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;
- Two 500 kV 2x250 MVAR Mechanically Switched Capacitors Banks at Ashton Creek Substation pit into service in August 2010;
- 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 5B and 5C 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:

Recent studies show that with two 250 MVAR 500 KV mechanically switch capacitor banks installed at Ashton Creek by August 2010, there will be a corresponding increase in the transfer capability through the west of Selkirk cut-plane. The following table shows the

FATC (Firm Available Transfer Capability) through this cut-plane for the period from January 1 2010 through December 2015:

		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2010	FTTC	1660	1660	1660	1660	1770	1770	1770	1770	2000	2000	1910	1910
	CU	1656	1656	1656	1673	2183	2183	2183	2183	2183	2183	1673	1673
	FATC	4	4	4	0	0	0	0	0	0	0	237	237
2011	FTTC	1910	1910	1910	1910	2000	2000	2000	2000	2000	2000	1910	1910
	CU	1673	1673	1673	1671	2182	2182	2182	2182	2182	2182	1671	1671
	FATC	237	237	237	239	0	0	0	0	0	0	239	239
2012	FTTC	1910	1910	1910	1910	2000	2000	2000	2000	2000	2000	1910	1910
	CU	1671	1671	1671	1668	2181	2181	2181	2181	2181	2181	1668	1668
	FATC	239	239	239	242	0	0	0	0	0	0	242	242
2013	FTTC	1910	1910	1910	1910	2000	2000	2000	2000	2000	2000	1910	1910
	CU	1668	1668	1668	1717	2181	2181	2181	2181	2181	2181	1717	1717
	FATC	242	242	242	193	0	0	0	0	0	0	193	193
2014	FTTC	1910	1910	1910	1910	2000	2000	2000	2000	2000	2000	1910	1910
	CU	1717	1717	1717	1717	2180	2180	2180	2180	2180	2180	1717	1717
	FATC	193	193	193	193	0	0	0	0	0	0	193	193
2015	FTTC	1910	1910	1910	1910	2000	2000	2000	2000	2000	2000	1910	1910
	CU	1717	1717	1717	1718	2179	2179	2179	2179	2179	2179	1718	1718
	FATC	193	193	193	192	0	0	0	0	0	0	192	192

* *From Table 3.2 & 3.3 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:

		Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
2010	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	4	4	4	0	0	0	0	0	0	0	237	237
	AB-NIC	4	4	4	0	0	0	0	0	0	0	136	136
2011	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	237	237	237	239	0	0	0	0	0	0	239	239
	AB-NIC	136	136	136	136	0	0	0	0	0	0	136	136
2012	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	239	239	239	242	0	0	0	0	0	0	242	242
	AB-NIC	136	136	136	136	0	0	0	0	0	0	136	136
2013	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	242	242	242	193	0	0	0	0	0	0	193	193
	AB-NIC	136	136	136	136	0	0	0	0	0	0	136	136
2014	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	193	193	193	193	0	0	0	0	0	0	193	193
	AB-NIC	136	136	136	136	0	0	0	0	0	0	136	136
2015	P1	136	136	136	136	136	136	136	136	136	136	136	136
	P2	193	193	193	192	0	0	0	0	0	0	192	192
	AB-NIC	136	136	136	136	0	0	0	0	0	0	136	136

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. However, 5L83 project is currently under further regulatory proceedings. As such, it is prudent to exclude the additional ILM transfer capability created by 5L83 at this time.

The following table shows total amount of firm ATC in MW, without 5L83, 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	94
14-02-01	882	15-02-01	849
14-03-01	984	15-03-01	948
14-04-01	1202	15-04-01	1160

14-05-01	1280	15-05-01	1280
14-06-01	232	15-06-01	219
14-07-01	828	15-07-01	797
14-08-01	1280	15-08-01	1280
14-09-01	315	15-09-01	300
14-10-01	1280	15-10-01	1280
14-11-01	776	15-11-01	747
14-12-01	64	15-12-01	56

6. Study Conclusions

A table showing potential firm ATC for Shaped Services for each of service requests is included in Appendix 1. Because of the uncertainly involved, the impact due to the proposed 5L83 has not been included in this analysis.

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.

