMurray area due to transient instability, voltage instability or unacceptable low voltage excursions under high transfer-out conditions.

The AESO has established the Fort McMurray Transfer-In Cutplane limits and the Fort McMurray Transfer-Out Cutplane limits. The map attached as Appendix 3 of this Information Document illustrates these cutplanes.[2]

The AESO respects the Fort McMurray Cutplane limits when managing transfer-in and transfer-out flow from the northeast area.

Appendix 1 lists the effective generation units for managing regional constraints in the northeast area. Appendix 2 provides a detailed geographical map of the northeast area indicating bulk transmission lines and substations.

[1] "Authoritative Documents" is the general name given by the AESO to categories of documents made by the AESO under the authority of the *Electric Utilities Act* and associated regulations, and that contain binding legal requirements for either market participants or the AESO, or both. AESO Authoritative Documents include: the ISO rules, the Alberta reliability standards, and the ISO tariff.

[2] A cutplane is a common term used in engineering studies and is a theoretical boundary or plane crossing two (2) or more bulk transmission lines or electrical paths. The cumulative power flow across the cutplane is measured and can be utilized to determine flow limits that approximate conditions that would allow safe, reliable operation of the interconnected electric system.

3 Constraint Conditions and Limits

When managing a transmission constraint in the Fort McMurray area, the AESO ensures that bulk transmission line flows out of the area are managed in accordance with bulk transmission line ratings established by the legal owner of the transmission facility to protect transmission facilities and ensure the continued reliable operation of the interconnected electric system.

3.1 *Non-Studied Constraints and Limits*

For system conditions that have not been pre-studied, the AESO uses energy management system tools and dynamic stability tools to assess system operating limits in real time.

3.2 *Studied Constraints and Limits*

The AESO establishes cutplane limits to avoid transient instability or voltage violations or thermal violations in the event of certain contingencies.

Fort McMurray Transfer-Out Cutplane Limits

Fort McMurray Transfer-Out cutplane power flow is calculated at specific substations in the northeast area as the total of outflow on:

9L74 @ 888S Dover; plus

9L07 @ 951S Thickwood; plus

9L23 @ 848S Ruth Lake; plus

9L84 @ 934S Black Fly; plus

848S Ruth Lake transformers 901T and 902T; plus

12L44 @ 951S Thickwood

The specific contingency and the corresponding transfer-out limits are provided in Appendix 4: Table 1, Table 2, and Table 3 Fort McMurray Transfer-Out Cutplane tables.

Fort McMurray Transfer-In Cutplane Limits

The Fort McMurray Transfer-In cutplane power flow is calculated at specific substations in the northeast area and is calculated as the total of inflow on:

9L10 @ 939S Livock; plus

1117L @ 167S Ipiatik Lake; plus

9L47 @ 852S Round Hill; plus

9L930 @ 72S Leismer; plus

12L44 @ 951S Thickwood

The specific contingency and the corresponding transfer-in limits are provided in Appendix 4: Tables 4, Table 5, and Table 6 Fort McMurray Transfer-In Cutplane tables .

4 Transmission Constraint Management

The AESO manages transmission constraints in all areas of the interconnected electric system in accordance with the provisions of Section 302.1. However, not all of those provisions are effective in the Fort McMurray area due to certain operating conditions that exist in that area. This Information Document describes the application of the general provisions of Section 302.1 to the Fort McMurray area, and the additional clarifying steps required to effectively manage transmission constraints in that area.

The protocol steps which are effective in managing transmission constraints in the northeast area are outlined in Table 1 below, followed by additional steps which may be required.

Table 1 – Transmission Constraint Management Sequential Procedures for Northeast Area

Section 302.1 of the ISO rules, subsection 2(1) protocol steps	Applicable to manage Fort McMurray cutplane inflow?	Applicable manage Fort McMurray cutplane outflow?
(a) Determine effective pool assets	Yes	Yes
(b) Ensure maximum capability not exceeded	No	Yes
(c) Curtail effective downstream constraint side export service and upstream constraint side import service	No	No
(d) Curtail effective demand opportunity service on the downstream constraint side	No	No
(e)(i) Issue a dispatch for effective contracted transmission must-run	No	No
(e)(ii) Issue a directive for effective non-contracted transmission must-run	No[3]	No
(f) Curtail effective pool assets in reverse energy market merit order followed by pro-rata curtailment	No	Yes
(g) Curtail effective loads with bids in reverse energy market merit order followed by pro-rata load curtailment	Yes	No

[3] An exception would be if the inflow limit does not allow for non-industrial system designation firm load to be served.

