BC Transmission CORPORATION

Building Connections

System Impact Study for Long Term Point-To-Point

Oasis Requests 71435049 and 71435307 On the AESO – BPAT Path and Oasis Request 71435311 On the BCTC - BPAT Path

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System Planning & Performance Assessment

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Executive Summary

The following applications for Firm Transmission Services for wheeling power from Alberta and BC to the US on the AESO x BPAT Path and BCTC x BPAT Path were submitted to British Columbia Transmission Corporation (BCTC) in accordance with BCTC's OATT:

OASIS #	Time Stamp	Path	Amount	Term
71435049	6 Jun 2007	AESO-BPAT	75 MW	5 year (1 Jan 2010 – 1 Jan 2015)
71435307	6 Jun 2007	AESO-BPAT	1000 MW	5 year (1 Jan 2011 – 1 Jan 2016)
71435311	6 Jun 2007	BCTC-BPAT	1000 MW	5 year (1 Jan 2011 – 1 Jan 2016)

Because the POD for these three requests is at the BC.US. Border, there will be significant impact on the Interior to Lower Mainland (ILM) transmission path.

This SIS analyzed the BCTC System only and did not evaluate the transfer capability of the neighbouring systems. The Customers requesting these services are responsible for obtaining transmission services from the respective Transmission Service Providers. With reference to the BCTC transmission system only, this SIS concluded that:

1. OASIS #71435049 (75 MW on AESO x BPAT Path for 5 years starting from January 1, 2010) cannot be accommodated due to cut plane constraints in the South Interior transmission path and the Interior to Lower Mainland path. Network upgrades required to accommodate full service cannot be put in place prior to the End Date of the Request. Only Shaped Service can be provided for this Request for up to the amounts shown in Appendix 1.

2. OASIS #71435307 (1000 MW on AESO x BPAT Path for 5 years starting from January 1, 2011) cannot be accommodated due to the constraints in the South Interior transmission path and the Interior to Lower Mainland path. For the same reason given for OASIS #71435049, only Shaped Service can be provided for this Request for up to the amounts shown in Appendix 1 pending on the status of OASIS #71435049.

3. OASIS #71435311 (1000 MW on BCTC x BPAT Path for 5 years starting from January 1, 2011), cannot be accommodated due to the constraints in the Interior to Lower Mainland path. Network upgrades required to provide full service cannot be put in place prior to the End Date of this Request. Only Shaped Service can be provided for this Request for up to the amounts shown in Appendix 1 pending on the status of Request #71435049 and #71435307.

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1. Introduction

The following Firm Point to Point service requests for wheeling power on the AESO x BPAT Path from Alberta to the US, and for exporting on the BCTC x BPAT Path from British Columbia to the US are submitted in accordance with BCTC's OATT.

OASIS #	Time Stamp	Path	Amount	Term
71435049	6 Jun 2007	AESO-BPAT	75 MW	5 years (1 Jan 2010 – 1 Jan 2015)
71435307	6 Jun 2007	AESO-BPAT	1000 MW	5 years(1 Jan 2011 – 1 Jan 2016)
71435311	6 Jun 2007	BCTC-BPAT	1000 MW	5 years (1 Jan 2011 – 1 Jan 2016)

Since request #71435311 is for transferring power from the GMS.MCA.REV Point-of-Receipt (POR), it is assumed that Network Resources at this POR are not required for serving Network Load at the times when energy schedules are submitted for this LT PTP reservation.

Because these three requests have the same POD at the BC.US.Border, each will have its share of impact on the South Interior path and the Interior to Lower Mainland (ILM) transmission path.

2. Terms of Reference

A review of the submitted requests and System Impact Study were conducted as follow:

(a) BCTC used its existing planning and operating criteria, standards and procedures, which conform to NERC/WECC Standards, to determine necessary transmission system reinforcements and re-dispatch requirements.

