505 FORT MCMURRAY AREA OPERATION

1. Purpose

To provide criteria and policies for the operation of the Fort McMurray area transmission system and to define policies and procedures for the System Controller (SC) in implementing transfer limits and ensuring system reliability in the Fort McMurray area.

2. Background

The transfer limits in and out of the Fort McMurray area and the operation of the area transmission system are constrained due to the following system characteristics:

The Fort McMurray area is connected to the Alberta Interconnected Electric System (AIES) by three long 240 kV transmission lines, 9L57/9L56 (Dover/Brintnell/Mitsue), which is 272 km, 9L07/9L55/9L22 (Dover/McMillan/Heart Lake/Whitefish), which is 347 km, and 9L990/9L930 (Ruth Lake/Leismer/Whitefish), which is 320 km. There are two major substations in the Fort McMurray area, Ruth Lake (A848S), which supports 144 kV and 72 kV feeders to other substations and Dover (A888S), which is a 240 kV switching station connected to load and generation in the area.

Loss of a second 240 kV line with one other 240 kV line out of service may cause generation instability, voltage instability or unacceptable low voltage excursions under high transfer-out condition.

Loss of all three 240 kV lines could result in extreme voltage and frequency excursions in the Fort McMurray area causing generator tripping, load loss, and the area separating into electrical islands. This will also result in a power outage to the Fort McMurray and Fort MacKay town sites.

The major transmission facilities in the area are shown in **Figure 1**. With the addition of several co-generation facilities in conjunction with the oil sand processing activities, the Fort McMurray area has become a source of supply and contingency reserves to the AIES. As a result, the transmission transfer capability is becoming heavily utilized.

The area has a number of generating assets, providing steam and electrical energy to oil sands mining and processing loads, with additional generation and load growth expected in the future.

3. Policy

This OPP sets out the transfer limits for the Fort McMurray area with one, two or three 240 kV lines in service, the curtailment order, voltage control methodology and the various remedial action schemes (RAS) in the area.

3.1 Fort McMurray area cut-planes

The power (MW) transfer-in and transfer-out quantities of the Fort McMurray area are monitored by the ISO at the Ruth Lake cut plane and the Leismer cut plane. These cut planes and the affected generating and load facilities are more completely set out in Table 1.

3.2 Fort McMurray area transfer-in limits

(1) The transfer-in limits to the Fort McMurray area are established to avoid voltage instability in the event of next single contingency, and are dependent on the status of each of the three 240 kV lines connecting the Fort McMurray area to the AIES, namely 9L07/9L55/9L22, 9L57/9L56, and 9L990/9L930.

Leismer cut-plane

(2) When 9L990 is in service, the real time amount of power (MW) at any time being transferred into the Fort McMurray area will be monitored by the ISO at the Leismer cut-plane, and is calculated as the sum of:

(i) inflow on 9L57 as measured at the Dover substation (A888S), 9L55 as measured at the McMillan substation (A885S) and 9L990 as measured at the Ruth Lake substation (A848S), plus

(ii) inflow from the Kinosis T-tap at 9L990 to the Kinosis substation (A856S), but if the power flows in the direction from the Kinosis substation (A856S) to the Kinosis T-tap at 9L990, it is deemed to be zero, plus

(ii) inflow on 957L from Leismer substation (T72S) towards the Christina Lake substation (T723S), but if the power flows in the direction from the Christina Lake substation (T723S) to the Leismer substation (T72S) on 957L, it is deemed to be zero.

(3) The more specific transfer- in limits under the more specific contingencies are as set forth below and appear in the fourth column of Table 3 below.

Ruth Lake cut-plane

(4) When 9L990 is out of service, the real time amount of power (MW) at any time being transferred into the Fort McMurray area will be monitored by the ISO at the Ruth Lake cut-plane, and is calculated as the sum of the inflow on 9L57 as measured at the Dover substation (A888S) and 9L55 as measured at the McMillan substation (A885S).

(5) The more specific transfer-in limits under the more specific contingencies are as set forth below and appear in the second column of Table 4 below.

Transfer-in limit when three 240 kV lines in service (3-line transfer-in limit)

(6) When all three 240 kV lines into the Fort McMurray area in service, the transfer-in limit is 300 MW.

Transfer-in limit when two 240 kV lines in service (2-line transfer-in limit)

(7) When only two 240 kV lines into the Fort McMurray area in service, the transfer-in limit is 160 MW.

Transfer-in limit when only one 240 kV line in service (1-line transfer-in limit)

(8)(a) The transfer-in limit to the Fort McMurray area when only one of the three 240 kV lines in service is the transfer level (MW) that will accommodate the area's largest generating asset contingency without exceeding the voltage stability limit of 160 MW into the area, and specifically will be calculated as 160 MW **minus** the area's largest generating asset contingency.