Applicable Protocol Steps

The first step in managing constraints in any area is to identify those generating units effective in managing a constraint. All of the generating units and loads operating in the Fort McMurray area are indicated in the single line diagram in Appendix 3 and the generating units effective in managing a transmission constraint in the Fort McMurray area are identified in Appendix 1.

Step (a)

The Fort McMurray Transfer-In cutplane is managed by curtailing effective downstream load for inflow constraints. The Fort McMurray Transfer-Out cutplane has effective generation pool assets which are identified in Appendix 1.

Step (b)

Curtailing generation pool assets to their maximum capability is not effective for the Fort McMurray import constraints, but it is effective for Fort McMurray export outflow constraints and is used when a Fort McMurray export constraint occurs.

Step (c)

There are no interties within the northeast area and southern Alberta import and export flows on the system are not effective in managing a transmission constraint.

Step (d)

Curtailing effective demand opportunity service on the downstream constraint side is not effective in managing transmission constraints in the Fort McMurray area since there is no demand opportunity service.

Steps (e)(i) and (ii)

There are no transmission must-run contracts in the northeast area and transmission must-run is not effective in managing a transmission constraint in the northeast area.[4]

Step (f)

To address a long-term constraint, curtailing effective generating units using the reverse merit order followed by pro-rata curtailment is only effective when outflow limits are exceeded for Fort McMurray Transfer-Out Cutplane limit. A short term constraint is considered to include the hour the constraint occurred, plus the following two hours, when the reverse merit order is utilized. For long-term constraints, the pro-rata curtailment of identified effective generation pool assets occurs.

Step (g)

Curtailing load pool assets in reverse energy market merit order followed by pro-rata load curtailment of identified generation pool assets is the last step of the protocol and is used when inflow limits are exceeded for the Fort McMurray Transfer-In Cutplane or Fort McMurray Transfer-Out Cutplane. When pro-rata load curtailment is required, the AESO issues directives to effective direct connect industrial loads and to the northeast area legal owner of transmission facilities specifying the required pro-rata curtailment levels.

4 Project Updates

As necessary, the AESO intends to provide information in this section about projects underway in the Fort McMurray area that are known to have an impact on the information contained in this Information Document.

[4] In the unusual circumstance that the northeast area is being supported by a single path and the inflow is limited to an amount less than the non-industrial system designation firm load, the AESO may issue directives to effective generation pool assets to provide sufficient energy to meet such firm load.

5 Appendices

Appendix 1 – *Effective Pool Assets*

Appendix 2 – *Geographical Map of the Northeast Area*

Appendix 3 – *Northeast Area Cutplanes: Transfer-In and Transfer-Out Single Line Diagram*

Appendix 4 – *Cutplane Transfer Limits for the Northeast Area*

Revision History

Posting Date	Description of Changes
2020-03-11	Amended Section 3 Transfer-Out measuring point substations. Amended Section 3 to include the Fort McMurray Transfer-In/Transfer-Out constraints resulting from of the energization of the Fort McMurray 500kV West Transmission Line. Updated Appendix 1 list of effective assets.
2019-05-14	Updated Appendix 2 and Appendix 3 maps. Amended Appendix 4: revised Tables 1 through 3 Fort McMurray Transfer-Out Cutplane Limits and Tables 4 through 6 McMurray Transfer-In Cutplane Limits to reflect constraints from energization of the Fort McMurray 500kV West Transmission Line. Administrative amendments.
2018-02-13	Amended Appendix 4, Table 4 - N-0 Fort McMurray Export Cutplane Transfer-out Limits.
2015-08-25	With energization of Christina Lake 240 kV transmission development, maps amended to include the new Ipiatik Lake 167S substation and new line numbers 1116L and 1117L. Transfer-in (import) cutplane limits in Appendix 4 have been revised. Table 5 revised to reflect that the Livock phase shifting transformer is not applicable to table limits.
2015-08-13	Maps amended to include the new Dawes 2011S substation and new line number 9L89. Also, transfer-out (export) cutplane limits have been revised.
2014-05-29	Updated to remove Kinosis-Leismer Cutplane.
2014-05-08	Appendix 4 amended to reflect changes to the Kinosis-Leismer Cutplane Transfer-in Limits. Section 2, Section 3.2, Appendix 2 and Table 4 amended to reflect a portion of 9L990 renamed to 9L45.
2014-05-01	Maps amended to include Kettle River 2049S substation, Bohn 931S substation and the 7L05 line.
2014-02-14	Map amendments to include Engstrom 2060S substation and the 7L167 Line
2013-12-11	Updated to include map amendments, cutplane table amendments, and minor drafting edits.
2012-12-04	Updated to include cutplane name changes, updated maps and minor drafting edits.
2012-09-13	Updated to include minor drafting edits

