

**System Impact Study for
Power Supply 400 MW Import on the
EAL × BCHA Path**

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**Network Performance Planning Department
T&D Engineering**



Executive Summary

BC Hydro Power Supply (Power Supply) submitted OASIS request 311567 to the BC Hydro Transmission & Distribution (T&D) for Long Term Firm Point-to-Point transmission service under the Wholesale Transmission Service (WTS) tariff to import 400 MW on the EAL × BCHA Path from 1 January 2001 to 31 December 2005.

This System Impact Study identifies system constraints and options, additional Direct Assignment Facilities or Network Upgrades required to provide the requested service. The base conditions for the study are BC Hydro's native load requirements from 2001 to 2005; and prior firm import and transfer commitment on the EAL × BCHA path throughout the whole time period. Power flow, transient and voltage stability studies were performed to ensure that the Power Supply transmission request can be accommodated in compliance with the BC Hydro, Western Systems Co-ordinating Council (WSCC), and North American Electric Reliability Council (NERC) reliability criteria. This System Impact Study only addresses the capability of the BC Hydro system and does not consider capabilities of adjacent systems.

The System Impact Study concluded that the Power Supply 400 MW transmission request from 2001 to 2005 could not be accommodated although partial service may be available. Simultaneous imports into the BC Hydro system create a Frequency Excursion restriction on the EAL × BCHA Path. This restriction cannot be mitigated without more generators on-line.

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

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1. Introduction

BC Hydro Power Supply (Power Supply) submitted an OASIS Request No. 311567 to BC Hydro Transmission and Distribution (T&D) for Long-Term Firm Point-to-Point Transmission Service for 400 MW on the EAL × BCHA Path for the period 1 January 2001 to 31 December 2005.

Pursuant to the WTSA, T&D determined that a System Impact Study is required for the Application.

Power flow, transient and voltage stability studies were performed to examine whether the Power Supply transmission request can be accomplished in compliance with the BC Hydro, Western Systems Co-ordinating Council (WSCC) and North American Electric Reliability Council (NERC) reliability criteria.

2. Terms of Reference

A summary of the Terms of Reference is provided below:

- (a) T&D will use its existing planning and operating criteria, standards and procedures which conform with WSCC Reliability Criteria, to determine necessary transmission system reinforcements and other options.
- (b) Specifically, the following studies will be done under this Study Agreement:
 - Thermal, transient and voltage stability studies to determine the system capability to permit the 400 MW import from Alberta.
 - Identify system transmission constraints and any Network Upgrades.
 - Analyze load shedding, generator shedding and other options, tie-line transfer limits and network curtailment remedial action schemes required for the reliable operation of the interconnected system.
- (c) The study will assess the generation reserve issues as required by the WSCC.
- (d) The above technical studies will be done for the following system conditions:
 - The system configurations will be based on the provided resource allocations and network loads, and reserved Long-Term Firm Point-to-Point Transmission Service up to the 2006/2007 period.
 - High stress system conditions, including but not restricted to the freshet and winter peak load cases.
 - If the transmission system is not capable of providing for the requested transmission service, then lower stress system conditions will be required to determine the present capability of the transmission system
- (e) The studies will not identify any constraints on neighbouring systems, as it is the Transmission Customer's responsibility to ensure that any neighbouring utility limitations are addressed.

3. System Study Conditions

The base conditions for the study are the BC Hydro native load requirements and prior firm import and transfer commitments, including prior pending WTS applications.

3.1. Resources for Transmission Request

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

3.2. Transmission System Assumptions for Transmission Request

Transmission System assumptions for this Transmission Service request are contained in Appendix A.

4. System Requirements for Transmission Request

Planning studies were performed as per T&D's Transmission System Planning Criteria and Study Methodology. The Direct Assignment Facilities and Network Upgrades associated with the Transmission Request in Appendix A.1 was included.

Only those portions of BC Hydro's transmission system that are adversely affected by the transmission request have been addressed below.

4.1. Simultaneous Imports into the BC Hydro System

Imports into the BC Hydro system are restricted by frequency excursion for simultaneous loss of 5L51 & 5L52 and transfer trip of the Nelway tie. With the existing obligations and pending WTS applications on the BPAT × BCHA Path, this request for Transmission Service is restricted to 0 MW without more generators on-line.

