



**British Columbia Transmission
CORPORATION™**

**System Impact Study for
One-Year Transfer Application on the
AESO × BCTC Path
1 May 2006 – 1 May 2007**

**Report No: SPA2006-5
August 2006**

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Executive Summary

The following application for Long Term Firm Point-to-Point (LTFPtP) transmission service on the AESO x BCTC Path was submitted to British Columbia Transmission Corporation (BCTC):

OASIS #	Time Stamp	Customer	Amount	Term
70604537	16 Dec. 2005	BCPS	100 MW	1 year (1 May 2006 – 1 May 2007)

The application is based on the assumption that in BC the Network Resources in Seven Mile Generating Station (SEV) will be reduced and will be substituted by the requested import to serve the Network Load.

In response to the above application and in accordance with the Open Access Transmission Tariff (OATT), BCTC prepared this System Impact Study (SIS). The SIS only addresses the capability of the BCTC's transmission grid and does not consider capabilities of adjacent systems.

The starting conditions for this SIS are: BCTC's studies of the 2004 Network Integrated Transmission Services request (NITS2004), BC Hydro's native load requirements, existing "General Wheeling Agreement" (GWA) transfer rights, and prior firm Point-to-Point commitments on the AESO x BCTC Path.

In this SIS, it is concluded that the 100 MW OASIS # 70604537 cannot be accommodated between 1 May 2006 and 31 August 2006 due to the total import restrictions¹. During this time, with the minimum 24290 MJ on-line rotational energy from BC Hydro and Fortis BC plants, the requested service will cause frequency excursion in BCTC's transmission network following a double outage of 5L51 and 5L52. After the expiry of the existing 134 MW Short Term FPtP AESO x BCTC OASIS # 1457456 on 31 August 2006, there will be adequate import capability into BCTC network. Between 01 September 2006 and 1 May 2007, the 100 MW OASIS # 70604537 can be accommodated providing that the pre-contingency SIE generation during peak flow hours remains higher than 1220 MW.

¹ Between 1 May 2006 and 31 August 2006 only 15 MW of the requested service can be accommodated.

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1. Introduction

The following Wholesale Transmission Service (WTS) Application for importing LTFFtP power from Alberta to BC Hydro's network on the AESO × BCTC path is processed in accordance with BCTC's OATT:

OASIS #	Time Stamp	Customer	Amount	Term
70604537	16 Dec. 2005	BCPS	100 MW	1 year (1 May 2006 – 1 May 2007)

The application is based on the assumption that in BC the Network Resources in SEV will be reduced and will be substituted by the requested import to serve the Network Load.

2. Terms of Reference

Review of the submitted OASIS requests is conducted with reference to the following four BCTC documents:

- 1- "Facilities Study For BC Hydro Distribution NITS 2004, Report # SP2005-26, September 2005" (NITS2004-FS).
<http://www.bctc.com/NR/rdonlyres/86705D4D-0560-4A56-AAB1-5F9FA32ADDF9/0/SP200526Final2.pdf>
- 2- "System Impact Study For BC Hydro Distribution NITS 2004 - Stage 3 (Final) Revision-1, Report # SP2005-06, May 2005" (NITS2004-SIS-Stage3).
http://www.bctc.com/NR/rdonlyres/7242916C-A344-434E-8C4E-5B27108ADB9B/0/SIS_Stage3Revision1.pdf
- 3- "System Impact Study For BC Hydro Distribution NITS 2004 - Stage 1 - Preliminary Results, Report # SP2005-04, February 2005".
http://www.bctc.com/NR/rdonlyres/F2EABDC9-2A4D-4FA6-8C3F-9D8692B1ADA0/0/BCH_NITS2004_SIS_Stg1.pdf
- 4- Real Time Operations SOO 7T-17 on BC – Alberta Interconnection, Revision date: 26 April 2006.
<http://www.bctc.com/NR/rdonlyres/4F9D4A14-9835-41C6-BD89-C62FF5CCBA4B/0/7t17.pdf>
- 5- Real Time Operations System Operating Order (SOO) 7T-34 on South Interior Generation Shedding and Outage Requirements, Effective date: 3 May 2006.
- 6- Real Time Operations System Operating Order (SOO) 7T-64 on BCTC Transfer Limits, Revision date: 9 September 2005.