2012-06-14	Updated to include material content from existing Section 302.5 of the ISO rules, Northeast Area Transmission Constraint Management
2011-06-30	Initial Release

Appendix 1 – Effective Pool Assets

1. The effective pool assets for the Fort McMurray Transfer-Out Cutplane, listed alphabetically by their pool IDs, are:

    CNR5

    IOR5

    MKR1

    MKRC

    SCL1

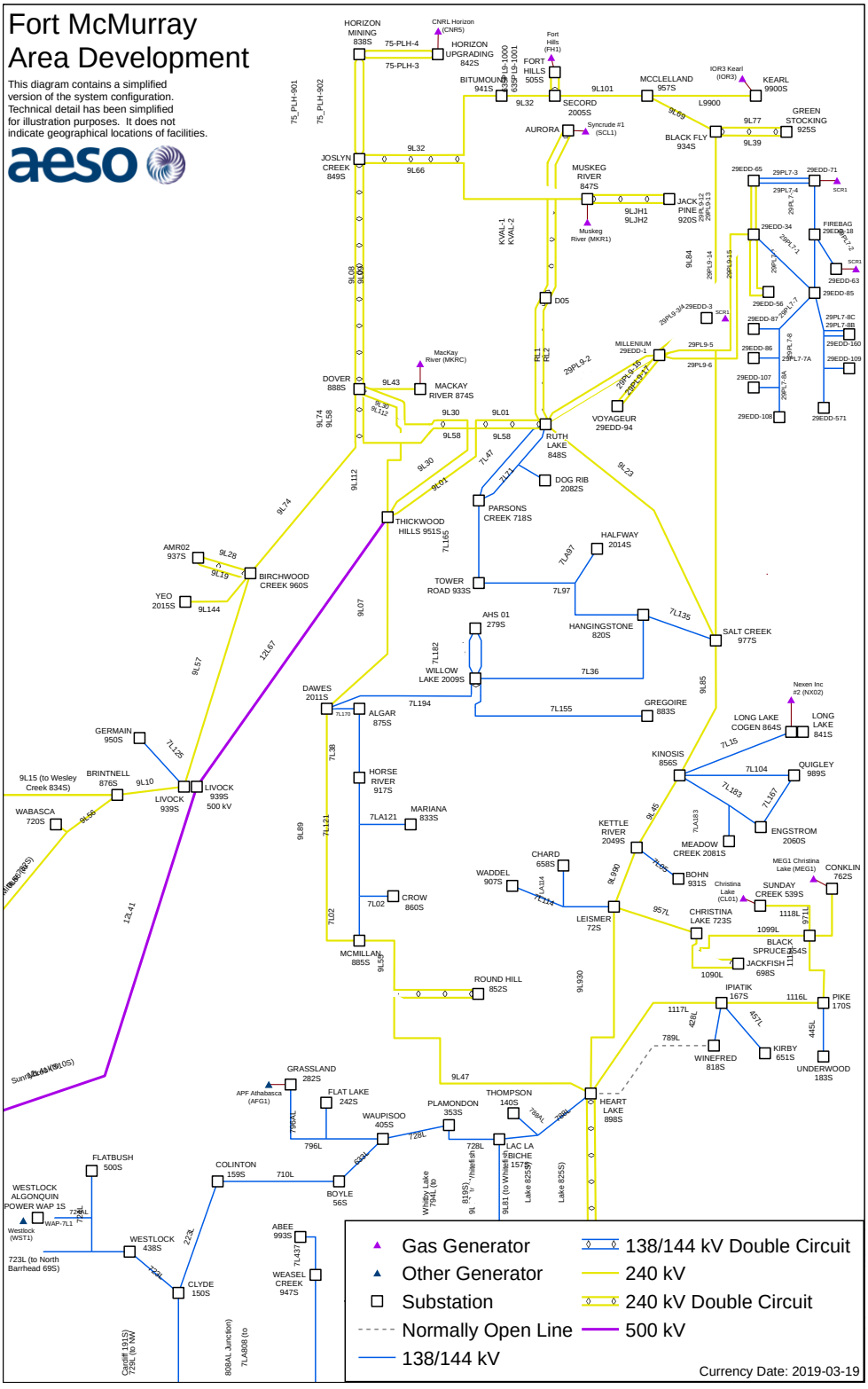
    SCR1, SCR5, SCR6

    FH1

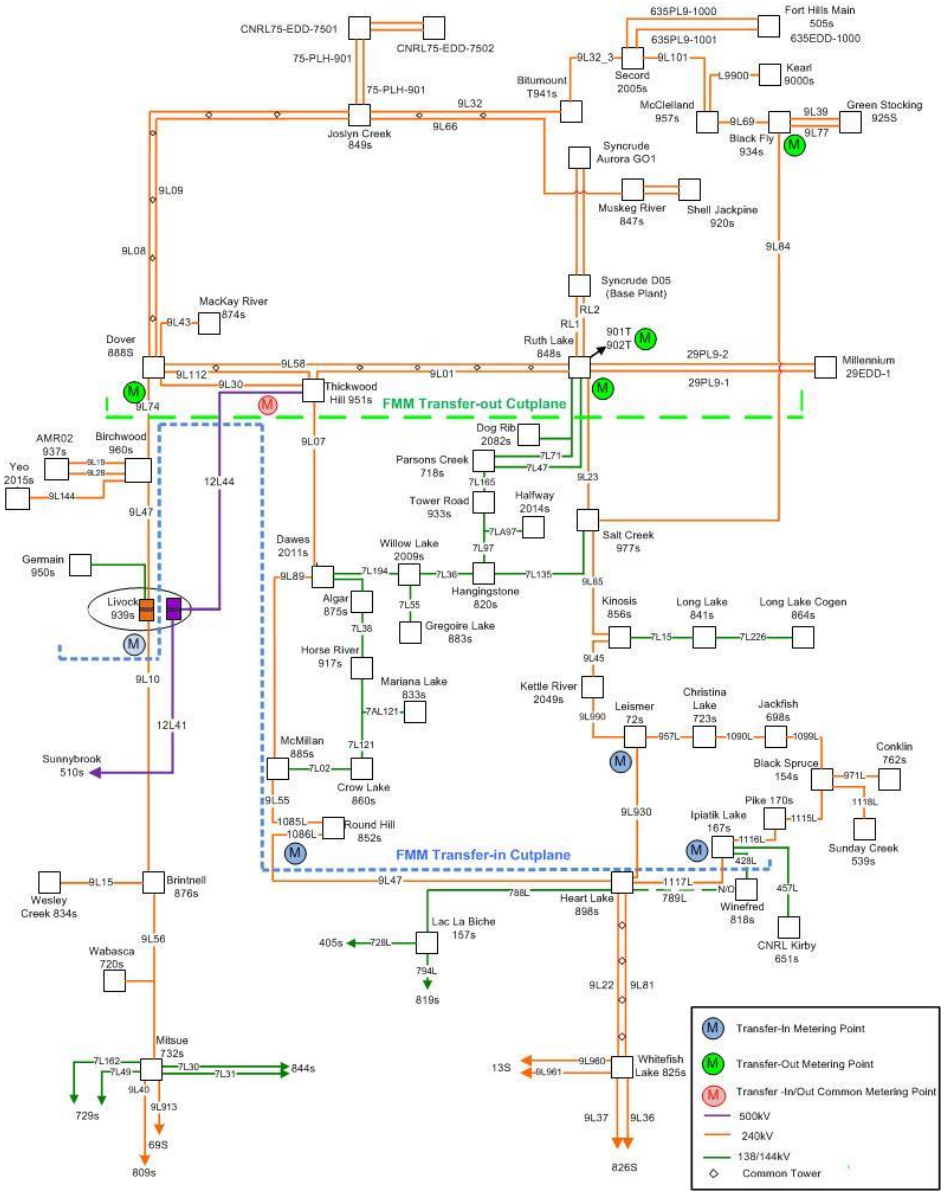
The effective pool assets for the Fort McMurray Transfer-In Cutplane are:

Load – curtailed in accordance with the transmission facility owner load curtailment plan, if applicable.

Appendix 2 – Geographical Map of the Northeast Area



Appendix 3 – Northeast Area Cutplanes: Transfer-In and Transfer-Out Single Line Diagram



Appendix 4 – Cutplane Transfer Limits for the Northeast Area

Table 1 - Fort McMurray Transfer –Out Cutplane Transient Limits

Note: Transient stability limits are not exceeded.

