



**System Impact Study for
BC Hydro Generation's 221 MW,
Five Year Transfer on the
BPAT x BCHA Path**

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System Performance Assessment Department

Executive Summary

On 1 November 2001, BC Hydro Generation Line of Business (GLOB) submitted OASIS # 420994 for 221 MW Long Term Firm Point-to-Point (LTFPtP) transmission service on the BPAT x BCHA Path. The requested term is from 1 January 2002 to 1 January 2007. The submission is a rollover of the OASIS # 324059 and has priority over other BPAT x BCHA pending applications. In response to OASIS # 420994, “British Columbia Transmission Corporation” (BCTC) has prepared this System Impact Study.

Simultaneous outage of 5L51 and 5L52 during light load season, when BC Hydro is importing power, may subject BC Hydro’s domestic customers to significant load shedding. Consequently, there are limitations on the amount of power that BC Hydro can import from the US and Alberta.

The limits on net megawatt transfers from the US and Alberta into the BC Hydro service area are defined in BCTC’s Real Time Operations System Operating Order 7T-64 (SOO 7T-64). For each level of online rotational energy and each load level, these limits specify the amount of import into BC Hydro service area that can be lost without causing frequency excursions lower than 58.0 Hertz. The import limits depend on existing commitments on the BPAT x BCHA and EAL x BCHA paths, other import paths, Teck Cominco Rights, and the applicable transmission reliability margin (TRM).

Review of the BC Hydro’s existing import commitments indicates that, for the minimum rotational energy on line, OASIS # 420994 could only be accommodated partially. The amount of Available Transmission Capacity (ATC) on the BPAT x BCHA path is shown in Table 1:

Minimum Rotational Energy MJ	2004 ATC MW	2005 ATC MW	2006 ATC MW
24290	94	114	93

Table 1

The ATC constraints between 2004 and 2006 are related to the frequency excursion caused by the simultaneous outage of 5L51 and 5L52 and can be removed by:

A) Increasing the amount of on-line rotational energy and upgrading 5L52 to have the same thermal limits as 5L51

or

B) Building a new transmission line between the US and Canada

Table 2 shows how increasing the on-line rotational energy and upgrading 5L52 will augment the ATC on BPAT x BCHA path:

Increased Rotational Energy MJ	2004 ATC MW	2005 ATC MW	2006 ATC MW
29550	221	226	223

Table 2

The ATC constraints after 2006 are mainly due to the nominated transmission capacity for the Return of Down Stream Benefits.

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1. Introduction

BC Hydro GLoB submitted OASIS # 420994 for 221 MW LTFPtP Transmission Service on the BPAT × BCHA path from 1 January 2002 to 1 January 2007.

Pursuant to the Wholesale Transmission Service Application (WTSA), it was determined that a System Impact Study was required for the Application.

2. Study Assumptions

The base conditions for the study are the BC Hydro native load requirements and prior firm import and transfer commitments.

The Point-of-Receipt (POR) for the transmission service is the BC-US Border. The resources for the import are located in the US transmission system. In BC, the Network Resources are reduced such that the imports are used to serve the Network Load.

The factors that have been used in determining the ATC for incremental import into the BC Hydro control area include:

- The Network Integration Transmission Service Agreements OASIS No.'s 39073, 39077, and 72625.
- The transfer for OASIS No. 257654 (Return of Down Stream Benefits)
- The transfer for OASIS No. 311567 (101 MW on EAL x BCHA) assuming automatic rollover rights.
- Teck Cominco Scheduling rights.
- Minimum on-line Rotational Energy of 24290 MJ for supplying BC load.
- BC Hydro's Probable Peak Load Forecast including Power Smart dated 17 November 2003.
- Custer – Ingledow Transfer Limits from SOO 7T-18, Attachment 2B.
- Transmission Reliability Margin of 50 MW on the BPAT x BCHA Path.
- Transmission Reliability Margin of 65 MW on the EAL x BCHA Path.
- January 2006 in-service date for 5L52 thermal uprating based on the April 2004 project commencement.

3. Analysis

High power imports from the US and Alberta during light load season will subject BC Hydro's domestic customers to significant load shedding for a simultaneous outage of both 500 kV circuits to the US (5L51 and 5L52) or both the Custer-Monroe 500 kV lines in the US. Forced outages of both 5L51 & 5L52 or both Custer-Monroe 500 kV lines have occurred three times since 1977. These outages did not cause significant consequences, as BC Hydro was not in a light load and heavy import situation.

The Custer-Ingledow transfer limits are defined in BCTC System Operating Order 7T-18 (SOO 7T-18). Attachment 2B of this document indicates that in summer time the Custer – Ingledow transfer limit is approximately 1800 MW for all system conditions except 5L51 or 5L52 out of service.

When BC Hydro is heavily importing, a simultaneous outage of 5L51 & 5L52 will separate the BC Hydro transmission grid from the US and Alberta systems. After separation, the generation deficit in the BC Hydro system will cause a frequency dip. BC domestic load will have to be shed to restore the system frequency. The lesser the amount of on-line generation, 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. This study is based on the minimum rotational energy required for serving the loads of BC Hydro and Aquila Networks of Canada (ANC).

With the existing import obligations, the frequency dip on the neighbouring systems should meet the "Western Electricity Coordinating Council" (WECC) Reliability Criteria, but the frequency dip at a BC Hydro load bus may dip below 59.0Hz. The "WECC Coordinated Off-Nominal Frequency Load Shedding and Restoration Plan" extols planning for operation below 59.0Hz if/when extreme conditions dictates such operation but states that intentional operation below 57.9 Hz (equivalent to 5% loss of life for generators) was judged to be imprudent.

BCTC SOO 7T-64 identifies the total simultaneous import capability from both the US and Alberta during light load periods using the 57.9Hz criteria. Table 3.1 shows that with the minimum on-line rotational energy, 24290 MJ to serve BC load, there will be enough ATC to accommodate OASIS # 420994 partially. The same table indicates that the amount of ATC will augment with an increase in the amount of on-line rotational energy.

Rotational Energy MJ	2004 ATC MW	2005 ATC MW	2006 ATC MW
24290	94	114	93
29550	221	226	223

Table 3.1

To accommodate the higher power imports between Custer and Ingledow substations, 5L52 has to be upgraded to have the same thermal rating as 5L51 (2.5 kA / 2200 MW @ 30 C). After the thermal upgrade of 5L52 the WECC Path Rating should be reviewed.

4. Conclusions

Review of the BC Hydro Generation Line of Business OASIS # 420994 for 221 MW LTFPtP Transmission Service on the BPAT x BCHA path indicated the following:

1. The requested Transmission Service can not be provided in its entirety.
2. With the minimum rotational energy on-line, partial Transmission Service can be provided between now and 1 January 2007.
3. Full transmission service can be provided by dispatching more rotational energy on-line and thermally upgrading 5L52 to 2200 MW @ 30 C.
4. A new 500 kV line between the US and BC will increase the ATC on BPAT x BCHA Path beyond the requested 221 MW. However, the in-service date for a new line is not expected to be before 1 January 2007.

There are no Direct Assignment Facilities associated with this request for Transmission Service.