System Impact Study

For

Increasing Firm ATC

From BC to Alberta

and

From BC Interior to the US

Report No. SPA 2007-88

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British Columbia Transmission Corporation

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Executive Summary

This report provides a high level review of Network Upgrades required for increasing Firm Point to Point (PTP) Available Transfer Capability (ATC) from BC to Alberta and from BC Interior, which includes the Northwest region, to the US. The system model used in the analysis assumes that the second Nicola-Meridian line (5L83) is not present. The study uses first contingency criteria and TTC/ATC Methodologies as stated in section 2.0 of the Business Practices (http://www.bctc.com/NR/rdonlyres/D9F43D5D-959F-458A-8549-F88D108AE357/0/022006Mar1FinalSection2.pdf), and identifies the constraints in the transmission system to be rectified in order to increase Firm PTP ATC.

Cost estimates for required reinforcements are provided. These are high level estimates, and some are based on previous studies. As such, they need to be updated once all the required reinforcement details from a Facilities Study have been identified.

Further more, this study examines BCTC transmission system only and assumes that Alberta or the US is able to accommodate the proposed transfers. As such, no contingency or operating constraints in Alberta or the US is studied.

For BC to Alberta transfers, depending on the transfer level, there are two major constraints: the 138 kV BC-Alberta ties, and the voltage support in Cranbrook area. The 138 kV constraints can be avoided by opening the 138 kV BC-Alberta tie during period of high transfer levels, thus forcing all transfers to go onto the Cranbrook Langdon 500 kV line. Reactive reinforcement in the form of switched capacitor or SVC at Cranbrook/Selkirk area is required and is expected to vary between $36M and $54M at the transfer level of between 850MW and 1200MW.

For BC Interior to the US, the constraint is on the ILM path. BCH Coastal Generation can influence the amount of ATC on the ILM path. Under certain Coastal Generation scenarios, additional Firm PTP to the US would cause 5L81 or 5L82 to be overloaded when there is a contingency on the other line. Under such situation, thermal upgrade of the emergency ratings of the capacitor banks on these lines is required to accommodate additional Firm PTP. The cost to upgrade these two lines to a rating of 3000A nominal is estimated at $27M.

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1.0 Introduction

The purpose of this study is to determine Network Upgrades required for increasing Firm PTP ATC from BC to Alberta and from BC Interior, which includes the Northwest region, to the US. The study report provides a high level review of costs estimate and timelines for implementing these Network Upgrades. The system model used in the analysis assumes that the second Nicola-Meridian line (5L83) is not present. The study uses first contingency criteria and TTC/ATC Methodologies as stated in section 2.0 of the Business Practices (http://www.bctc.com/NR/rdonlyres/D9F43D5D-959F-458A-8549-F88D108AE357/0/022006Mar1FinalSection2.pdf), and identifies the constraints in the transmission system to be rectified in order to increase Firm PTP ATC.

2.0 Studies Performed

This study is carried out to examine only the capability of the BCTC transmission system in terms of wheeling power to Alberta or to the US. It does not study contingencies in the Alberta or the US systems but assumes that these two systems are capable of importing the transferred amount without problems within their systems.

The 2009, 2014 and 2016 Heavy Winter load flow base cases are used as the starting point for the studies. These load flow cases are the most stressed cases within the given time period. They have the most up-to-date load and resource and IPP representations. The base cases do not include the second Nicola-Meridian line (5L83) or the ILM alternative upgrades.

For the BC to AB, the base cases include existing 480 MW Firm PTP commitments plus 65 MW Transmission Reliability Margin (TRM).

For the BC to the US, the base cases include existing 230 MW Firm PTP commitments plus 50 MW TRM. The transfer on the eastern BC-US tie is set to zero to reflect third-party transmission rights. Also, AB is exporting 101MW to BC.

Finally, a combined wheeling through from the US and export from BC (1200MW) to Alberta is examined to identify the transmission upgrade requirements for utilizing the full path rating of the BCTC-AESO inter-tie.

3.0 Study Results

3.1 BC – AB Incremental Firm ATC

The system was simulated at various firm transfer levels from 545 MW to 1200 MW to identify overloads and constraints. Solutions were determined to mitigate these overloads and constraints. It was found the 138 kV ties to Alberta (1L274 and 1L275) were over loaded. However, if the 138 kV ties to Alberta are opened to force all exports to flow on the CBK-LGN 500 kV line, the overloading conditions could be avoided. The following shows the Network Upgrades and the resulting additional Firm PTP ATC with the assumptions that the 138 kV systems are operated in an open loop configuration for heavy BC to AB transfer levels:

- For 545 MW to 850 MW: no Network Upgrade is required.
- For 850 MW to 1200 MW:

  Two reinforcement options are identified to allow this level of transfer:
  Reinforcement Option 1
    - Reactive support in the form of a SVC at Cranbrook will be required. The amount of reactive power reinforcement is about 550 MVAr. The preliminary costs estimate for this option is approximately $36M, and it would take approximately 3 years to implement.
    - With reactive reinforcement at Cranbrook, a contingency on 5L91 (Selkirk-Ashton Creek) or on 5L96 (Selkirk-Vaseux) does not show any voltage violations or thermal overload problems. The system remains stable following these contingencies.

  Reinforcement Option 2
    - Series compensation on 5L94 (Cranbrook-Langdon) and 5L92 (Cranbrook-Selkirk) could be implemented to provide the same level of transfer at a cost of approximately $54M. This option will take approximately 4 years to implement.

3.2 BC – US Incremental Firm ATC

Coastal Generation was adjusted such that loss of circuit 5L81 will result in 5L82 being utilized at full capacity. An increase in Firm PTP from BC Interior to the US will result in overloading 5L82 when there is a contingency on 5L81. However, losing 5L82 will not result in overloading 5L81 for up to 85 MW additional Firm PTP. Further increase from this level will overload 5L81 when there is a contingency on 5L82. The following shows the Network Upgrades and the resulting additional Firm PTP ATC on the BC Interior to the US path:

- 0MW to 85MW:
    - Thermal upgrades of 5L82 to 3.0 kA nominal at an approximate cost of $13M. These upgrades would take 2 to 3 years to implement.

- 0MW to 170MW:
    - Thermal upgrades of 5L82 to 3.0 kA nominal
    - Thermal upgrades of 5L81 to 3.0 kA nominal

  These upgrades would cost approximately $27M and take 2 to 3 years to implement.

However, these upgrades can be avoided if re-dispatch of Coast Generation (in a ratio of 1-1 with the requested transfer) is available.

4.0 Conclusions

Not considering the limitations within Alberta system, the BCTC system is capable of delivering 1200 MW to the BC Alberta border when adequate reactive reinforcement is provided.

To provide up to 170MW of incremental export levels from BC Interior to the US, thermal upgrades of 5L81 and 5L82 will be required. However, if re-dispatch of Coast Generation is available, these upgrades can be avoided.