(b) The limit set out in subsection (8)(a) above will be automatically calculated through an AESO energy management system (EMS) calculation.

(c) If the transfer-in level exceeds the 1-line transfer-in limit set out under subsection (8)(a) above, then area load customers (being ATCO Electric, Syncrude, Suncor, Albian Sands Muskeg River, Canadian Natural Resources Limited (CNRL) Horizon, Nexen Long Lake, Petro Canada MacKay River, MEG Energy, Imperial Oil Resources (IOR) Kearl Lake and FortisAlberta via AltaLink ACC) must be notified by the ISO of the situation and that there is risk of potential area voltage collapse that could result in islanding following the loss of the area's largest generating asset.

Curtailment order when 1-line, 2-line, or 3-line transfer-in limit is exceeded

(9) If any of the one-line, two-line, or three-line transfer-in limits at the Leismer cut-plane as specified in Table 3 or at the Ruth Lake cut-plane as specified in Table 4 are exceeded, the area load customers will be curtailed in the following order:

(i) First, if any of the area effective load customers are taking load exceeding their contracted DTS levels, they will be curtailed to their contracted DTS quantity (MW) levels;

(ii) Second, if further load curtailment is required, then the required curtailment quantity (MW) will be allocated on a pro-rata basis to the area effective load customers, based on their contracted DTS levels, which levels as listed in Table 6 are confidential with the ISO.

3.3 Fort McMurray area transfer-out limits

(1) The transfer-out limits are dependent on the status of each of those three 240 kV lines referenced in Section 3.2 (1) above.

(2) The transfer-out limits at each of the Ruth Lake cut-plane and Leismer cut-plane are as specified in Table 2 and Table 3 respectively.

Ruth Lake cut-plane

(3) The real time amount of power (MW) transferred out of the Fort McMurray area at the Ruth Lake cut-plane is calculated as the sum of:

(i) the outflow on 9L57 as measured at the Dover substation (A888S), 9L55 as measured at the McMillan substation (A885S), 9L990 as measured at the Ruth Lake substation (A848S); plus

(ii) the total dispatched operating reserves and dispatch down service (DDS) to Syncrude, Suncor, Muskeg River, MacKay River and CNRL Horizon.

Leismer cut-plane

(4) The real time amount of power (MW) transferred out of the Fort McMurray area at the Leismer cut-plane is calculated as the sum of:

(i) outflow on 9L57 as measured at the Dover substation (A888S), 9L55 as measured at the McMillan substation (A885S), 9L990 as measured at the Ruth Lake substation (A848S); plus

(ii) outflow from the Kinosis substation (A856S) towards Kinosis T-tap on 9L990, but if the power flows in the direction from the Kinosis T-tap at 9L990 to the Kinosis substation (A856S), it is deemed to be zero);plus

(iii) outflow from the Christina Lake substation (T723S) towards Leismer substation (T72S) on 957L, but if the power flows in the direction from Leismer substation

(T72S) to the Christina Lake substation (T723S) on 957L, it is deemed to be zero; plus

(iv) total dispatched operating reserves and DDS to Syncrude, Suncor, Muskeg River, MacKay River, CNRL Horizon, Nexen Inc # 1 (Long Lake) and MEG1 Christina Lake.

Transfer-out limit when only one 240 kV line in service

(5) When any two of the three 240 kV lines are out of service, there is the potential of islanding the Fort McMurray area if the remaining 240 kV line experiences a fault and therefore the Fort McMurray area generating asset operators including Syncrude, Suncor, Muskeg River, CNRL Horizon, Nexen Inc #2 (Long Lake), MEG1 Christina Lake and MacKay River will be notified by the ISO when the Fort McMurray area is operating under only one 240 kV line in service condition.

Curtailment for transfer-out limit exceeded

(6) If the transfer-out limits at the Ruth Lake cut-plane or the Leismer cut-plane are exceeded, each of the generating asset operators within the subject cut-plane will be issued a directive by the system controller to curtail net-to-grid generation to reduce the MW transfer-out to within the limit using the following sequence:

(a) First, curtail area effective generating asset output to their maximum capability (MC) level if their power output (MW) quantities exceed their MC.

(b) Second, curtail area effective generating asset output on a pro rata basis, using their net-to-grid MW generation, plus dispatched operating reserves quantities, plus dispatch down service quantities.

(7) The curtailment calculation referenced in Subsection (6) (b) above for each generating asset is determined as follows:

Generating Asset Curtailment Quantity (MW) equals: required generation curtailment MULTIPLIED BY [(generating asset net-to-grid generation PLUS dispatched operating reserves PLUS dispatch down service (DDS)) DIVIDED BY (total net-to grid generation, PLUS total dispatched operating reserves PLUS total DDS of all effective generators)]

(8) If the power flow (MW) in the direction from the Kinosis substation (A856S) to the Kinosis T-tap on 9L990 is zero, the net-to-grid generation of Nexen Inc #2 (Long Lake) will be excluded in the generating asset curtailment calculation as referenced in Section 3.3 (6).