Note that if pending WTS applications on the BPAT × BCHA Path are not accepted, partial service will be available under minimum generation conditions.

5. Available Transfer Capability

The Available Transfer Capability (ATC) on the EAL × BCHA Path depends on the generation pattern, existing firm commitments on the BC system, firm import, Capacity Benefit Margin (CBM), and Transmission Reliability Margin (TRM).

The following table provides the anticipated ATC of the system with both the minimum generation and with more generators on-line to meet simultaneous import restrictions for the BC Hydro system:

| | Rotational Energy | |
|------|-------------------|-----------|
| | 23,380 MJ | 33,460 MJ |
| 2001 | 0 | 0 |
| 2002 | 0 | 0 |
| 2003 | 0 | 13 |
| 2004 | 0 | 13 |
| 2005 | 0 | 48 |

No Network Upgrades have been identified which would be expected to be ready in time to further reduce the restrictions or increase the ATC.

6. Conclusions

The System Impact Study concluded that, with the existing and pending transfers, the Power Supply transmission request could not be met, although partial service may be available.

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

Appendix A.

Transmission System Assumptions for Transmission Request

A.1 Prior Uncompleted Firm Point-to-Point Requests

The prior uncompleted Firm Point-to-Point requests for Transmission Service on the BPAT × BCHA or EAL × BCHA Paths during the period of this request is Transmission Requests # 273602.

A.2 Modifications to the Power-Flow Base Cases

The following were included in the power-flow base cases:

- All existing Transmission Service reservations were included. However, since Counter-Flow Scheduling on a bi-directional path will not increase the amount of Firm Transfer Capability on the path, transfers have been set to zero with the following exceptions.
- The transfers for Transmission Requests # 257654, 273602, 291566, 293825, 299499, and 324059 are included.
- The Direct Assignment Facilities and Network Upgrades associated with the Transmission Request in Appendix A.1 was included.
- Resources added as per Resources for Transmission Request.

Appendix B.

System Requirements for Transmission Request

B.1 EAL × BCHA Path and South Interior East Bulk Transmission

The WSCC Operating Transfer Capability of the EAL × BCHA path is 1000 MW East-to-West (import).

B.1.1 Thermal Capability, Transient and Voltage Stability

This transmission sub-system is considered as Firm “N-0 adequate” for loss of 5L94 (Langdon to Cranbrook), and is limited to 300 MW of import by thermal and stability limits for a maintenance outage of 5L92 or 5L98. This restriction can be raised to a higher level by installing a second 230 kV circuit from Selkirk to Nelway to Cranbrook, or other similar reinforcement. However, such Network Upgrades would not be considered to be feasible in time to serve this transmission service request.

B.2 South Interior West Bulk Transmission

B.2.1 Voltage Stability

The total transfer capability from Selkirk to Nicola is limited by voltage stability for loss of 5L91 (Selkirk to Ashton Creek) or 5L98 (Selkirk to Nicola). This restriction is most evident during maximum generation and light load conditions in the Selkirk and Kootenay areas.

However, it is expected that the existing South Interior West bulk transmission system would not be restricted if, as indicated in the data submission, smaller Columbia plants (especially those in the Selkirk area) are reduced to 80% (without being taken out-of-service) before reducing the Mica and Revelstoke plants.

B.3 Interior to Lower Mainland Bulk Transmission

B.3.1 Thermal Capability

The transmission system was evaluated during the Winter Peak and Summer Light with the transfers as listed in Appendix A.2. In addition, coincidence with Transmission Requests # 72623 and 254221 was also evaluated. Results indicated that the thermal capability will be able to accommodate the requested transfer.

B.4 Simultaneous Import into the BC Hydro System

B.4.1 Frequency Excursion

Import into the BC Hydro system, including transfers on the EAL × BCHA Path, is restricted by frequency excursion. Studies indicate that during Summer Light load with the existing obligations and pending WTS applications on the BPAT × BCHA Path, firm import on the EAL × BCHA Path is restricted to 0 MW without more generators on-line to provide a higher amount of Rotating Energy.