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.

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[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
2021-10-27	Amended Appendix 4 by revising Tables 1 through 3, the Fort McMurray transfer-out cutplane limits, and Tables 4 through 6, the Fort McMurray transfer-in cutplane limits
2020-03-11	Amended Section 3 Transfer-Out measuring point substations.
2019-05-14	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. 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

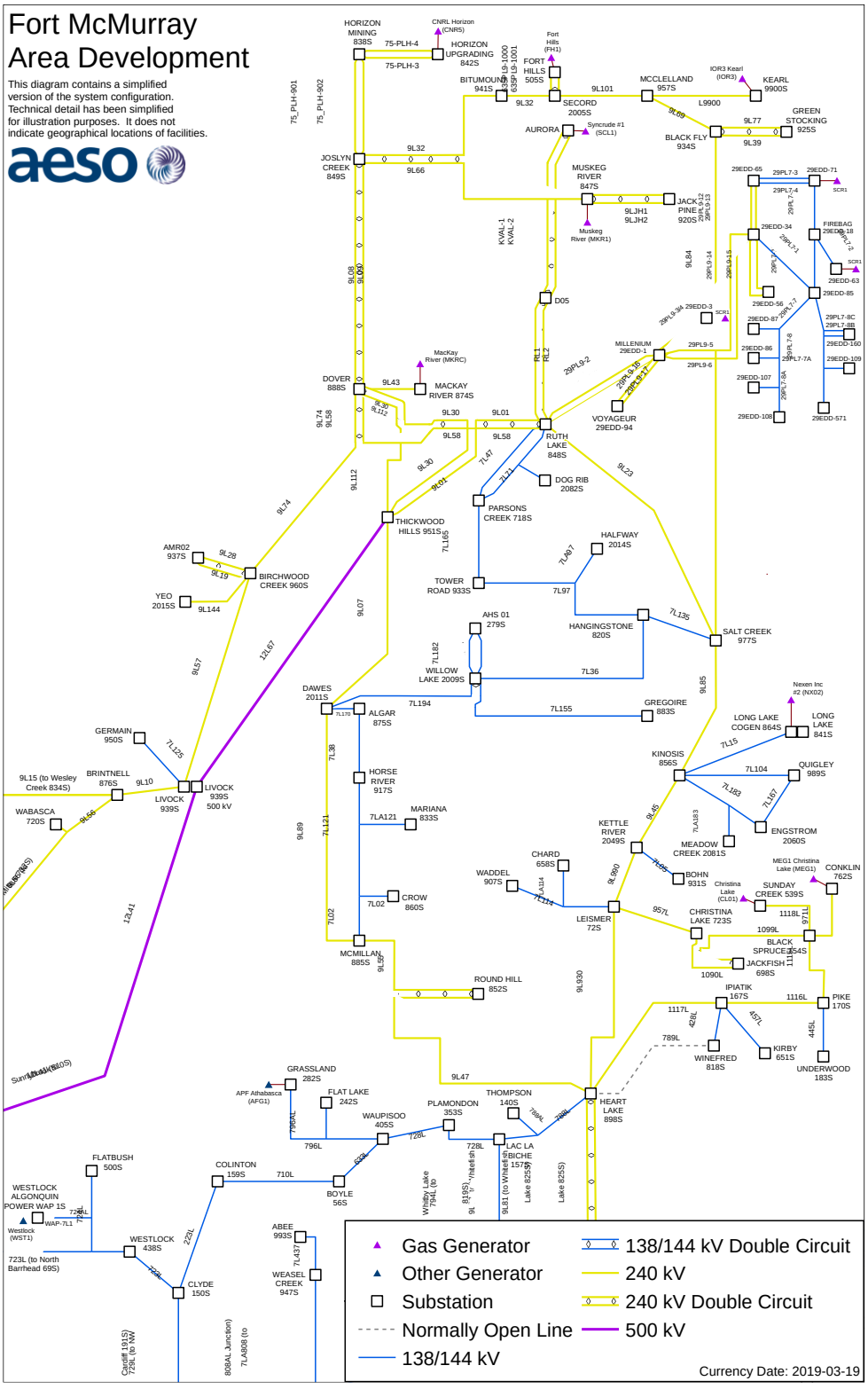
    SCR1, SCR5, SCR6

    FH1

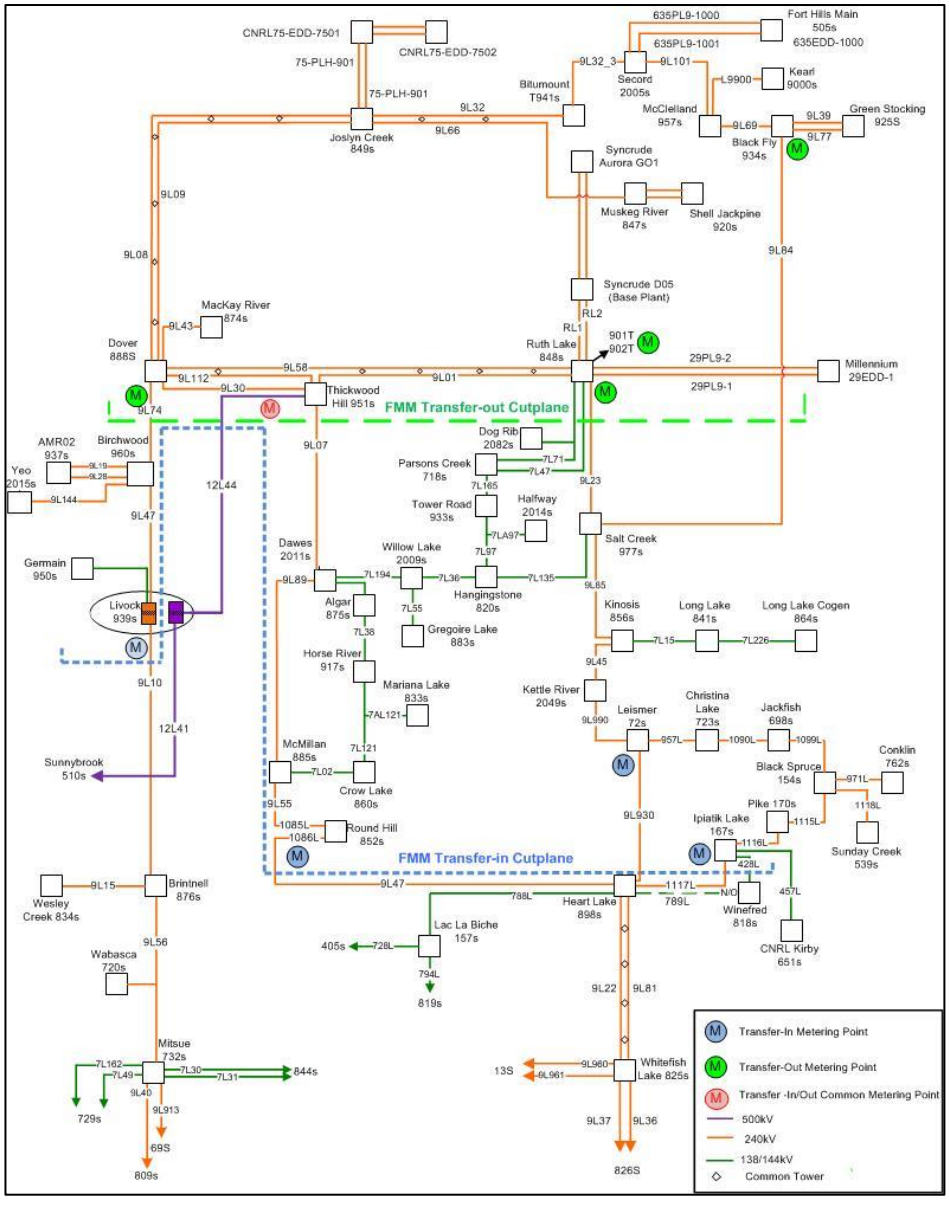
The effective pool assets for the Fort McMurray Transfer-In Cutplane are:

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

Transient stability limits are not exceeded.