(9) If the power flow (MW) in the direction from the Christina Lake substation (T723S) to the Leismer substation (T72S) on 957L is zero, the net-to-grid generation of MEG 1 Christina Lake will be excluded in the generating asset curtailment calculation as referenced in Section 3.3 (6).

(10) When 9L990 is out of service, only the Ruth Lake cut-plane will be used in monitoring the transfer-out quantities to the Fort McMurray area, and any related applicable actions.

3.4 Voltage Control

(1) Overvoltage protection will apply to all three 240 kV lines. Ruth Lake (A848S) substation has three reactors available for voltage control, including one 20 MVAr and two 5 MVAr

reactors. Line connectable reactors also exist at Ruth Lake (909R, 35 MVAr) and at Dover (916R, 40 MVAr). These reactors are used primarily for the purpose of line energization but can also be used for system voltage control as required. There is a 20 MVAr reactor at each of the Kinosis (A856S), McMillan (A885S) and Heart Lake (A898S) substations. These reactors are used both for 240 kV line energization or to control voltages along the 240 kV lines, depending on the levels of energy transfer out of the Fort McMurray area.

The Wabasca (A720S) reactors are not normally used due to 25 kV considerations. They can be used when energizing 9L56 from Mitsue (A732S) to suppress line end voltage or when radially feeding the Wabasca load from the 240 kV.

Active VAr coordination by the SC, among area generators at Syncrude, Suncor, Muskeg River, Nexen Inc # 2 (Long Lake), CNRL Horizon, MEG1 Christina Lake and MacKay River and Transmission Facility Owner (TFO) system compensation devices is required to keep voltages within desired operating ranges, for the wide variety of operating conditions encountered in the Fort McMurray area. The operating ranges are defined in OPP 702. Also for reference is the ATCO Operating Policies and Procedures SO-201, SO-205 (section 3) and transmission line operating manuals.

With all three 240 kV lines in service, and at transfer-out levels within limits, the 240 kV system voltage at Ruth Lake (A848S) will be operated in the normal range of 264 kV (1.10 pu) to 269 kV (1.12 pu) to ensure acceptable post contingency voltage levels. For better pre-contingency preparation, the Ruth Lake voltage will be operated in the upper end of the normal operating range.

(2) When one or two of the 240 kV lines connecting the Fort McMurray area to the AIES is out of service, the normal voltage range will be maintained even if it requires reducing the power transfer-out by curtailing area generation.

3.5 Ruth Lake / Syncrude Open Terminal Islanding RAS (IRAS)

(1) The IRAS scheme set out below will be used to prevent exposure of local load to any excessive abnormal frequency or voltage conditions that could arise in the event of coincidental open terminal breaker status on PLL260-1-RL1 and PLL260-1-RL2 at Ruth Lake.

(2) The IRAS scheme at the Ruth Lake substation (A848S) will monitor open terminal status of both 240 kV lines (RL-1 and RL-2). On open operation of both line terminals, a high speed transfer trip signal is sent to the Syncrude base plant. Syncrude may also separate from the AIES automatically through underfrequency protection relay operation.

(3) Following a separation of the Syncrude plant, the SC will coordinate with the ATCO Electric operator and the Syncrude plant operator to re-connect the Syncrude plant to the AIES.

(4) Further operating practices are as set out in ATCO Electric SO-205 Fort McMurray Area Operating Practices.

3.6 Ruth Lake / Suncor Millennium Open Terminal Islanding RAS

(1) The IRAS scheme set out below will be used to prevent exposure of local load to any excessive abnormal frequency or voltage conditions that could arise in the event of coincidental open terminal operation on 29PL9-1 and 29PL9-2 at Ruth Lake.

(2) The IRAS scheme at the Ruth Lake substation (A848S) will monitor open terminal (breaker and line MOD) status of 29PL9-1 and 29PL9-2 at Ruth Lake substation. On open

operation of both line terminals, a high speed transfer trip signal will be sent to the Suncor Millennium connected plant facilities. Suncor/TransAlta plant may also separate from the AIES automatically through underfrequency protection relay operation.

(3) Following a separation of the Suncor plant, the SC will coordinate with the ATCO Electric (AE) operator and the Suncor plant operator to re-connect the Suncor plant to the AIES.

(4) Further operating practices are as set out in *ATCO Electric SO-205 Fort McMurray Area Operating Practices*.

3.7 9L43 open-terminal RAS (OTRAS)

(1) The OTRAS scheme set out below will be to prevent exposure of local load to any high frequency or high voltage conditions that could arise. This scheme is necessary to avoid islanding the MacKay River generator with the Petro Canada load local to the MacKay River substation (874S).