3. Resources for Transmission Request

The Point-of-Receipt (POR) will be BC - Alberta border on the AESO x BCTC Path. Point-of-Delivery (POD) will be BC Hydro's Network Load. Alberta generators are the resources for this request.

4. System Study Conditions

Review of the OASIS request # 70604537 is based on the following network conditions:

- BC Hydro's December 2005 load forecast.
- Total Transfer Capability (TTC) of the 5L91-5L96-5L98 cut-plane without using any generation shedding RAS: 1850 MW.
- The existing General Wheeling Agreement (GWA) with Fortis BC on transfer rights.
- The minimum on-line rotational energy to serve light hour loads in BCTC and Fortis BC: 24290 MJ
- Automatic rollover of OASIS # 311567 LTFPtP transfer on the AESO x BCTC path: 101 MW
- OASIS # 1457456 Short-term FPtP transfer on the AESO x BCTC path between 01 October 2005 and 31 August 2006: 134 MW
- Teck Cominco Scheduling rights: 370 MW
- Designated Return of Down Stream Benefits (DSBr) :

F2007	F2008
1244.3 MW	1240.9 MW

- Transmission Reliability Margin (TRM) on the AESO x BCTC path: 65 MW
- Transfer limit from Alberta to BC for system normal: 1000 MW

5. Project and Transmission Service Risks

The content of this document contains some uncertainty in terms of the load forecast, cut-plane limits, and the amount of available on-line rotational energy.

6. Analysis

The import capability into the BCTC's transmission grid on the AESO x BCTC path can be restricted by the following factors:

A) Transfer limit on the Alberta – BC transmission inter-ties: The limits are defined in BCTC SOO 7T-17. In this SOO, for system normal conditions the transfer limit is 1000 MW. In real time, the actual limit may be less than 1000 MW due to generation shedding restrictions in Alberta. The analysis shows that total import of 101 MW to 501 MW from Alberta will not impose any restrictions on the Alberta – BC transmission inter-ties.

B) The amount of on-line rotational energy in BC: When importing power from the US and Alberta, a simultaneous outage of 5L51 and 5L52 will trigger a RAS that separates BC transmission from the US and Alberta grids. After separation, the generation deficit in BC will cause a frequency dip. BC's domestic load will have to be shed to restore the system frequency. The lesser the amount of on-line rotational energy, the more severe the frequency dip and the higher the amount of load shedding required for recovery.

The frequency dip and the load shedding can be controlled in part by having more rotational energy on-line. The frequency dip on the BC system cannot be lower than 57.9 Hz. BCTC's SOO 7T-64 identifies the total simultaneous import capability from both the US and Alberta during light load periods using the 57.9 Hz criteria.

In this study, between May 2006 and May 2007 the forecasted light summer load in BCTC and Fortis BC areas are approximately 4500 MW to 4700 MW. At these load levels, total import into the BC transmission network is restricted to avoid frequency excursion, below 57.9 Hz, for simultaneous outage of 5L51 and 5L52. Table 1 shows the total allowable import into the BC transmission grid. The import capabilities are based on the assumption that the minimum on-line rotational energy of BC Hydro and Fortis BC plants is 24290 MJ. The table lists BCTC's existing import obligations and derives the remaining import capability from Alberta.

Table 1

Duration	Aprx. Import Capability @ 24,290 MJ	Existing Import Obligations MW					Remaining Import Capability from Alberta @ 24,290 MJ
		TRM (AB)	Alcan	Cominco	DSBs	OtherAB-BC	
1Apr2006 to 31Aug2006	2050	65	147	370	1218	235	15
1Sep2006 to 31 Mar2007	2050	65	147	370	1218	101	149
1Apr2007 to 31Mar2008	2076	65	147	370	1244	101	148
1Apr2008 to 31Mar2009	2105	65	147	370	1241	101	181
1Apr2009 to 31Mar2010	2119	65	147	370	1245	101	191
1Apr2010 to 31Mar2011	2138	65	147	370	1400	101	55
1Apr2011 to 31Mar2012	2149	65	0	370	1400	101	213
1Apr2012 to 31Mar2013	2162	65	0	370	1400	101	226
1Apr2013 to 31Mar2014	2194	65	0	370	1400	101	258
1Apr2014 to 31Mar2015	2203	65	0	370	1400	101	267
1Apr2015 to 31Mar2016	2217	65	0	370	1400	101	281
1Apr2016 to 31Mar2017	2237	65	0	370	1400	101	301
1Apr2017 to 31Mar2018	2269	65	0	370	1400	101	333
1Apr2018 to 31Mar2019	2305	65	0	370	1400	101	369
1Apr2019 to 31Mar2020	2353	65	0	370	1400	101	417
1Apr2020 to 31Mar2021	2404	65	0	370	1400	101	468
1Apr2021 to 31Mar2022	2460	65	0	370	1400	101	524
1Apr2022 to 31Mar2023	2509	65	0	370	1400	101	573
1Apr2023 to 31Mar2024	2558	65	0	370	1400	101	622