	Requests	Path	MW		Start Time	End Time
A	71435049	AESO to BPAT	75		2010-01-01	2015-01-01
B	71435307	AESO to BPAT	1000		2011-01-01	2016-01-01
C	71435311	BCTC to BPAT	1000		2011-01-01	2016-01-01

	FATC		A	B	B1	C	C1	C2
	AESO - BPAT	BCTC to BPAT		"A" Confirmed	"A" not confirmed	Both "A" & "B" not confirmed	"A" confirmed but not "B"	Both "A" and "B" confirmed: or "B1" confirmed
Jan-10	4	142	4					
Feb-10	4	1022	4					
Mar-10	4	1137	4					
Apr-10	0	1280	0					
May-10	0	1280	0					
Jun-10	0	288	0					
Jul-10	0	961	0					
Aug-10	0	1280	0					
Sep-10	0	382	0					
Oct-10	0	1280	0					
Nov-10	136	903	75					
Dec-10	98	98	75					
Jan-11	132	132	75	57	132	132	57	0
Feb-11	136	985	75	61	136	985	910	849
Mar-11	136	1097	75	61	136	1000	1000	961
Apr-11	136	1280	75	61	136	1000	1000	1000
May-11	0	1280	0	0	0	1000	1000	1000
Jun-11	0	273	0	0	0	273	273	273
Jul-11	0	926	0	0	0	926	926	926
Aug-11	0	1280	0	0	0	1000	1000	1000
Sep-11	0	365	0	0	0	365	365	365
Oct-11	0	1280	0	0	0	1000	1000	1000
Nov-11	136	870	75	61	136	870	795	734
Dec-11	89	89	75	14	89	89	14	0
Jan-12	122	122	75	47	122	122	47	0
Feb-12	136	950	75	61	136	950	875	814
Mar-12	136	1058	75	61	136	1000	983	922
Apr-12	136	1280	75	61	136	1000	1000	1000
May-12	0	1280	0	0	0	1000	1000	1000
Jun-12	0	259	0	0	0	259	259	259
Jul-12	0	892	0	0	0	892	892	892
Aug-12	0	1280	0	0	0	1000	1000	1000
Sep-12	0	348	0	0	0	348	348	348
Oct-12	0	1280	0	0	0	1000	1000	1000
Nov-12	136	838	75	61	136	838	763	702
Dec-12	80	80	75	5	80	80	5	0
Jan-13	112	112	75	37	112	112	37	0
Feb-13	136	915	75	61	136	915	840	779
Mar-13	136	1020	75	61	136	1000	945	884
Apr-13	136	1246	75	61	136	1000	1000	1000
May-13	0	1280	0	0	0	1000	1000	1000
Jun-13	0	245	0	0	0	245	245	245
Jul-13	0	860	0	0	0	860	860	860
Aug-13	0	1280	0	0	0	1000	1000	1000
Sep-13	0	331	0	0	0	331	331	331
Oct-13	0	1280	0	0	0	1000	1000	1000
Nov-13	136	807	75	61	136	807	732	671
Dec-13	72	72	72	0	72	72	0	0
Jan-14	103	103	75	28	103	103	28	0
Feb-14	136	882	75	61	136	882	807	746
Mar-14	136	984	75	61	136	984	909	848
Apr-14	136	1202	75	61	136	1000	1000	1000
May-14	0	1280	0	0	0	1000	1000	1000
Jun-14	0	232	0	0	0	232	232	232
Jul-14	0	828	0	0	0	828	828	828
Aug-14	0	1280	0	0	0	1000	1000	1000
Sep-14	0	315	0	0	0	315	315	315
Oct-14	0	1280	0	0	0	1000	1000	1000
Nov-14	136	776	75	61	136	776	701	640
Dec-14	64	64	64	0	64	64	0	0
Jan-15	94	94	0	94	94	94	94	0
Feb-15	136	849	0	136	136	849	849	713
Mar-15	136	948	0	136	136	948	948	812
Apr-15	136	1160	0	136	136	1000	1000	1000
May-15	0	1280	0	0	0	1000	1000	1000
Jun-15	0	219	0	0	0	219	219	219
Jul-15	0	797	0	0	0	797	797	797
Aug-15	0	1280	0	0	0	1000	1000	1000
Sep-15	0	300	0	0	0	300	300	300
Oct-15	0	1280	0	0	0	1000	1000	1000
Nov-15	136	747	0	136	136	747	747	611
Dec-15	56	56	0	56	56	56	56	0

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