(2) Initiation of this OTRAS will occur when:

(i) any two poles of the 9L43 line breakers, 907 and 908, open at Dover substation (A888S) or

(ii) If the line disconnect switch 9L43D1 is opened at the Dover substation (A888S).

(3) In either of those events, the OTRAS will initiate a high speed transfer tripping of the MacKay River generator breaker.

(4) Further operating practices are as set out in ATCO *Electric SO-205 Fort McMurray Area Operating Practices*.

3.8 9L66 open-terminal RAS (OTRAS)

The 9L66 OTRAS will disconnect the Muskeg River generator from the AIES in the event of 9L66 open terminal at the Joslyn Creek substation (A849S). The scheme initiates a run-back of the Muskeg River generation to allow the generators to successfully island with the neighboring ATCO Power/Albian Sands load when separated from the AIES. Further operating practices are as set out in ATCO *Electric SO-205 Fort McMurray Area Operating Practices*.

3.9 CNRL Horizon Islanding RAS (IRAS)

This IRAS is implemented to prevent the CNRL Horizon and Albian Sands Muskeg River from islanding on the transmission system with system load. This scheme will monitor 9L08 and 9L09 breakers and series connected device status at the Dover substation (A888S) and the Joslyn Creek substation (A849S). The scheme will trip the CNRL Horizon and Albian Sands Muskeg River when both 9L08 and 9L09 (Dover to Joslyn) are coincidently out of service. Further operating practices are as set out in ATCO *Electric SO-205 Fort McMurray Area Operating Practices*.

3.10 Fort McMurray 240 kV line energization and use of reactors

(a) Due to the length of the 240 kV transmission lines and the resulting high open end voltages, the following restrictions apply regarding line energization.

- **Do not** energize 9L57/9L56 in its entirety from the Dover substation (A888S) with an open terminal at the Mitsue substation (A732S).
- **Do not** energize 9L07/9L55/9L22 in its entirety from the Dover substation (A888S) with an open terminal at the Whitefish Lake substation (A825S).

To avoid very high terminal end voltages, lines should be energized as follows:

- 9L57/9L56 should be energized from south to north (Mitsue to Dover), and only when the 40 MVAr (at 240 kV) reactor 916R is connected to the Dover line terminal end.
- 9L56 (Mitsue to Brintnell) should be energized from Mitsue and only when the 3 x 5 MVAr (at 25 kV) reactors at Wabasca are in service.
- 9L57 (Brintnell to Dover) should be energized from Brintnell, and only when the 40 MVAr (at 240 kV) reactor 916R is connected to the Dover line terminal end.
- 9L07/9L55/9L22 should be energized from south to north (i.e. from Whitefish Lake/ Heart Lake/ McMillan to Dover), and only when the 40 MVAr reactor 916R is connected to the Dover line terminal end. The 20 MVAr (at 25 kV) reactors should also be connected at both McMillan and Heart Lake.
- 9L07 should be energized from McMillan to Dover, and only when the Dover 40 MVAr reactor 916R is connected to the Dover line terminal end.
- 9L55 can be energized from either McMillan or Heart Lake when the 20 MVAr reactors are connected at both McMillan and Heart Lake. Otherwise, if the Heart Lake reactor is available, ensure the 240 kV bus voltage is within 110% using the reactor if required and energize 9L55 at Heart Lake.
- 9L22 should be energized from Whitefish Lake to Heart Lake and only when the 20 MVAr reactor is connected at Heart Lake.
- 9L990 should be energized from south to north (Leismer to Ruth Lake), and only when the 35 MVAr (at 240 kV) reactor 909R is connected to the Ruth Lake line terminal end.
- 9L930 should be energized from south to north (Whitefish Lake to Leismer).
- Further operating practices for each line are as set out in *ATCO Electric SO-205 Fort McMurray Area Operating Practices.*

3.11 240 kV loop closure and synch-check

The 240 kV transmission lines, 9L57 at Dover (A888S) and 9L57/9L56 at Brintnell (A876S), have synch-check relays to ensure safe closure of the 240 kV circuit breakers and to minimize impacts on Fort McMurray area generation. In the event of an outage to one line and coincident high levels of transfer-out on the remaining two lines, a significant power angle difference may be experienced across the open line 240 kV circuit breakers at Dover or Brintnell. The synch-check relays are set to a maximum closing angle of 35 degrees. Transfer-out of the area needs to be reduced to 385 MW or less before breaker closure is attempted. See Section 5.4.

4. Responsibilities

4.1 ISO

The ISO will:

- Outline in the System Coordination Plan any additional requirements or deviations to this OPP for generation or load dispatch. The System Coordination Plan will outline the manner in which the generation and loads are to be dispatched by the SC and any additional operational information necessary for operation under maintenance outage conditions.