Table 1 shows that in summer 2006 the minimum on-line rotational energy will not be sufficient to support the 100 MW import application. During this time, only 15 MW of the requested service can be accommodated. After the expiry of the existing Short Term FPtP 134 MW OASIS # 1457456 on 31 August 2006, there will be 149 MW remaining import capability from Alberta. OASIS # 70604537 is not expected to cause frequency excursion between 1 September 2006 and 1 May 2007.

Other restrictions:

C) Transfer capability of the west of Selkirk cut-plane: As stated in the NITS2004 Facilities Study: “After commissioning of Vaseux Lake (VAS) 500 kV substation in November 2005, the total transfer capability on the 5L91 - 5L96 - 5L98 cut-plane will be limited to about 1850 MW. The limit is imposed to prevent voltage instability for loss of 5L96.”

In 2007, the approximate range of load requirements on the west of Selkirk cut-plane will be between 1900 MW and 2130 MW during peak load hours and between 2300 MW and 2470 MW during light load hours. This level of demand will exceed the firm TTC of the transmission cut-plane. To avoid voltage instability, generation dispatch in the SIE region has to be restricted such that the post contingency flow on the west of Selkirk cut-plane remains below 1850 MW. Cut-plane flows higher than the firm TTC can be accommodated by arming a SIE generation shedding RAS.

Increasing the import from Alberta and reducing the corresponding generation in SEV will limit the amount of SIE generation available for shedding. During light load hours the demand on the west of Selkirk cut-plane can exceed its TTC by up to 620 MW. This corresponds to the highest amount of SIE generation that has to be shed following a 5L96 outage. BCTC's SOO 7T-34 defines the minimum post contingency generation requirements in the south interior region. Based on this SOO, after the outage of 5L96, there has to be 2 SEV units + 1 equivalent SEV unit on-line as a minimum. To accommodate this import request, the minimum pre-contingency on-line SIE generation during peak flow hours has to be 1220 MW².

The existing nameplate capacity of the generating plants in SEV and Kootenay Chanel (KCL) is near 1400 MW. Total nameplate capacity of the generating plants in the SIE region, including Arrow Lake Hydro (ALH) and Brilliant Expansion (BRX), is approximately 1800 MW. After reducing the SEV by 100 MW, the remaining SIE generation capacity can be as high as 1700 MW which is higher than the required 1220 MW. The applicant will be able to reduce SEV generation and maintain the minimum generation requirements. SEV generation can be reduced by restricting the output of the on-line units or by taking one unit off-line.

7. Conclusions

In this SIS, it is concluded that OASIS # 70604537 cannot be accommodated between 1 May 2006 and 31 August 2006 due to the total import restrictions³. During this time, with the minimum 24290 MJ on-line rotational energy from BC Hydro and Fortis BC plants, the requested service will cause frequency excursion in BCTC's transmission network

² Breakdown of the 1220 MW generation: 620 MW to be shed for excess peak hour flow + 400 MW for the minimum 2 SEV units requirement + 200 MW for the minimum one equivalent SEV unit requirement.

³ See footnote 1.