Table 1 - Fort McMurray Transfer-Out Cutplane Transient Limits

Outage	Outage Element	Fort McMurray Export Cutplane Transient Stability Limit (MW)	Next Contingency
N-0 System Normal	N/A	1390	12L41
N-1	Fort McMurray West 500 kV[1]	900	9L74
	9L01	1250	9L58
	9L07	1240	12L41
	9L08	1250	
	9L09	1250	
	9L10 or 939S Livock PST	950	
	9L15	1240	
	9L22	1250	
	9L81	1250	
	9L23	1240	
	9L30	1250	
	9L32	1250	9L101
	9L45	1120	12L41
	9L47	1140	
	9L55	1140	
	9L56	1160	
	9L57	930	
	9L58	1250	9L01
	9L66	1250	12L41
	9L69	1250	
	9L74	900	
	9L84	1250	
	9L85	1170	
	9L89	1230	
	9L101	1190	9L32
	9L112	1250	12L41
	9L930	1250	
	9L990	1125	
	848S Ruth Lake 901T or 902T	1250	

Outage	Outage Element	Fort McMurray Export Cutplane Transient Stability Limit (MW)	Next Contingency
	885S McMillian 902T	1340	
	951S Thickwood SVC	1250	12L41
	957L	1250	
	977S Salt Creek 901T	1250	
	1090L	1250	
	1099L	1250	
	1115L	1250	
	1116L	1250	
	1117L	1250	
	2011S Dawes 901T	1250	

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.

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

Table 2 - Fort McMurray Transfer- Out Cutplane Voltage Limits

	Element	Fort McMurray Export Cutplane Voltage Stability Limit (MW)	Next Contingency	Limiting Violation
N-0 System Normal	N/A	910		Limited by Fort McMurray area generation
N-1	Fort McMurray West 500 kV[1]	550	9L74	Fort McMurray area voltage
	9L01	890	N/A	N/A
	9L07	890		
	9L08	890		
	9L09	890		
	9L10 or 939S Livock PST	600	Fort McMurray West 500 kV[1]	Fort McMurray area voltage
	9L15	890	N/A	N/A
	9L22	890		
	9L81	890		
	9L23	890		
	9L30	890		
	9L32	890		
	9L45	890		
	9L47	890		
	9L55	890		
	9L56	890		
	9L57	590	Fort McMurray West 500 kV[1]	Fort McMurray area voltage
	9L58	890	N/A	N/A
	9L66	810		
	9L69	880		
	9L74	550	Fort McMurray West 500 kV[1]	Fort McMurray area voltage
	9L84	890	N/A	N/A
	9L85	880		
	9L89	880		
	9L101	890		
	9L112	890	N/A	N/A

	Element	Fort McMurray Export Cutplane Voltage Stability Limit (MW)	Next Contingency	Limiting Violation
	9L930	890		
	9L990	890		
	848S Ruth Lake 901T or 902T	890		
	885S McMillan 902T	890		
	951S Thickwood SVC	890		
	957L	890		
	977S Salt Creek 901T	890		
	1090L	890		
	1099L	890		
	1115L	890		
	1116L	890		
	1117L	890		
	2011S Dawes 901T	890		

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.