- Review and update this OPP as new transmission facilities, loads and generators are added or removed in the Fort McMurray area.
- Issue updated versions of this OPP as required.

System Controller

The SC will:

- Monitor the area import and export MW against the transfer limits. SCADA alarms have been set up as listed in Table 2.
- Issues directives for curtailment of load and generation if import and export limits are exceeded.
- Issue directives for the generating assets in the Fort McMurray area as required to maintain the voltages and transfer limits set out in this OPP and to ensure area and AIES reliability.
- Coordinate actions with the transmission facility operators and generation asset operators to maintain voltages as set out in this OPP.
- Notify affected transmission facility operators and generation asset operators if any of the area RAS functionality is changed.
- Notify the area generation asset operators when only one 240 kV line is in service.

4.2 Transmission facility operators

The transmission facility operators will:

- Under the direction of the SC, work with area generation facility operators and other transmission facility operators to maintain the voltages limits set out in this OPP.
- Keep their portion of the RAS in good working order at all times.
- Advise the SC and affected generation facility operators, as soon as possible, if their portion of the RAS is not fully functional. The information provided will include the nature of the problem, measures taken and an estimate of the time required to return the system to normal operation.
- When 788L is out of service, advise the SC if adverse conditions exist (e.g. forest fires, snow/ice/wind storm) that poses increased risk of common tower failure to 9L930 and 9L22 (north of Whitefish Lake; see Figure 1).
- Perform switching of transmission facilities in the Fort McMurray area.
- Comply with OPP 601 regarding outages to its equipment.

4.3 Generation facility operators

The generation facility operators will:

- Comply with SC generation curtailment directives and voltage adjustment directives within 10 minutes.
- Upon receiving a SC generating asset curtailment directive as referenced in Section 5.2 (A)3 or 5.2 (B)3, choose whether to curtail the dispatched energy, the dispatched AS or a combination of both to meet the directive MW quantity.

- Under the oversight of the SC, work with area transmission facility operators and other generation asset operators, to maintain the voltages set out in this OPP.
- Keep their portion of the RAS in good working order at all times.
- Advise the SC and other transmission facility operators, as soon as possible, if their portion of the RAS is not fully functional. The information provided will include the nature of the problem, measures taken and an estimate of the time required to return the system to normal operation.
- Immediately advise the SC if a generating asset is not available for dispatch.
- Comply with OPP 601 regarding outage to its generating assets.

4.4 Fort McMurray Area DTS customers

DTS customers will:

- Curtail the load to the required level upon receiving a directive from the SC as soon as practical.
- Restore the load only after having received cancellation of a directive from the SC to do so.

5. System Controller Procedures

5.1 Fort McMurray area net transfer-in limit exceeded

(A) If the Fort McMurray area net transfer-in alarm at the Leismer cut-plane is triggered, then the ISO will:

1. Designate the Fort McMurray constrained zone in the DT for releasing DDS dispatch, if any, back to energy market.
2. Check on SCADA whether any area load customer is taking load that is exceeding its contracted DTS level.
3. Curtail customer loads to within their contracted DTS levels, as required.
4. If only one 240 kV line is in service and the net area transfer-in level still exceeds the transfer-in limit after step 3, call the area load customers to advise them of the potential risk of voltage collapse and/or islanding if the largest area generator trips.
5. After the transfer-in level at the Leismer cut-plane has reduced to within the transfer-in limit, call the area load customers to advise them that there is no longer a potential risk of voltage collapse and/or islanding following the largest generator trip.
6. If the area transfer-in volume at the Leismer cut-plane still exceeds 160 MW (2-line transfer-in limit) or 300 MW (3-line transfer limit), immediately contact the area load customers and issues directives to curtail load in order to reduce the net area transfer-in to the required transfer limit level. For each area load customer that is taking load from the system calculate, using the DTS levels included in Table 6 , the quantity (MW) of the customer's curtailment which will be the result of the following formula:

Total required curtailment quantity MULTIPLIED BY [customer's DTS DIVIDED BY total DTS of net transfer-in customers.]

7. Restore the curtailed DTS load when the net area transfer-in level permits.
8. Restore DOS loads when the net area transfer-in level permits.
9. Enter in the shift log (see OPP 1301) details of all directives including time, load customer names and curtailment/restoration volumes.
10. Initiate Operations callout (see confidential OPP 1303) for unplanned directives.

(B) When 9L990 is out of service, the SC will:

1. Use Ruth Lake cut-plane only for monitoring the transfer-in to the Fort McMurray area, and act accordingly.
2. When the transfer-in limit at the Ruth Lake cut-plane is exceeded, follow the actions as described in the above Section 5.1 (A).