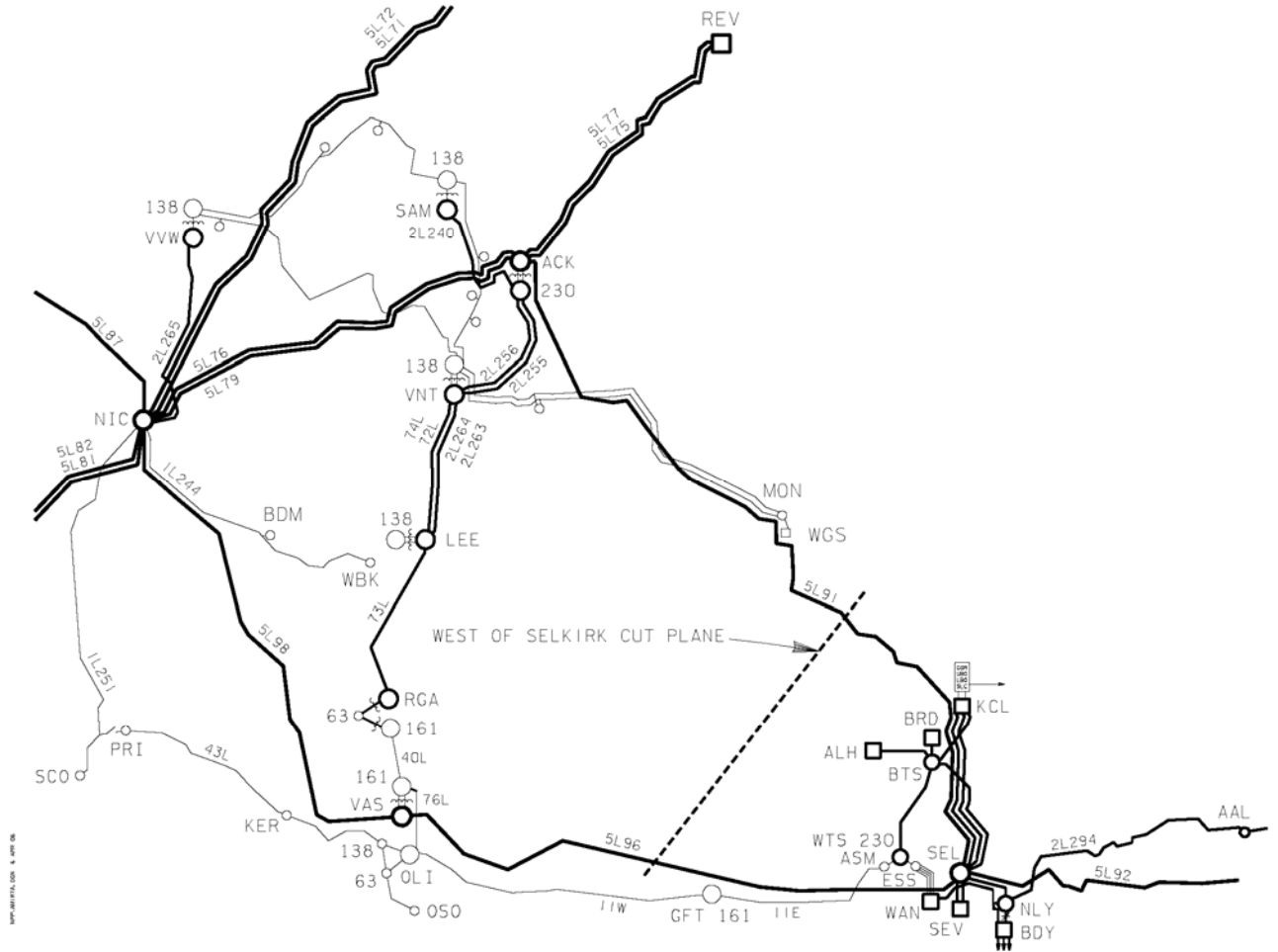
following a double outage of 5L51 and 5L52. After the expiry of the existing 134 MW Short Term FPtP AESO x BCTC OASIS # 1457456 on 31 August 2006, there will be adequate import capability into BCTC network. Between 01 September 2006 and 1 May 2007, the 100 MW OASIS # 70604537 can be accommodated providing that the pre-contingency SIE generation during peak flow hours remains higher than 1220 MW.

Appendix 1 Transmission Cut-Planes

Figure 1: The West of Selkirk Cut Plane

TTC: 1850 MW

Expected cut plane flow: 1900 – 2130 MW during peak load hours in 2007
2300 – 2470 MW during light load hours in 2007⁴



⁴ NITS2004-FS, Page 28