

Fort McMurray Operation Changes

July 29, 2009

Reliable **Power**

Reliable **Markets**

Reliable **People**



Outline



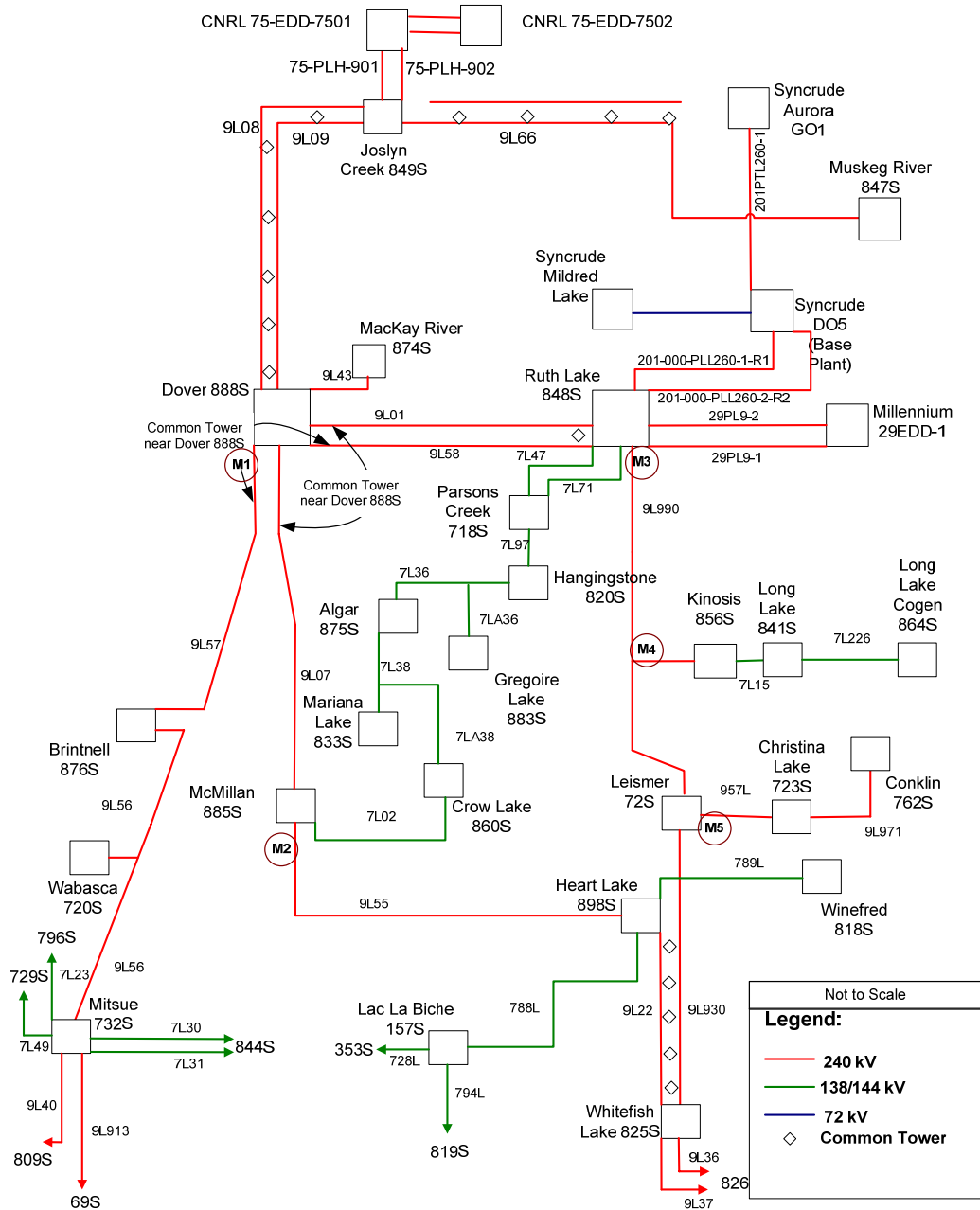
- Background
- Fort McMurray operational studies
- Market rules
- Summary

Background



- Fort McMurray (FMM) area is connected to the Alberta grid (AIES) through three long 240kV transmission lines:
 - 9L57/9L56 (Dover – Brintnell – Mitsue) ~272km
 - 9L07/9L55/9L22 (Dover – McMillan – Heart Lake – Whitefish) ~347km
 - 9L990/9L930 (Ruth Lake – Leismer – Whitefish) ~320km
- About 85% of the area generation is in north of FMM and the remaining 15% is located in south east of the area.
- Transfer limits into and out of the area respect system performance standards for voltage stability and voltage deviation following a single contingency (N-1) or a subsequent outage (N-1-1).