5.2 Fort McMurray area net transfer-out limit exceeded

(A) When the transfer-out limit at the Ruth Lake cut-plane is exceeded, the SC will:

1. Issue directives to curtail Suncor, Syncrude, Muskeg River, CNRL and MacKay River to their respective MC levels if the quantity (MW) being generated exceed each of their respective MCs.
2. Determine the appropriate quantities (MW) for the AS and energy markets with the use of the real-time tool.
3. Issue directives to each of Suncor, Syncrude, Muskeg River, CNRL and MacKay River for quantities (MW) as determined in the above step 2.
4. Choose the Fort McMurray constrained zone in the DT for releasing the DDS dispatch and enter the amount of the constraint down generation (CDG).
5. If the transfer-out level permits, issue directives to restore curtailed generation and reserves in reverse order.
6. Enter in the shift log (see OPP 1301) details of all directives for generation/reserve curtailment and restoration including times, generating asset names and curtailment/restoration volumes.
7. Initiate Operations callout (see confidential OPP 1303) for unplanned directives.

(B) When transfer-out limit at the Leismer cut-plane is exceeded, the SC will

1. Issues directives to curtail Suncor, Syncrude, Muskeg River, CNRL, MacKay River, Nexen # 2 (Long Lake) and MEG1 Christina Lake to their MC levels if their quantity (MW) being generated exceed their respective MCs, but exclude Nexen # 2 (Long Lake) and MEG1 Christina Lake in accordance with Sections 3.3. (8) and Section 3.3. (9) respectively.)
2. Determine the appropriate quantities (MW) for the AS and energy markets with the use of the real-time tool.
3. Issues directives to each of Suncor, Syncrude, Muskeg River, CNRL, MacKay River, Nexen # 2 (Long Lake) and MEG1 Christina Lake for the quantities (MW) as determined in 2 above.

4. Choose the Fort McMurray constrained zone in the DT for releasing the DDS dispatch and enter the amount of the CDG.
5. If the transfer-out level permits, issue directives to restore curtailed generation and reserves in reverse order.
6. Enter in the shift log (see OPP 1301) details of all directives for generation/reserve curtailment and restoration including times, generating asset names and curtailment/restoration volumes.
7. Initiate Operations callout (see confidential OPP 1303) for unplanned directives.

(C) When both transfer-out limit at the Ruth Lake cut-plane and the Leismer cut-plane are exceeded with different amount of overload, the SC will:

1. Determine at which cut-plane the net transfer-out flow should be brought back within limit first, with the cut-plane with greater overload being be curtailed first
2. Perform steps as described in the above Section 5.2. (A) or Section 5.2. (B), whichever is appropriate, to bring back the net transfer-out flow within limit at the cut-plane as determined in the above 1 above.
3. If there is still violation on the transfer-out limit at the remaining cut-plane, take the actions as described in the above Section 5.2 (A) or Section 5.2 (B), whichever is appropriate.

(D) When both transfer-out limit at the Ruth Lake cut-plane and the Leismer cut-plane are exceeded with equal amount of overload, the SC will:

1. Perform the actions as described in the above Section 5.2. (A) to bring back net transfer-out flow at the Ruth Lake cut-plane within limit first.
2. If there is still violation on the transfer-out limit at the Leismer cut-plane, perform the actions as described in the above Section 5.2 (B).

(E) When 9L990 is out of service, the SC will:

1. Use the Ruth Lake cut-plane only for monitoring the transfer-out of the Fort McMurray area, and act accordingly.
2. When the transfer-out limit at the Ruth Lake cut-plane is exceeded, perform actions as described in the above Section 5.2 (A).

5.3 Voltage control

The SC will:

1. Coordinate operation of Ruth Lake (A848S) 240 kV bus voltage in the upper end of the normal operating range of 264 kV to 269 kV by:
   a. Coordinating VAr adjustments from Syncrude, Suncor, Muskeg River, CNRL Horizon, Nexen Inc # 2 (Long Lake), MEG1 Christina Lake and MacKay River to provide area voltage support while maintaining a VAr balance among the generating assets.
   b. Requesting the ATCO Electric Transmission Operator to switch area reactive devices as required. Refer to OPP 702 for a list of all reactive devices.
   c. Checking VAr flows at the Ruth Lake and Dover substations for proper VAr control coordination among Syncrude, Suncor, Muskeg River, Nexen Inc # 2 (Long

Lake), CNRL Horizon, MacKay River and the reactive devices, and making adjustments as required.

2. Issue directives to reduce area transfer-out by following the procedures in Section 5.2 if Ruth Lake 240 kV bus voltage cannot be maintained within the normal operating range of 264 kV to 269 kV.
3. Enter in the shift log (see OPP 1301) details of all directives for generation/reserve curtailment and restoration including times, generating asset names and curtailment/restoration volumes.
4. Initiate Operations callout (see confidential OPP 1303) for unplanned directives.