If Real Time tools (RTCA and RTVSA) are not available, the area is operated to the most restrictive limit for the contingency.

Outage	Element	FMM Transfer-Out Transient Limits (MW)	Next Contingency
N-0 System Normal	N/A	1410	12L41 (939s Livock to 510s Sunnybrook)
N-1	FMM West 500 kV	970	9L74
	1090L	1200	12L41 (939s Livock to 510s Sunnybrook)
	1099L		
	1115L		
	1116L		
	1117L		
	2011s Dawes 901T		
	848s Ruth Lake 901T		
	848s Ruth Lake 902T		
	885s McMillian 902T		
	957L		
	977s Salt Creek 901T		
	9L01		
	9L07		
	9L08 or 9L09		
	9L10	955	
	9L101	1200	
	9L112		
	9L15		
	9L22 or 9L81	1200	
	9L23		
	9L30		
	9L32		
	9L45	1175	
	9L47	1200	
	9L55		
	9L56		
	9L57	955	
	9L58	1200	
	9L66		
	9L69		
	9L74	925	
	9L84	1200	
	9L85		
	9L89		
	9L930		

Outage	Element	FMM Transfer-Out Transient Limits (MW)	Next Contingency
	9L990	1180	

Table 2 - Fort McMurray Transfer- Out Cutplane Voltage Limits

Note: If real-time tools allow a higher cutplane limit for the contingencies listed in the tables below, the AESO operates to the higher limit.

Outage	Element	FMM Transfer-Out Voltage Stability Limit (MW)	Next Contingency	Limiting Element
N-0 System Normal	N/A	930	Limited by FMM generation	
N-1	FMM West 500 kV	870	9L74	Area Voltage
	1090L	930	N/A	N/A
	1099L			
	1115L			
	1116L			
	1117L			
	2011s Dawes 901T			
	848s Ruth Lake 901T			
	848s Ruth Lake 902T			
	885s McMillian 902T			
	957L			
	977s Salt Creek 901T			
	9L01			
	9L07			
	9L08 or 9L09			
	9L10	810	FMM West 500 kV	Area Voltage
	9L101	930	N/A	N/A
	9L112			
	9L15			
	9L22 or 9L81			
	9L23			
	9L30			
	9L32			
	9L45			
	9L47			
	9L55			
	9L56			
	9L57	805	FMM West 500 kV	Area Voltage
	9L58	930	N/A	N/A
	9L66			
	9L69			
	9L74	770	FMM West 500 kV	Area Voltage
	9L84	930	N/A	N/A

Outage	Element	FMM Transfer-Out Voltage Stability Limit (MW)	Next Contingency	Limiting Element
	9L85			
	9L89			
	9L930			
	9L990			

Table 3 - Fort McMurray Transfer-Out Cutplane Thermal Limits

Note: If real-time tools allow a higher cutplane limit for the contingencies listed in the tables below, the AESO operates to the higher limit.

Outage	Element	Fort McMurray Transfer-Out Thermal Limit (MW)	Next Contingency
N-0 System Normal	None	930	Fort McMurray Generation limitations
N-1	FMM West 500 kV	560	9L74
	1090L	930	N/A
	1099L	930	9L85
	1115L	930	N/A
	1116L	930	
	1117L	930	
	2011s Dawes 901T	930	
	848s Ruth Lake 901T	930	
	848s Ruth Lake 902T	930	
	885s McMillian 902T	930	
	957L	930	
	977s Salt Creek 901T	930	
	9L01	705	9L23
	9L07	585	9L85
	9L08 or 9L09	930	N/A
	9L10	600	FMM West 500 kV
	9L101	410	9L23
	9L112	930	N/A
	9L15	750	FMM West 500 kV
	9L22 or 9L81	500	9L81 or 9L22
	9L23	410	9L101
	9L30	930	N/A
	9L32	730	9L23
	9L45	740	9L07
	9L47	830	FMM West 500 kV
	9L55	830	
	9L56	810	
	9L57	595	
	9L58	905	9L01
	9L66	930	N/A

Outage	Element	Fort McMurray Transfer-Out Thermal Limit (MW)	Next Contingency
	9L69	765	9L23
	9L74	560	FMM West 500 kV
	9L84	795	9L23
	9L85	585	9L07
	9L89	640	9L85
	9L930	930	N/A
	9L990	750	9L07

Table 4 - Fort McMurray Transfer-In Cutplane Transient Limits

Note: If real-time tools allow a higher cutplane limit for the contingencies listed in the tables below, the AESO operates to the higher limit.