FMM Main Transmission Network



Not to Scale

Legend:

- 240 kV
- 138/144 kV
- 72 kV
- ◇ Common Tower

FMM Area Cut-Plane (Old)

- The old FMM area cut-plane was a summation of the following nodes:
 - Active power (MW) flow on the 240kV transmission line 9L57 (Dover 888S – Brintnell 876S) at 888S +
 - Active power (MW) flow on the 240kV transmission line 9L55 (McMillan 885S – Heart Lake 898S) at 885S +
 - Active power (MW) flow on the 240kV transmission line 9L990 (Ruth Lake 848S – Leismer 72S) at 848S.

FMM Area Interim Cut-Plane (Existing)



- Mid 2008 interim area cut-plane was adapted to mitigate reliability and fairness issues that could be caused by the Nexen Energy load & generation addition in SE of FMM area.
- The existing area cut-plane is the summation of active power flow (MW) on 9L57, 9L55 and 9L990 as in the old cut-plane, plus:
 - Active power (MW) flow at Kinosis to T-tap at 9L990 (export).
 - Active power (MW) flow from T-tap at 9L990 to Kinosis (import).

Operational Studies



- The proposed OPP changes are the result of operational studies that account for new projects in the FMM area;
 - Nexen/Opti Long Lake 144kV connected to the grid at Kinosis; combination of onsite load & generation.
 - Christina Lake 723S 240kV connected to the grid at Leismer; Fortis POD.
 - Meg Energy 240kV connection to Christina Lake 723S; combination of onsite load & generation with generation in-service date of September 2009.
 - Wadel 907S 144kV connection to Leismer; in-service date is September 2009 (ATCO POD).
 - Other load growth in the area south of the old FMM cutplane

Transfer Out Study Results



- Slight reduction in the export limit required due new load as well as natural load growth in south of FMM area without any recent system developments in the area.
- Generation capability in the SE of FMM area has an impact on system operation and export limits.
- FMM cut-plane needs to be moved further south or restricted significantly for the loss of a 240kV transmission line (e.g. 9L930 Whilefish Lk to Leismer) while Long Lake and Conklin operating in different modes.

Recommendations

- An additional cutplane at Leismer is needed to retain as much transmission transfer capability as practical. Leismer cut-plane includes the impact of the recent load/generation additions in south of FMM area.
- Leismer cut-plane is a summation of active power flow on 9L57, 9L55, 9L990, and:
 - Active power (MW) flow from Kinosis to T-tap at 9L990 (export) +
 - Active power (MW) flow on 957L from Christina Lake 723S to Leismer 72S at 72S (export).
 - Active power (MW) flow from T-tap at 9L990 to Kinosis (import) +
 - Active power (MW) flow on 957L from Leismer to Christina Lake at 72S (import) .

Transfer Out Limits

	All Lines in	1 line out of service
Existing transfer out limits (MW)	600	N-9L07/ 9L55/9L22/9L990/9L930 370 N-9L57/9L56 340
Recommended transfer out limits (MW) (ref proposed OPP 505 Table 1 and 2)	Ruth Lake limit: 550 Leismer limit: 575	N-9L57/9L56: Ruth Lake limit 320, Leismer 340 N-9L990: Ruth Lake limit 320 N-9L930: Leismer limit 350 N-9L07/9L55/9L22: Ruth Lake limit 340, Leismer 370

Market Changes



- Operating reserves provided by the generators north of each cut-planes are added to transfer out calculations
- When area transfer out limits are violated at either north (Ruth Lake) or south (Leismer) cut-planes, the related generators within the impacted cut-plane(s) will be directed to curtail
- Curtailment will be based on the generator net-to-grid MW generation and Operating Reserves
- All effective generators will be curtailed pro rata