5.4 Restoring 9L57/9L56 following a line trip

The SC will:

1. Issue directives to area generators to ensure that the Fort McMurray area net transfer-out is at or below 385 MW.
2. Ensure that Dover substation (A888S) 916R reactor is switched in before energizing 9L57/9L56 from the remote end.
3. Coordinate with the ATCO Electric Transmission Operator line restoration procedures.
4. If the ATCO Electric Transmission Operator is unsuccessful in the attempt to close the line from the Dover substation, confirm if it is due to the power angle across the breaker exceeding the sync check relay setting of 35 degrees.
5. If the ATCO Electric Transmission Operator confirms that the power angle difference is the likely cause for unsuccessful breaker closure, issue directives to area generators to curtail by a total of 20 MW, following the procedures in Section 5.2.
6. When the Fort McMurray net transfer-out level has been reduced by 20 MW, notify the ATCO Electric Transmission Operator to attempt another breaker close.
7. If necessary, repeat steps 4 through 6 until successful breaker closure is achieved.
8. Cancel directives to restore area generation once the line is in service, following the procedures in Section 5.2.
9. Enter in the shift log (see OPP 1301) details of all directives for generation curtailment and restoration including times, generating asset names and curtailment/restoration volumes.
10. Initiate Operations callout (see confidential OPP 1303) for unplanned directives.