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

Table 3 - Fort McMurray Transfer-Out Cutplane Thermal Limits

Outage	Element	Fort McMurray Export Cutplane Thermal Limit (MW)	Next Contingency	Limiting Violation
N-0 System Normal	None	910	None	Limited by Fort McMurray area generation
N-1	Fort McMurray West 500 kV[1]	630	9L74	1034S Margie (voltage)
	9L01	670	9L23	9L58 (thermal)
	9L07	600	9L45	Thermal violation on 7L36
	9L08	910	N/A	N/A
	9L09	910	N/A	N/A
	9L10 or 939S Livock PST	710	Fort McMurray West 500 kV[1]	788L (thermal)
	9L15	900	9L57	950s Garmin (voltage)
	9L22	550	9L81	788L (thermal)
	9L81	550	9L22	788L (thermal)
	9L23	670	9L01	9L58 (thermal)
	9L30	910	N/A	N/A
	9L32	910	N/A	N/A
	9L45	600	9L07	7L36 (thermal)
	9L47	790	Fort McMurray West 500 kV[1]	9L74 (thermal)
	9L55	790	Fort McMurray West 500 kV[1]	9L74 (thermal)
	9L56	910	N/A	N/A
	9L57	680	Fort McMurray West 500 kV[1]	788L (thermal)
	9L58	800	9L01	7L36 (thermal)
	9L66	830	N/A	N/A
	9L69	910	N/A	N/A
	9L74	630	Fort McMurray West 500 kV[1]	1034S Margie (voltage)
	9L84	910	N/A	N/A
	9L85	600	9L07	7L36 (thermal)

Outage	Element	Fort McMurray Export Cutplane Thermal Limit (MW)	Next Contingency	Limiting Violation
	9L89	810	Fort McMurray West 500 kV[1]	9L74 (thermal)
	9L101	730	9L23	848S Ruth Lake 704T (thermal)
	9L112	910	N/A	N/A
	9L930	870	Fort McMurray West 500 kV[1]	9L74 (thermal)
	9L990	610	9L07	7L36 (thermal)
	848S Ruth Lake 901T or 902T	910	N/A	N/A
	885S McMillan 902T	910	N/A	N/A
	951S Thickwood SVC	910	Fort McMurray West 500 kV	9L74 (thermal)
	957L	910	N/A	N/A
	977S Salt Creek 901T	910		
	1090L	910		
	1099L	910		
	1115L	890	Fort McMurray West 500 kV[1]	9L74 (thermal)
	1116L	890	Fort McMurray West 500 kV[1]	9L74 (thermal)
	1117L	900	Fort McMurray West 500 kV[1]	9L74 (thermal)
	2011S Dawes 901T	910	N/A	N/A

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.

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

Table 4 - Fort McMurray Transfer-In Cutplane Transient Limits

	Outage Element	Fort McMurray Inflow Cutplane Transient Stability Limit (MW)	Next Contingency
N-0 System Normal	N/A	1240	Fort McMurray area generation
N-1	Fort McMurray West 500 kV[1]	830	9L10
	9L01	1240	12L44
	9L07	1220	
	9L08	1240	
	9L09	1240	
	9L10 or 939S Livock PST	830	
	9L15	1190	
	9L22	1190	
	9L81	1190	
	9L23	1240	
	9L30	1240	
	9L32	1230	
	9L45	1000	
	9L47	1130	
	9L55	1100	
	9L56	1090	
	9L57	850	
	9L58	1230	
	9L66	1230	
	9L69	1230	
	9L74	880	
	9L84	1230	
	9L85	1060	
	9L89	1170	
	9L101	1240	
	9L112	1240	
	9L930	1180	
	9L990	1000	
	848S Ruth Lake 901T or 902T	1220	
	885S McMillan 902T	1230	
	951S Thickwood SVC	1230	

	Outage Element	Fort McMurray Inflow Cutplane Transient Stability Limit (MW)	Next Contingency
	957L	1230	
	977S Salt Creek 901T	1230	
	1090L	1230	
	1099L	1220	
	1115L	1200	
	1116L	1200	
	1117L	1180	
	2011S Dawes 901T	1230	

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.