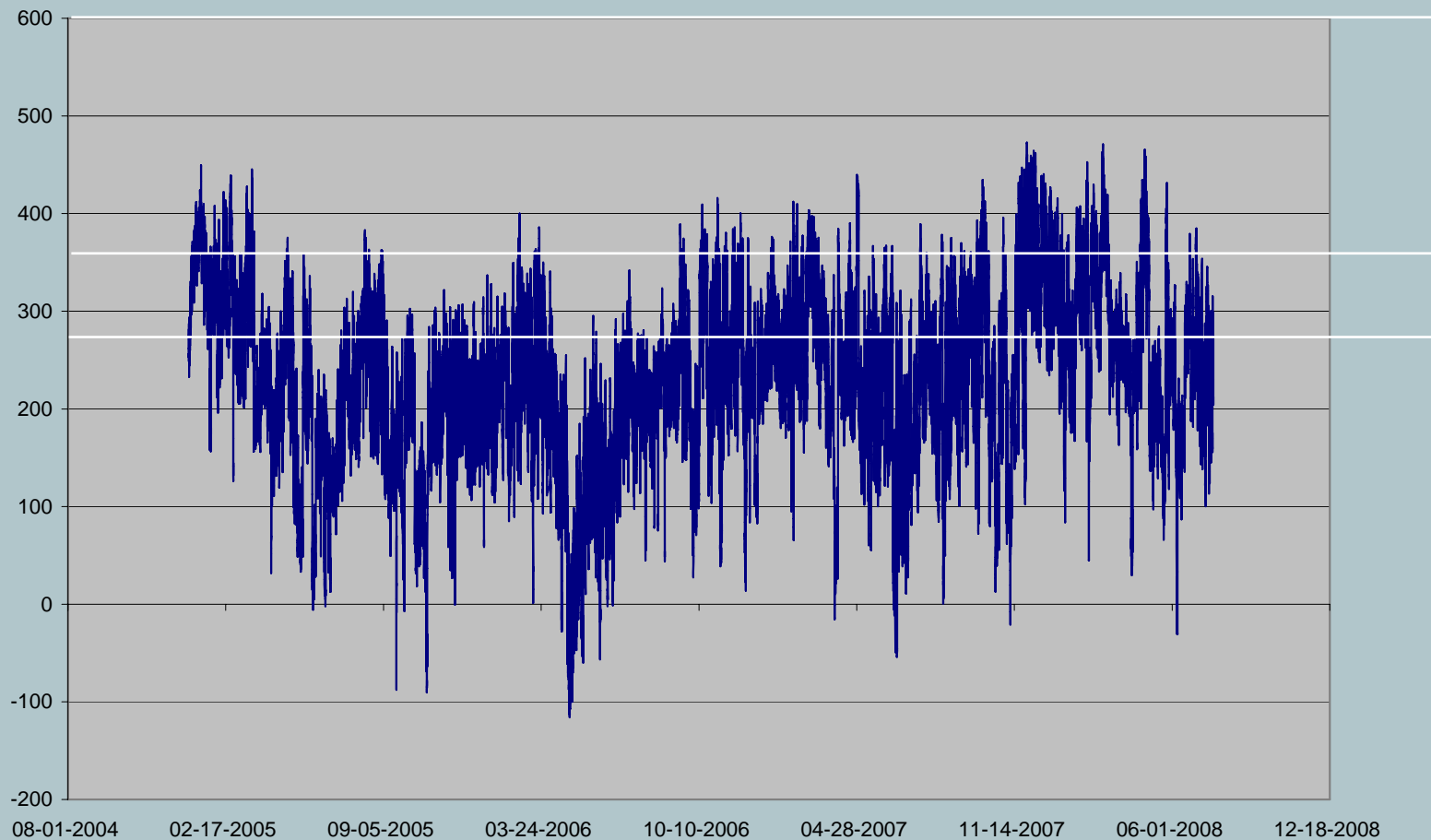
FMM Transfer – 2005 to 2008 (hourly average)



- Based on the historic SCADA data the transfer into and out of FMM area during January 2005 to June 2008 are:
 - 231MW average export.
 - 38.6MW average import.
 - Peak export was 471.84MW on 2007-11-29, HE 19.
 - Peak import was 113.8MW on 2006-04-28, HE 21.