6. Figures and Tables

Figure 1

Major transmission system in the Fort McMurray area

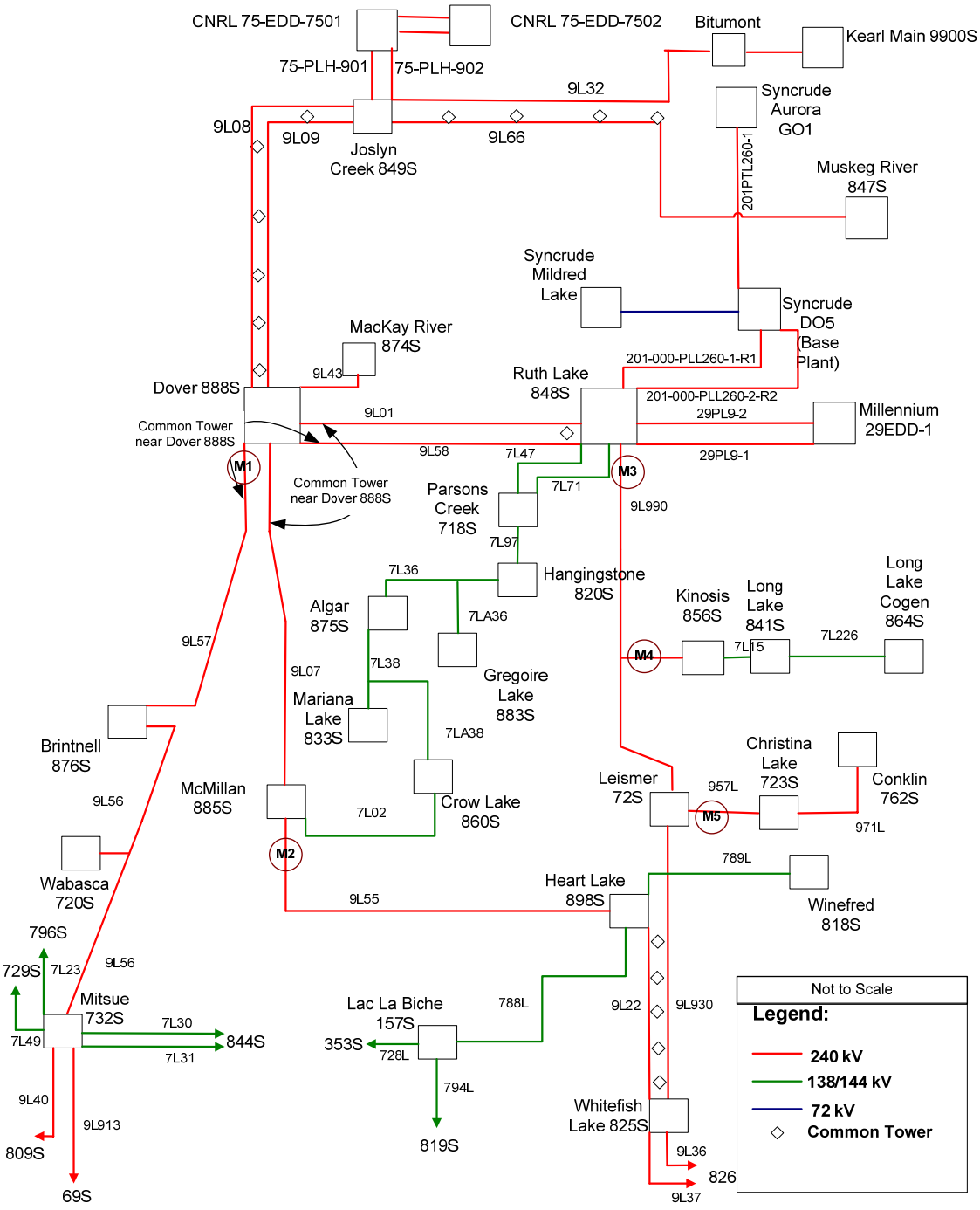

Table 1

Cut Planes, Metering Points and Affected Facilities

Cut-plane	**Metering Points (as set out in Figure 1)**	**Generating and load facilities within the applicable cut-plane are those of:**
Ruth Lake cut-plane	M1, M2, M3	Syncrude, Suncor, Muskeg River, MacKay River, CNRL Horizon, IOR Kearl Lake[1]
Leismer cut-plane	M1, M2, M3, M4 , M5	Syncrude, Suncor, Muskeg River, MacKay River, CNRL Horizon, IOR Kearl Lake[1] Nexen Inc # 1 (Long Lake), MEG1 Christina Lake

Table 2

Fort McMurray area transfer-out limits at the Ruth Lake cut-plane

Transmission lines Status	**System Conditions**	**Ft McMurray Area Transfer-out Limit (MW)**
9L57/9L56, 9L07/9L55/9L22 and 9L990 in-service	System normal	550
9L57/9L56 or 9L990 out-of -service	N/A	320
9L07/9L55/9L22 out-of -service	N/A	340
Any two of 9L57/9L56, 9L07/9L55/9L22 and 9L990 out-of-service	N/A	280

Table 3

Fort McMurray area transfer limits at Leismer cut-plane

Transmission lines Status	System Conditions	Ft McMurray Area Transfer-out Limit (MW)	Ft McMurray Area Transfer-in Limit (MW)
9L57/9L56, 9L07/9L55/9L22 and 9L990/9L930 in-service	System normal	575	300
9L930 out-of-service	N/A	350	160
9L57/9L56 out-of -service	N/A	340	
9L07/9L55/9L22 out-of -service	N/A	370	
9L57 or 9L56 3 pole tripped	Restoring or closing either 9L57 at Dover A888S, or 9L57/9L56 at Brintnell A876S	385 (see note 1)	160
Any two of 9L57/9L56, 9L07/9L55/9L22 and 9L930 out-of-service	N/A	280	160 minus the area single largest generator contingency

Note:

1. Reduction to transfer level is required to satisfy synch-check relay settings of 35 degrees prior to restoration. Further decreases in 20 MW steps may be required until restoration efforts are successful.

Table 4

Fort McMurray area transfer-in limits at the Ruth Lake cut-plane when 9L990 is out of service

Transmission lines Status	Ft McMurray Area Transfer-in Limit (MW)
9L990 out-of -service	160
Any one of 9L57/9L56, 9L07/9L55/9L22 and 9L990 out-of-service	160 minus the area single largest generator contingency

Table 5

ISO EMS transfer limit alarms

Condition	Alarm Descriptions
Ruth Lake cut-plane net transfer-in limit exceeded (applicable when 9L990 is out of service)	Ruth Lake cut-plane MW IMP ALARM
Ruth Lake cut-plane net transfer-out limit exceeded	Ruth Lake cut-plane MW EXP ALARM

Leismer cut-plane net transfer-in limit exceeded	Leismer cut-plane MW IMP ALARM
Leismer cut-plane net transfer-out limit exceeded	Leismer cut-plane MW EXP ALARM

Table 6

Ft McMurray area contracted demand transmission service (DTS) levels

The provisions of this Table 6 are confidential.

View confidential Tables

7. Revision History

Issued	Description
xxxx-xx-xx	
2009-09-15	Approved for interim implementation effective 2009-09-15; Supersedes 2009-02-19
2009-02-19	Supersedes 2008-07-29
2008-07-29	Approved for interim implementation; supersedes 2008-05-01
2008-05-01	Supersedes 2008-01-07
2008-01-07	Approved for interim implementation; supersedes 2007-09-27
2007-09-27	Supersedes 2006-07-11
2006-07-11	Supersedes interim OPP effective 2006-05-16
2006-05-16	Approved for interim implementation effective 2006-05-16
2005-05-25	Supersedes 2004-10-14
2004-10-14	Supersedes interim OPP effective 2004-08-30
2004-08-30	Approved for interim implementation effective 2004-08-30
2004-05-19	Supersedes 2004-03-03
2003-03-03	Issued for interim implementation; supersedes 2003-12-10
2003-12-10	Supersedes 2003-10-10
2003-10-10	Approved for interim implementation
2003-07-28	Revised to ISO Operating Policies and Procedures

SC Tool Versions

Date	Version Number	Description
2009-09-15		Include the Leismer cut-plane and MEG 1 Christina Lake
2008-07-29		Revision on calculation method of transfer-out and transfer-in limits
2008-02-01		SC Workbook