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

Table 5 - Fort McMurray Transfer-In Cutplane Voltage Limits

Outage	Element	Fort McMurray Import Cutplane Voltage Stability Limit (MW)	Next Contingency	Limiting Violation
N-0 System Normal	N/A	900	Fort McMurray West 500 kV[1]	Fort McMurray area voltage
N-1	Fort McMurray West 500 kV[1]	550	9L10 or 939S PST	
	9L01	780	9L101	
	9L07	770	Fort McMurray West 500 kV[1]	
	9L08	630	9L09	
	9L09	630	9L08	
	939S Livock PST or 9L10	550	Fort McMurray West 500 kV[1]	
	9L15	730	Fort McMurray West 500 kV[1]	
	9L81	770	957L	
	9L22	770	957L	
	9L23	750	9L32	
	9L30	750	9L101	
	9L32	750	9L101	
	9L45	500	9L101	
	9L47	600	9L101	
	9L55	620	Fort McMurray West 500 kV[1]	
	9L56	630	Fort McMurray West 500 kV[1]	
	9L57	600	Fort McMurray West 500 kV[1]	
	9L58	770	9L101	
	9L66	770	9L101	

Outage	Element	Fort McMurray Import Cutplane Voltage Stability Limit (MW)	Next Contingency	Limiting Violation
	9L69	710	957L	
	9L74	650	Fort McMurray West 500 kV[1]	
	9L84	710	957L	
	9L85	620	9L101	
	9L89	710	9L101	
	9L101	610	9L45	
	9L112	750	9L101	
	9L930	750	9L101	
	9L990	650	9L101	
	848S Ruth Lake 901T or 902T	790	Fort McMurray West 500 kV[1]	
	885S McMillan 902T	790	9L101	
	951S Thickwood SVC	760	Fort McMurray West 500 kV[1]	
	957L	810	9L101	
	977S Salt Creek 901T	690	2011S Dawes 901T	
	1090L	810	9L101	
	1099L	780		
	1115L	750		
	1116L	760		
	1117L	750		
	2011S Dawes 901T	690	7L135	

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.

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

Table 6 - Fort McMurray Transfer-In Cutplane Thermal Limits

	Element	Fort McMurray Inflow Cutplane Thermal Limit (MW)	Next Contingency	Limiting Violation
System Normal N-0	N/A	900	Fort McMurray West 500 kV[1]	950S Garmin (voltage)
N-1	Fort McMurray West 500 kV[1]	490	9L10 or 939S Livock PST	223L (150S Clyde -159S Colinton) (thermal)
	9L01	780	9L101	9900S Kearl (voltage)
	9L07	800	Fort McMurray West 500 kV[1]	950S Garmin (voltage)
	9L08	680	9L09	9900S Kearl (voltage)
	9L09	680	9L08	9900S Kearl (voltage)
	939S Livock PST or 9L10	490	Fort McMurray West 500 kV[1]	223L (150S Clyde and 159S Colinton) (thermal)
	9L15	730		950S Garmin (voltage)
	9L22	820		
	9L81	820		
	9L23	870		
	9L30	870		
	9L32	890		
	9L45	570		
	9L47	730		
	9L55	740		
	9L56	780		
	9L57	540		223L (150S Clyde/A159S Colinton) (thermal)
	9L58	800		1034S Margie (voltage)
	9L66	850		950S Garmin (voltage)
	9L69	870		
	9L74	600		223L (Clyde 150S/Colinton 159S) (thermal)
	9L84	860		950S Garmin (voltage)
	9L85	670		

	Element	Fort McMurray Inflow Cutplane Thermal Limit (MW)	Next Contingency	Limiting Violation
	9L89	800		
	9L101	610		9900S Kearl
	9L112	870		950S Garmin (voltage)
	9L930	830		1034S Margie (voltage)
	9L990	650		950S Garmin (voltage)
	848S Ruth Lake 901T or 902T	900		
	885S McMillan 902T	900		
	951S Thickwood SVC	820		
	957L	880		
	977S Salt Creek 901T	890		
	1090L	880		
	1099L	860		
	1115L	880		
	1116L	880		
	1117L	870		9900S Kearl (voltage)
	2011S Dawes 901T	900		950S Garmin (voltage)

Note[1]: Fort McMurray West 500 kV components include transmission line 12L41, transmission line 12L44, and transformer 951S Thickwood 1201T.