FMM Transfer – 2005 to 2008 (Hourly Average)

FMM Transfer Levels (MW) -- 2005 to 2008



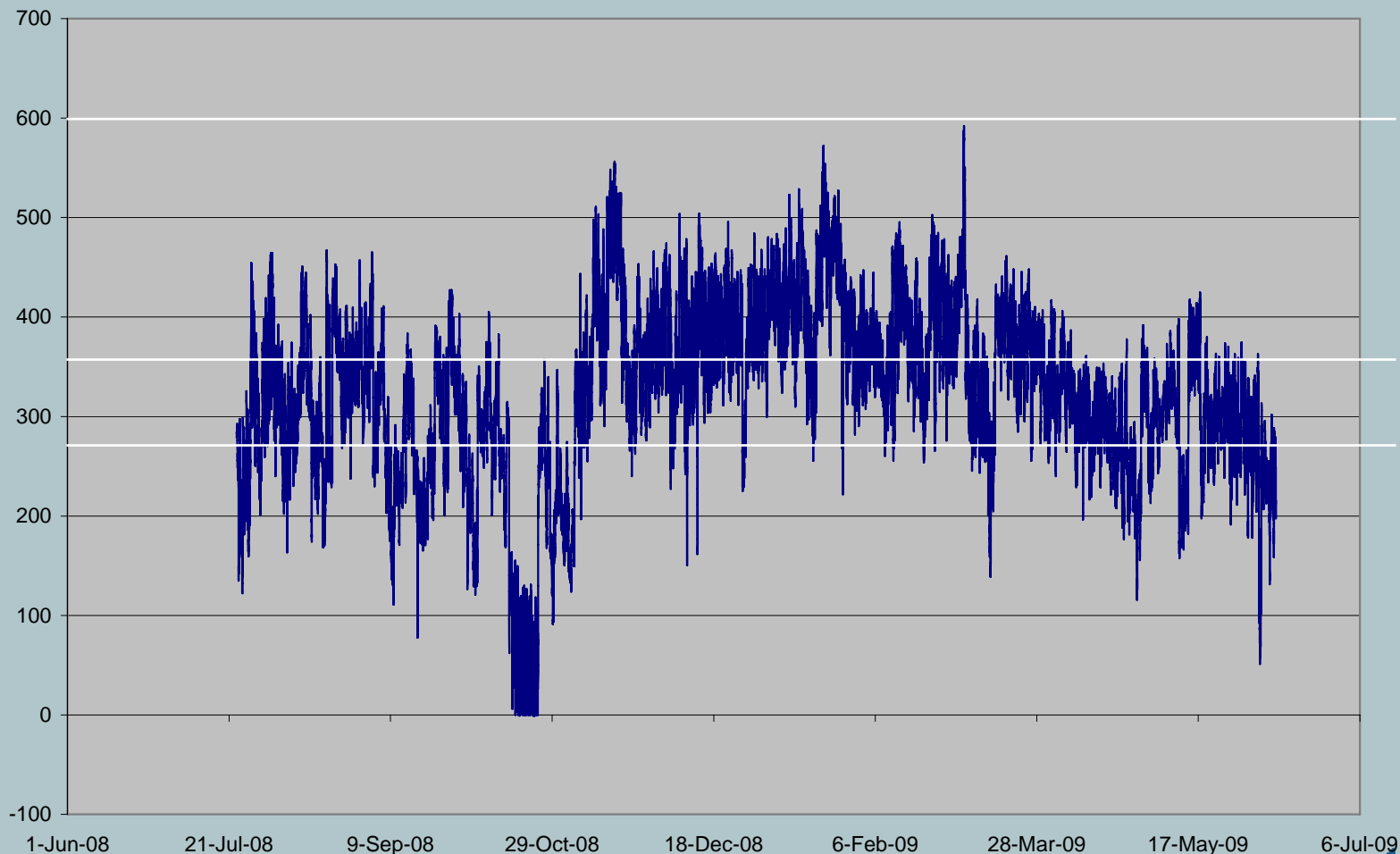
FMM Transfer – 2008 to 2009 (hourly average)



- Based on the historic SCADA data transfer into and out of FMM area during July 2008 to June 2009 are:
 - 325.5MW average export.
 - 583MW peak export on 2009-03-05; note that compare to the past three years peak export is increased by more than 100MW (~472MW vs. 583MW). This change is mainly due to Long Lake export into the grid and change of FMM cut-plane (interim cut-plane).
 - 52.8MW peak import on 2008-10-27 (15 minutes average)

FMM Export – 2008 to 2009 (hourly average)

FMM Export (MW) -- July 2008 to June 2009



FMM Export – 2008 to 2009 (hourly average)

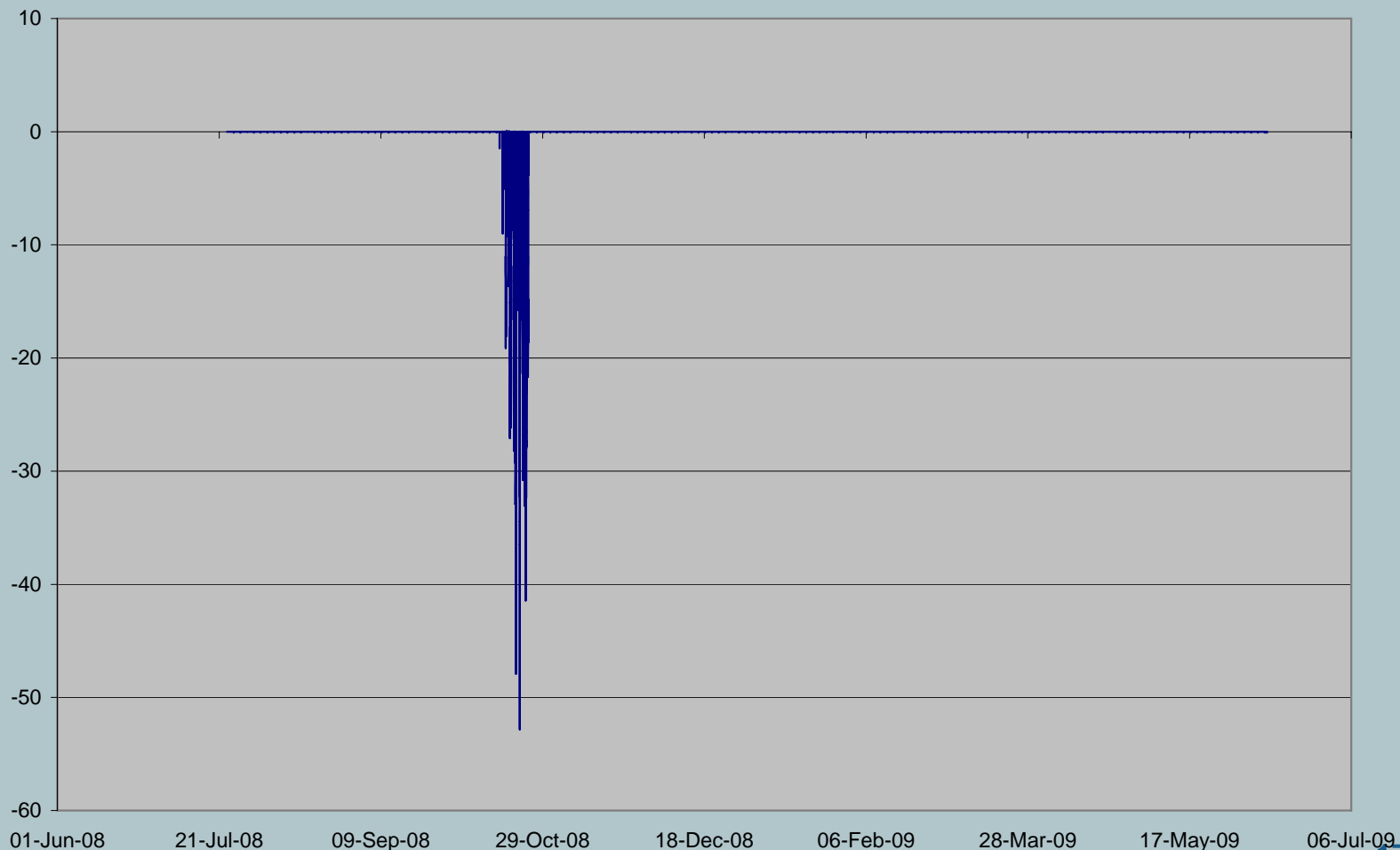


FMM Export (MW) -- July 2008 to June 2009



FMM Import – 2008 to 2009 (15 minutes average)

FMM Import (MW) -- June 2008 to July 2009



Summary



- Operational studies conducted to account for new projects in the FMM area
 - incorporate the effect of new generation and loads
 - make as much transmission transfer capability available as practical
 - provide reliable transfer out limits for expected operating conditions
- FMM cutplane limits and the new Leismer cutplane recommended
- Changes to OPP 505 include study recommendations and changes to market operation
 - New cutplane, updated export limits
 - Reserve transmission to ensure delivery of operating reserves
 - Pro-rata curtailment