Outage	Element	FMM Transfer-In Transient Limits (MW)	Next Contingency
N-0 System Normal	N/A	1240	12L44 939s Livock to 951S Thickwood
N-1	FMM West 500 kV	860	9L10
	1090L	1200	12L44 939s Livock to 951s Thickwood
	1099L	1190	
	1115L	1230	
	1116L		
	1117L	1220	
	2011s Dawes 901T	1240	
	848s Ruth Lake 901T		
	848s Ruth Lake 902T		
	885s McMillian 902T		
	957L	1210	
	977s Salt Creek 901T	1240	
	9L01		
	9L07	1140	
	9L08 or 9L09	1240	
	9L10	820	
	9L101	1240	
	9L112		
	9L15	1140	
	9L22 or 9L81	1180	
	9L23	1220	
	9L30	1240	
	9L32		
	9L45	920	
	9L47	1040	
	9L55	1000	
	9L56	1100	
	9L57	820	

Outage	Element	FMM Transfer-In Transient Limits (MW)	Next Contingency
	9L58	1240	
	9L66	1210	
	9L69	1240	
	9L74	860	
	9L84	1240	
	9L85	930	
	9L89	1130	
	9L930	1180	
	9L990	890	

Table 5 - Fort McMurray Transfer-In Cutplane Voltage Limits

Note: If real-time tools allow a higher cutplane limit for the contingencies listed in the tables below, the AESO operates to the higher limit.

Outage	Element	Fort McMurray Transfer-In Voltage Stability Limit (MW)	Next Contingency
N-0 System Normal	None	800	Limited by Fort Mac generation
N-1	FMM West 500 kV	580	9L10
	1090L	800	FMM West 500 kV
	1099L	770	
	1115L	800	
	1116L	800	
	1117L	770	
	2011s Dawes 901T	800	
	848s Ruth Lake 901T	800	
	848s Ruth Lake 902T		
	885s McMillian 902T	800	
	957L	800	
	977s Salt Creek 901T	800	
	9L01	800	
	9L07	740	
	9L08 or 9L09	800	
	9L10	580	
	9L101	740	
	9L112	800	
	9L15	760	
	9L22 or 9L81	755	
	9L23	760	
	9L30	800	
	9L32	790	9L23
	9L45	710	FMM West 500 kV
	9L47	595	

Outage	Element	Fort McMurray Transfer-In Voltage Stability Limit (MW)	Next Contingency
	9L55	625	
	9L56	635	
	9L57	580	
	9L58	800	
	9L66	800	
	9L69	800	
	9L74	575	
	9L84	800	
	9L85	720	
	9L89	700	
	9L930	780	
	9L990	670	

Table 6 - Fort McMurray Transfer-In Cutplane Thermal Limits

Note: If real-time tools allow a higher cutplane limit for the contingencies listed in the tables below, the AESO operates to the higher limit.

Outage	Element	Fort McMurray Transfer-In Thermal Limit (MW)	Next Contingency
N-0	None	920	FMM West 500 kV
N-1	FMM West 500 kV	630	9L10 or Livock PST
	1090L	920	FMM West 500 kV
	1099L		
	1115L		
	1116L		
	1117L		
	2011s Dawes 901T		
	848s Ruth Lake 901T		
	848s Ruth Lake 902T		
	885s McMillian 902T		
	957L		
	977s Salt Creek 901T	900	
	9L01	920	9L23
	9L07	770	FMM West 500 kV
	9L08 or 9L09	920	
	9L10	620	
	9L101	830	9L990
	9L112	920	FMM West 500 kV
	9L15	870	
	9L22 or 9L81	770	

Outage	Element	Fort McMurray Transfer-In Thermal Limit (MW)	Next Contingency
	9L23	920	9L990
	9L30	920	FMM West 500 kV
	9L32	810	9L23
	9L45	790	FMM West 500 kV
	9L47	760	
	9L55	770	
	9L56	830	
	9L57	620	
	9L58	910	9L01
	9L66	890	FMM West 500 kV
	9L69	920	
	9L74	650	
	9L84	920	
	9L85	640	Conklin Units
	9L89	790	FMM West 500 kV
	9L930	920	
	9L990	780	