(b) Specifically, the following studies were performed:
- Thermal and voltage stability studies to determine the system capability to permit the transfer;
- Identifying system transmission constraints and any Network Upgrades; and
- Analyzing load shedding, generator shedding and re-dispatch options, tie-line transfer limits and network curtailment remedial action schemes required for the reliable operation of the inter-connected system

(c) The studies analyzed the BCTC System only. The transfer capability of the neighbouring systems was not considered. **Customers requesting these services are responsible for obtaining transmission service from the neighbouring Transmission Service Providers.**

(d) The above technical studies were performed for the following system conditions:
- The system configuration was based on the resource allocations from the NITS Service Agreements, Network Loads, and reserved and pending Long-Term Firm Point-to-Point Transmission Services for the terms of these requests.
- High stress system conditions, including but not restricted to the winter peak load and summer light load cases.

3. Point-of-Receipt and Point-of-Delivery

For requests #71435049 and #71435307, the Point-of-Receipt (POR) is AB.BC border and the Point-of-Delivery (POD) is BC.US.Border. For request #71435311, the POR is GMS.MCA.REV and the POD is BC.US.Border.

4. System Study Conditions

Review of the OASIS requests # 71435049, 71435307 and 71435311 was based on the following network conditions and assumptions:

- 2010 HW and 2009 HW base cases with BC Hydro's May 2008 load forecast;
- Total Transfer Capability (TTC) and Committed Use (CU) across the West of Selkirk Cut plane as published in SPA-2008-76 "***Updated Project Justification with 2008 LTAP"*** for 500 kV 2x250 MVAR Mechanically Switched Capacitors Banks at Ashton Creek Substation;
- Existing firm reservations on the BCTC x BPAT Path;
- Existing firm reservations on the AESO x BCTC Path;
- Transmission Reliability Margin (TRM) on the AESO x BCTC Path: 65 MW;
- Transmission Reliability Margin (TRM) on the BCTC x BPAT Path: 50 MW; and
- May 10, 2009 TTC calculation results were used as the basis for projecting Firm Available Transfer Capacity (FATC) on ILM path beyond the 12 month time frame.

5. Analysis

Wheel through capability for the AESO x BPAT Path is restricted by the following factors:

A) Capability of the existing system to support the specific amount of import by way of AB-BC tie for wheel through purpose;
B) Amount of cut-plane ATC along the transmission path from the Alberta border to BC
C) Availability of cut-plane ATC along the BCTC x BPAT Path (including the ILM path from Nicola to the BC-US border)

5A Capability of the transmission system to support 1075 MW wheel through from Alberta

When power is transferred from Alberta to the US, the power will flow in an east to west direction, competing for transmission capacity with the generation in the South Interior. Significant network upgrades are required including additional reactive support in the form of 500 kV capacitors at Cranbrook, Selkirk and Nicola substations, and series compensation of circuits 5L92 and 5L94 to support the heavy flow (1000 MW) towards the BPA system.

The constraints and the ATC on the cut planes along the transmission paths are discussed in 6B and 6C below.

5B The Amount of ATC through the cut-planes between the Alberta border and Nicola

There are two major cut planes that the flow must cross. These are the across the Alberta border to BC and the West of Selkirk cut-planes. These two constraints are discussed in sections 5B-1 and 5B-2.

5B-1) Transfer limit from the Alberta border to BC:

The existing Firm Total Transfer Capability (FTTC) from the Alberta Border to BC is 450 MW.

There are existing long term firm reservations totaling 249 MW on the AESO x BCTC Path. The following table shows the available firm ATC on this path to accommodate any additional firm transfer.

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**
Firm TTC	450	450	450	450	450	450	450
TRM	65	65	65	65	65	65	65
Existing Reservations	249	249	249	249	249	249	249
Firm Intertie ATC	136	136	136	136	136	136	136

Additional Alberta to BC transfers up to 136 MW across this cut-plane can be accommodated without any system upgrades. Any additional Alberta to BC transfer totalling more than 1000 MW will require both significant system upgrades and WECC Path 1 re-rating

5B-2) Transfer capability of the west of Selkirk cut-plane:

A recent study of the transfer capability of this cut plane with the most current load and resource data was used in this analysis. Study report (SPA-2008-76, July 2008), titled

"***Updated Project Justification with 2008 LTAP*** *for 500 kV 2*250 MVAR Mechanically Switched Capacitor Banks at Ashton Creek Substation*". This study concluded the following FTTC and Committed Use (CU) across this cut-plane:

	Sep	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
FTTC	2000	2000	1920	1920	1920	1920	1920	1920	2000	2000	2000	2000
CU	2163	2163	1910	1910	1910	1910	1910	1910	2136	2163	2163	2163
FATC	**0**	**0**	**10**	**10**	**10**	**10**	**10**	**10**	**0**	**0**	**0**	**0**

* *From Table 3.2 & 3.2 of SPA 2008-76*

5B-3) FATC from Alberta-BC Border to Nicola

The FATC for the Alberta-BC border POR to Nicola (NIC) path for the duration requested was derived from the above two cut-planes in the South Interior, and is shown in the following table:

	Sep	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
P1 (MW)	136	136	136	136	136	136	136	136	136	136	136	136
P2 (MW)	0	0	10	10	10	10	10	10	0	0	0	0
FATC	**0**	**0**	**10**	**10**	**10**	**10**	**10**	**10**	**0**	**0**	**0**	**0**

P1 Alberta – BC Intertie
P2 West of Selkirk Transmission Cut-Plane

5C FATC from Nicola to BC.US.Border

Short-term FATC on the BCTC x BPAT Path, determined based on load and resource forecast data, was used to calculate FATC from Nicola to the BC-US border for the period that these OASIS requests span.

When 5L83 is in-service in October 31, 2014 it will enhance the ILM firm transfer capability by about 1550 MW. However, a good portion of the 1550 MW additional ILM transfer capability has been reserved by prior requests.

The following table shows total amount of firm ATC in MW for the NIC to BC.US.Border path for the period between January 1, 2010 and December 31, 2015.

	NIC to BC.US.Border Firm ATC		**NIC to BC.US.Border Firm ATC**
Date	**(MW)**	**Date**	**(MW)**
10-01-01	142	11-01-01	132
10-02-01	1022	11-02-01	985
10-03-01	1137	11-03-01	1097
10-04-01	1280	11-04-01	1280

10-05-01	1280	11-05-01	1280
10-06-01	288	11-06-01	273
10-07-01	961	11-07-01	926
10-08-01	1280	11-08-01	1280
10-09-01	382	11-09-01	365
10-10-01	1280	11-10-01	1280
10-11-01	903	11-11-01	870
10-12-01	98	11-12-01	89
12-01-01	122	13-01-01	112
12-02-01	950	13-02-01	915
12-03-01	1058	13-03-01	1020
12-04-01	1280	13-04-01	1246
12-05-01	1280	13-05-01	1280
12-06-01	259	13-06-01	245
12-07-01	892	13-07-01	860
12-08-01	1280	13-08-01	1280
12-09-01	348	13-09-01	331
12-10-01	1280	13-10-01	1280
12-11-01	838	13-11-01	807
12-12-01	80	13-12-01	72
14-01-01	103	15-01-01	794
14-02-01	882	15-02-01	1280
14-03-01	984	15-03-01	1280
14-04-01	1202	15-04-01	1280
14-05-01	1280	15-05-01	1280
14-06-01	232	15-06-01	919
14-07-01	828	15-07-01	1280
14-08-01	1280	15-08-01	1280
14-09-01	315	15-09-01	1000
14-10-01	1280	15-10-01	1280
14-11-01	1280	15-11-01	1280
14-12-01	764	15-12-01	756

6. Study Conclusions

A table showing potential firm ATC for Shaped Services for each of service requests is included in Appendix 1 with the assumption that 5L83 is in service by October 31, 2014.

For OASIS Request #71435049 (75 MW wheel through, AESO x BPAT Path**)**

Due to the ATC constraints across the West of Selkirk cut-plane, OASIS Request 71435049 cannot be accommodated. **Network upgrades required to accommodate full service cannot be put in place prior to the End Date of the Request.** Only Shaped Service can be provided to this Request.

For OASIS Request #71435307 (1000 MW wheel through, AESO x BPAT Path)

Significant network upgrades are required to accommodate full service request for wheel-through from Alberta to the US. The major network upgrades are in providing additional reactive support and cut-plane TTC improvements in the South Interior, and ILM path transfer capability enhancements.

For the same reason given for OASIS 71435049, OASIS Request 71435307 cannot be accommodated. Only Shaped Service can be provided to this Request.

For OASIS Request #71435311 (1000 MW export, BCTC x BPAT Path)

Transfer power from the GMS and MICA/Revelstoke area to the US faces similar challenges on the ILM path. **Network upgrades required to accommodate full service cannot be put in place prior to the End Date of the Request.** Only Shaped Service can be provided to this Request for up to the amounts shown in Appendix 1.

References

ILM Future Reinforcements
http://www.bctc.com/NR/rdonlyres/286D11DB-D379-4BC6-86F9-C2CD3EC50503/0/InformationReleaseonInteriortoLowerMainlandGridfinalAug24.pdf

Bulk Transmission System Cut-Planes Total Transfer Capability (TTC)
http://www.bctc.com/NR/rdonlyres/650BAC54-14B4-4DE1-A5AD-9B3A36D88E8D/0/BulkTransmissionCutplanesfinalJan30.pdf

Nov 6 2006 Firm ATC Update
http://www.bctc.com/NR/rdonlyres/5AD65BE7-8D5E-4C92-B5F0-CBEF1BCEAE6A/0/6Nov2006FirmATTUpdate.pdf

(Lower Mainland) Transmission System Transfer Capability Limits Upgrade Options and Cost Estimates
http://www.bctc.com/NR/rdonlyres/7FADD921-9D73-4FB4-9B2F-1A0887DD8F46/0/TransferCapabilityLimitsandCostEstimatesLMFINAL29Jun06Update.pdf

Transmission Study Report SPA 2008-76
*500 KV 2*250 MVAR Mechanically Switched Capacitor Banks at Ashton Creek Substation*, **Updated Project Justification with 2008 LTAP**

Appendix 1

The following table shows the FATC on AESO x BPAT Path and BCTC x BPAT Path for accommodating Shaped Services as partial fulfillment of Long-term Point-to-Point Service Requests #71435049, #71435307 and #71435311 with the assumption that 5L83 will be in service by October 2014, .

	FATC on Paths (MW)	
	BCTC-BPAT	AESO-BPAT
2010-01-01	142	10
2010-02-01	1022	10
2010-03-01	1137	10
2010-04-01	1280	10
2010-05-01	1280	0
2010-06-01	288	0
2010-07-01	961	0
2010-08-01	1280	0
2010-09-01	382	0
2010-10-01	1280	0
2010-11-01	903	10
2010-12-01	98	10
2011-01-01	132	10
2011-02-01	985	10
2011-03-01	1097	10
2011-04-01	1280	10
2011-05-01	1280	0
2011-06-01	273	0
2011-07-01	926	0
2011-08-01	1280	0
2011-09-01	365	0
2011-10-01	1280	0
2011-11-01	870	10
2011-12-01	89	10
2012-01-01	122	10
2012-02-01	950	10
2012-03-01	1058	10
2012-04-01	1280	10
2012-05-01	1280	0
2012-06-01	259	0
2012-07-01	892	0
2012-08-01	1280	0
2012-09-01	348	0
2012-10-01	1280	0
2012-11-01	838	10
2012-12-01	80	10

2013-01-01	112	10
2013-02-01	915	10
2013-03-01	1020	10
2013-04-01	1246	10
2013-05-01	1280	0
2013-06-01	245	0
2013-07-01	860	0
2013-08-01	1280	0
2013-09-01	331	0
2013-10-01	1280	0
2013-11-01	807	10
2013-12-01	72	10
2014-01-01	103	10
2014-02-01	882	10
2014-03-01	984	10
2014-04-01	1202	10
2014-05-01	1280	0
2014-06-01	232	0
2014-07-01	828	0
2014-08-01	1280	0
2014-09-01	315	0
2014-10-01	1280	0
2014-11-01	1280	10
2014-12-01	764	10
2015-01-01	794	10
2015-02-01	1280	10
2015-03-01	1280	10
2015-04-01	1280	10
2015-05-01	1280	0
2015-06-01	919	0
2015-07-01	1280	0
2015-08-01	1280	0
2015-09-01	1000	0
2015-10-01	1280	0
2015-11-01	1280	10
2015-12-01	756	10

The Following is a graphical representation of FATC for Shaped Service of the above table: