BC Transmission
CORPORATION
Building Connections

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December 5, 2007

Ms. Erica M. Hamilton
Commission Secretary
British Columbia Utilities Commission
Sixth Floor, 900 Howe Street
Box 250
Vancouver, BC V6Z 2N3

Via e-mail
commission.secretary@bcuc.com

Dear Ms. Hamilton:

Re: British Columbia Transmission Corporation (BCTC)
Project No. 3698486 – Interior to Lower Mainland Transmission Project
Errata Sheet for Exhibit B-1

BCTC files an Errata Sheet and replacement pages for Exhibit B-1. Replacement pages have a green background and changes are marked by a black line in the right margin.

BCTC also plans to file a set of orthophotos of the Project route with the Commission this week. Initial recipients of the Application may request a CD or printed copy of the orthophotos from BCTC; or download the orthophotos from www.bctc.com. BCTC expects to have the orthophotos on www.bctc.com by December 7, 2007.

Sincerely,

Original signed by:

Marcel Reghelini
Director, Regulatory Affairs

Copy: Initial distribution of Application

December 5, 2007

Errata Sheet for Exhibit B-1 – ILM Project CPCN Application and Appendices

Application

1. Section 5.1.1 – page 42
    a. Line 11 – typographical error (Capitalization)
    b. Line 23 – “ING” is replaced by “Clayburn Substation (CBN)”
    c. Line 26 to 27 – “Clayburn Substation (CBN)” is replaced with “CBN”

2. Section 8.1.6.2 – page 119
    a. Table 8-6 – Item 2 – Replace “recommended” with “endorsed” in the sentence, “Magnetic field levels will be below the levels recommended by the World Health Organization.”

Appendix H – ILM Project Assessment of Need

3. Section 2.0 – page 6
    a. Line 4 – “5L42” is replaced by “5L41”

4. Section 2.0 – page 7
    a. Line 5 – “therefore tend to require an earlier reinforcement of the when” is replaced by “therefore tends to require an earlier reinforcement of the ILM grid when”

5. Section 4.1 – page 10
    a. Replace Figure 4-1 to add letters “A” and “B” to the “Req Transfer @ Kelly/Nicola” line

6. Section 5.1 – page 12
    a. Line 5 to 6 – Delete “from incremental load growth minus the net increase in Coastal Generation of about 200 MW for a total 20-year incremental CU of 1400 MW”
    b. Line 6 – Replace “1600 MW and 2000 MW” with “1800 MW and 2200 MW”

7. Section 5.1 – page 13
    a. Replace Figures 5-2 and 5-3 to show additional detail

8. Section 5.1 – page 14
    a. Line 2 – Replace “demand by 2800 MW” with “demand by 2860 MW”
    b. Line 5 – Replace “demand by 3170 MW” with “demand by 3180 MW”
    c. Line 6 – Replace “demand by 6460 MW” with “demand by 6100 MW”
    d. Line 8 – Replace “demand by 3680 MW” with “demand by 3240 MW”
    e. Line 9 – Replace “demand by 8000 MW” with “demand by 7534 MW”

9. Section 5.1 – page 15
    a. Replace Figure 5-6 to add missing detail

10. Section 5.2.2.1 – page 20
    a. Line 6 – Replace “(line C)” with “(line E)”

11. Section 5.2.2.2 – page 22
    a. Line 6 – Replace “(line C)” with “(line E)”

12. Appendix A – page 29
    a. Line 5 – Replace “nomogram with one hour continuous thermal rating” with “nomogram with one hour thermal overload rating”

<u>Appendix I – Reinforcement Alternatives for the ILM Transmission Grid</u>

13. Section 2.2 – page 19
    a. Line 17 – Replace “5L46 would likely require new ROW for some of its 203 km.” with “5L46 would likely require new ROW for most of its 203 km.”

14. Section 4.0 – page 38
    a. Line 24 – Replace with “669 MW” with “450 MW”
    b. Line 25 – Replace with “517 MW” with “325 MW”

<u>Appendix K – ILM Horizon Year Total Transfer Capability Study</u>

15. Section 1 – page 6
    a. Line 2 – Replace “5800 MW” with “6272 MW to 6355 MW”

5.0 PROJECT DESCRIPTION

5.1 Project Components and Infrastructure

PRE-FILED EVIDENCE OF MELISSA HOLLAND, PROJECT MANAGER, ILM PROJECT

The purpose of this section is to describe the ILM Project as proposed by BCTC. The proposed alternative is a new transmission line (5L83) from NIC to MDN, which will increase transmission capability for serving customers in the Lower Mainland and on Vancouver Island.

5.1.1 Existing NIC to MDN Transmission Line Corridor

The first 500 kV AC transmission line constructed between NIC and MDN was circuit 5L82. Circuit 5L82 was completed in 1977 after the completion of the Mica Generating Station on the Columbia River. It is comprised primarily of guyed and rigid flat Single Circuit Steel Towers (SCST). Please see Figure 5-1 Interior to Lower Mainland Transmission Grid.

The NIC to MDN corridor also contains portions of circuits 5L81 and 5L41. Circuit 5L81, a 500 kV AC flat SCST circuit between NIC and Ingledow Substation (ING) in Surrey, was completed in 1976 to also transfer power from the Mica Generating Station to the Lower Mainland. Circuit 5L81 parallels 5L82 between NIC and Agassiz and both circuits tie into American Creek Capacitor Station (AMC), north of Hope. Circuit 5L81 leaves the NIC to MDN corridor at Agassiz to follow the Fraser Valley to ING.

Circuit 5L41, a 500 kV AC flat SCST from Kelly Lake Substation (KLY) near Clinton to Clayburn Substation (CBN), was completed in 1969 to transfer power to the Lower Mainland from the Gordon M. Shrum Generating Station on the Peace River. Circuit 5L41 parallels 5L81 and 5L82 between the headwaters of American Creek and Ruby Creek where it leaves the NIC to MDN corridor to follow the Fraser Valley to CBN near Abbotsford.

Other public planning activities include public forums and workshops. In 2004 and 2005, the need for additional transmission capacity between the Interior and Lower Mainland was a topic of discussion at BCTC's annual Provincial Public Forum and Technical Workshop and regional meetings/workshops. The process involved discussions with First Nations and the public.

8.1.6 Input Received and BCTC Responses

8.1.6.1 Consultation Logs

The consultation logs in Appendix S-8 provide detail on input received and BCTC's follow-up actions.

The Input Summary Table in Appendix S-9 provides additional information indicating whether comments noted and issues raised were by property owners, municipal and regional government representatives, the general public and interested parties, or all three. It also lists the number of times each topic was raised.

8.1.6.2 Summary of Issues Raised Through Public Consultation

Table 8-6 summarizes issues raised during the ILM consultation process and BCTC's responses to those issues.

Table 8-6. Issues Raised Through Public Consultation

Upgrade to Existing Circuits Alternative		
	Issue	**Management Of Issue**
1	Potential visual impacts	Part of the upgrades to existing circuits includes selectively raising some existing towers 3 to 8 metres or the addition of a tower within an existing transmission line. Visual impacts will be assessed as part of the project if this alternative is selected.
2	Interest and/or concern about electric and magnetic fields (EMF)	Magnetic field levels will be below the levels endorsed by the World Health Organization. Details on sources for information on EMF, including the BC Centre for Disease Control, the World Health Organization and Health Canada, were provided to the public.
3	Concern about nuisance shocks and induction	BCTC explained what nuisance shocks are, how they happen and that there are no safety concerns.

- 5L81 and 5L82 connect Nicola (NIC) Substation in the South Interior to Ingledow (ING) and Meridian (MDN) substations in the LM; and
- 5L42 connects Kelly Lake (KLY) Substation in the Interior to Cheekye (CKY) Substation and 5L41 connects KLY to Clayburn (CBN) Substation in the LM.

Four additional lines allow for power sharing between the substations:

- 5L45 connects CKY and MDN substations in the LM;
- 5L44 connects MDN and ING substations in the LM;
- 5L40 connects CBN an ING substations in the LM; and
- 5L87 connects NIC and KLY substations in the Interior.

Five of the ILM lines (5L41, 5L42, 5L87, 5L81, and 5L82) are series compensated to increase transfer capability.

Usage of the ILM grid is a function of:

(a) LM and VI load (net of DSM),

(b) Firm exports/imports, and

(c) Generation resources in the coastal and interior regions.

Flexibility and economics dictate generation dispatch patterns. The transmission system should be able to accommodate the forecast generation output of the coastal and interior regions. Additional Independent Power Producers (IPPs) in the coastal region may partially compensate for the increase in load in the region and slow the growth in ILM usage. DSM options that provide capacity reductions when the demand is high will also reduce load growth and slow growth in ILM usage.

Dispatch of interior generation to either dependable or maximum levels also affects the usage of the ILM grid. For transmission planning studies that usually consider the heaviest coastal loads during the winter, the dependable generation capacities are usually modeled. These reflect the historical available generation capacities under winter peak conditions. Sensitivity studies are often performed using maximum generating capacities to stress the transmission system even further. These reflect how the system may be operated under emergencies or freshet conditions where the spring runoff is high at all the interior plants and power must be generated or water is spilled. A maximum dispatch pattern leads to a higher committed use (CU) on the ILM grid and therefore tends to require an earlier reinforcement of the ILM grid when its transfer capability is exhausted.

When there is available capacity on the ILM grid it can play a role in enabling trade. When it is economic to do so, power can be exported from the Interior to the US and, conversely, power from the US and Alberta can be imported and delivered to loads via the ILM grid.

3.0 OBJECTIVES AND PLANNING STANDARDS

BCTC's planning objectives and standards are described in Sections 4.6.1 and 4.6.2 of Exhibit B-1 of BCTC's F2008-2017 Transmission System Capital Plan proceeding (F2008 TSCP), pages 50 to 59. The objectives are:

(a) Serving firm load,

(b) Enabling economic generation dispatch,

(c) Enabling point-to-point power transfers,

(d) Affordability,

(e) System performance,

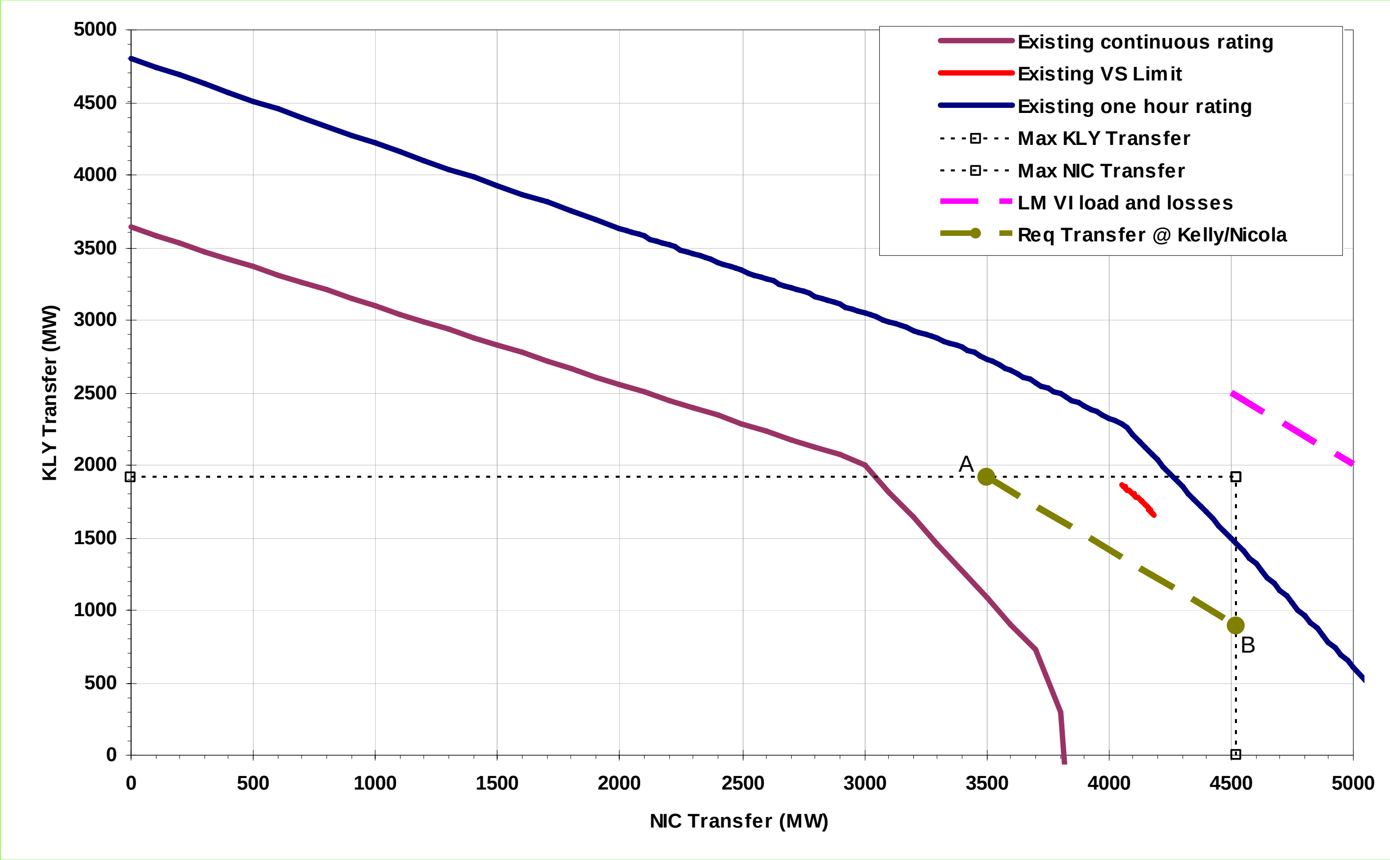
(f) Community Impact, and

(g) Environmental compliance.

3.1 Application of Planning Standards and Objectives

Because of the complexity of the electric system, it is impossible to study all system operating conditions and permutations of equipment availability. For example, the load varies from 40 to 100% of peak. The generators are dispatched not only to serve the load but also to economically extract energy from the reservoirs. The transmission graphical plot known as a nomogram. The nomograms for continuous thermal limits, one-hour thermal overload limits, and voltage stability limits for the ILM grid are shown in Figure 4-1 and discussed below.

Figure 4-1. ILM Nomograms



The ILM nomograms help explain the relationship between the sources of generation and the TTC, CU and Available Transfer Capability (ATC) of the ILM grid. Figure 4-1 also displays the following:

(a) “LM & VI Load and Losses line” is a 45-degree locus of the winter peak load and losses to be served in the coastal region. This line moves upward and to the right if the load increases, and moves downward and to the left if the load decreases.

(b) “Required transfer at Kelly and Nicola line” is also a 45-degree locus of all the combinations of transfer from the NI and SI that meet the LM & VI Load and Losses requirement after the dispatch of Coastal Generation. As more Coastal and VI peak load forecasts and generation for the next 20 years are shown in Figures 5-1, 5-2, and 5-3 for the amended LTAP and Contingency Resource Portfolios. There is a growing imbalance between load and supply in the LM and VI regions. The 20-year incremental CU from Figure 5-1 (amended LTAP portfolio) is approximately 1600 MW. Similarly, the 20-year incremental CU for Contingency Resource Plans (CRP) 1 and 2 in Figures 5-2 and 5-3 is approximately 1800 MW and 2200 MW, respectively.

Figure 5-1. Total Generation and Load in LM and VI – 2006 Amended LTAP

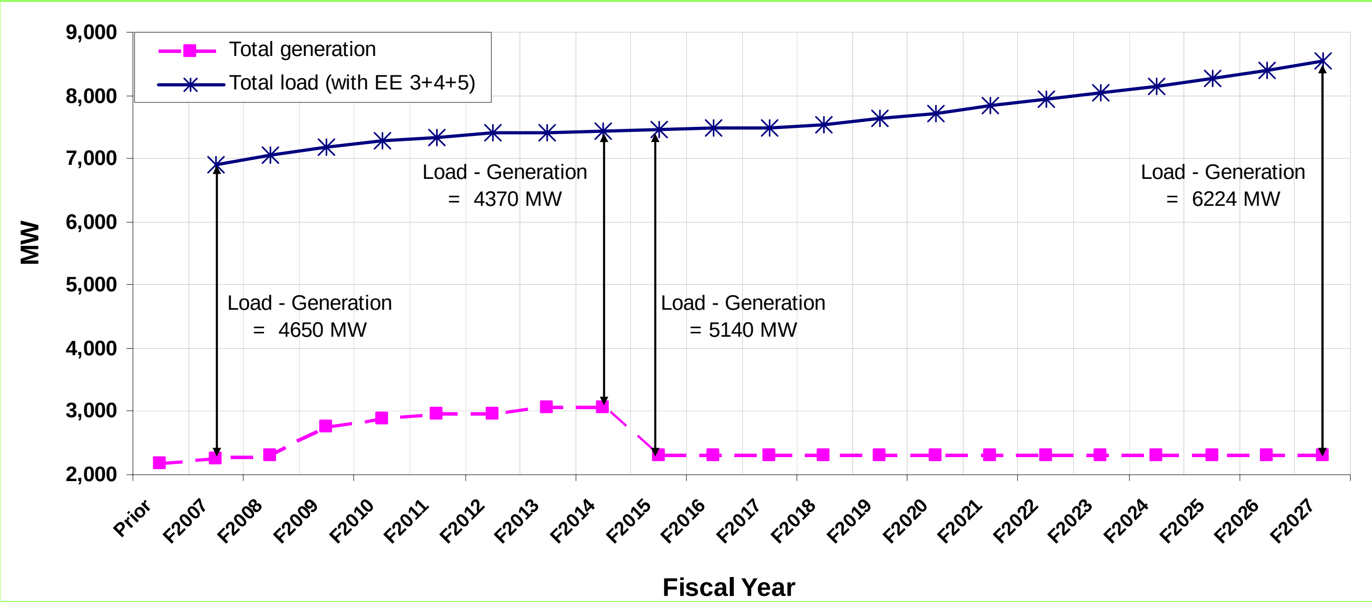


Figure 5-2. Total Generation and Load in LM and VI – 2006 Contingency Resource Plan 1

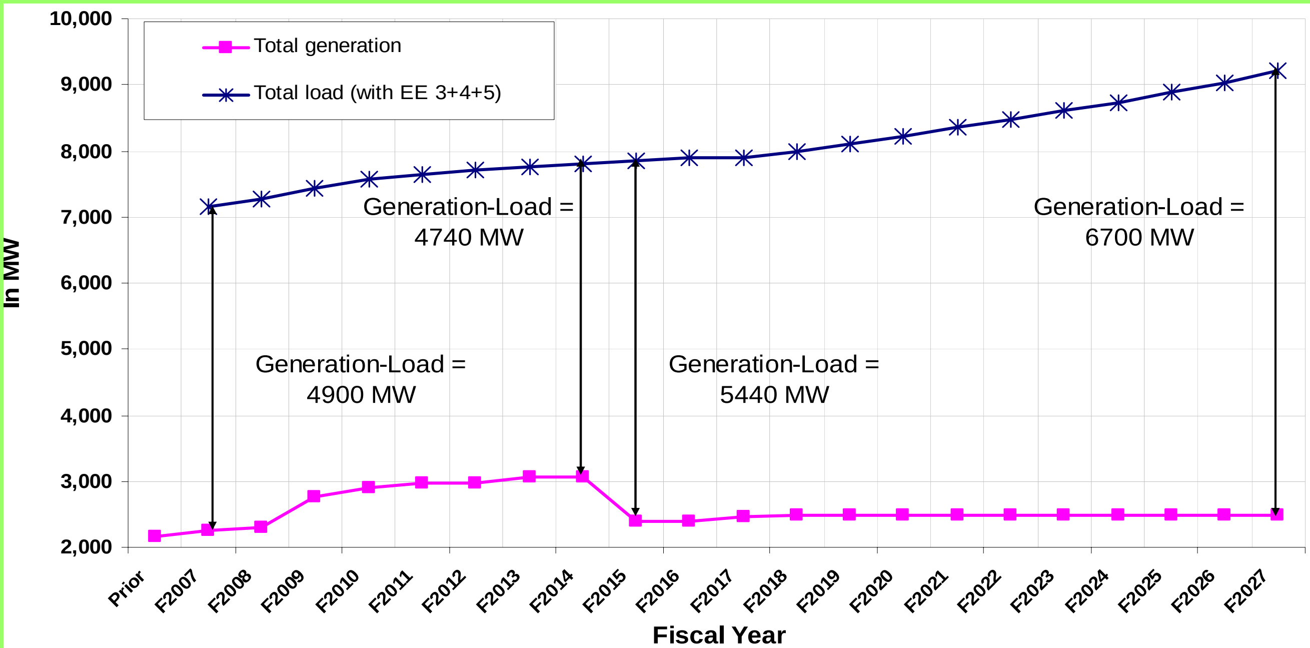
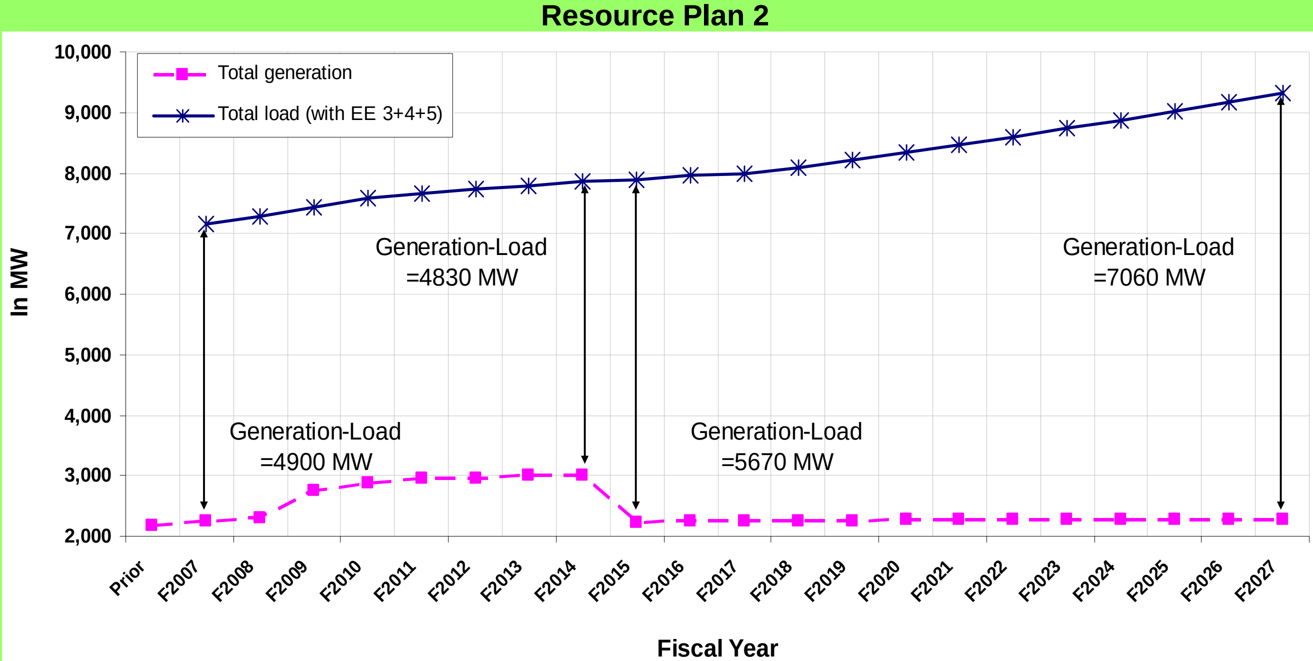


Figure 5-3. Total Generation and Load in LM and VI – 2006 Contingency Resource Plan 2



While demand is forecast to exceed supply in the coastal region, the opposite is true for the Interior. Figures 5-4, 5-5 and 5-6 show the forecast load and resources for each of the amended LTAP portfolio and CRPs. These figures show the Interior resource additions both in terms of their dependable and maximum capacities.

The Interior incremental dependable generation capacity exceeds the incremental demand by 2860 MW by F2027, while the incremental Interior maximum generation capacity exceeds the incremental demand by 4780 MW for the amended LTAP portfolio by F2027. For CRP1, the Interior region incremental dependable generation capacity exceeds the incremental demand by 3180 MW (F2027), while the incremental maximum generation capacity exceeds the incremental demand by 6100 MW (F2027). For CRP2, the Interior incremental dependable generation capacity exceeds the incremental demand by 3240 MW (F2027), while the incremental maximum generation capacity exceeds the incremental demand by 7534 MW (F2027).

Figure 5-4. Total Generation and Load in Interior Regions – 2006 Amended LTAP

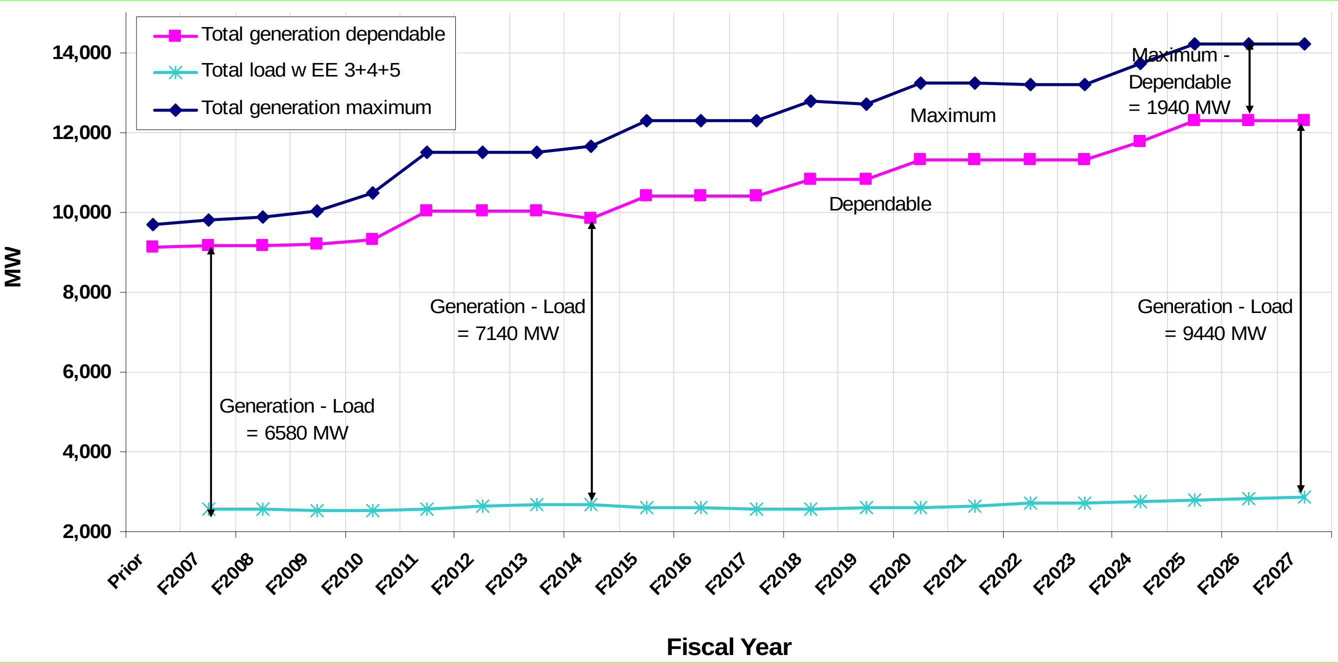


Figure 5-5. Total Generation Additions and Load Growth in Interior Regions – 2006 Contingency Resource Plan 1

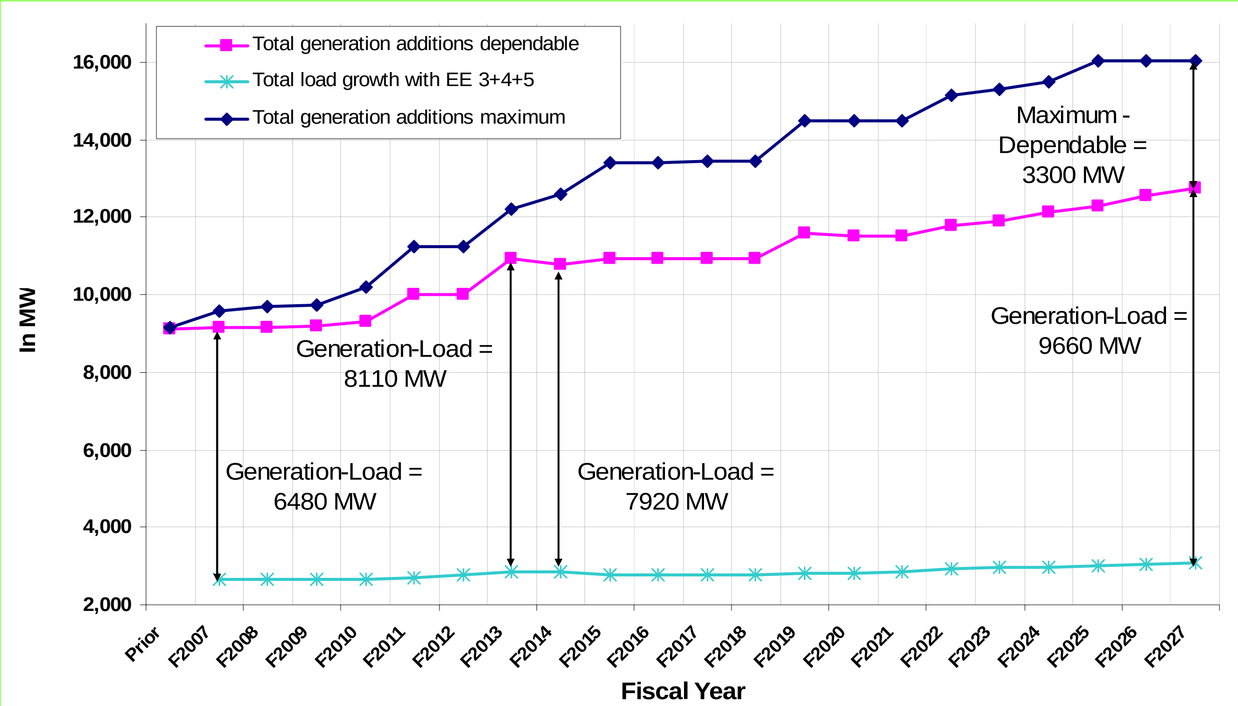


Figure 5-6. Total Generation Additions and Load Growth in Interior Regions – 2006 Contingency Resource Plan 2

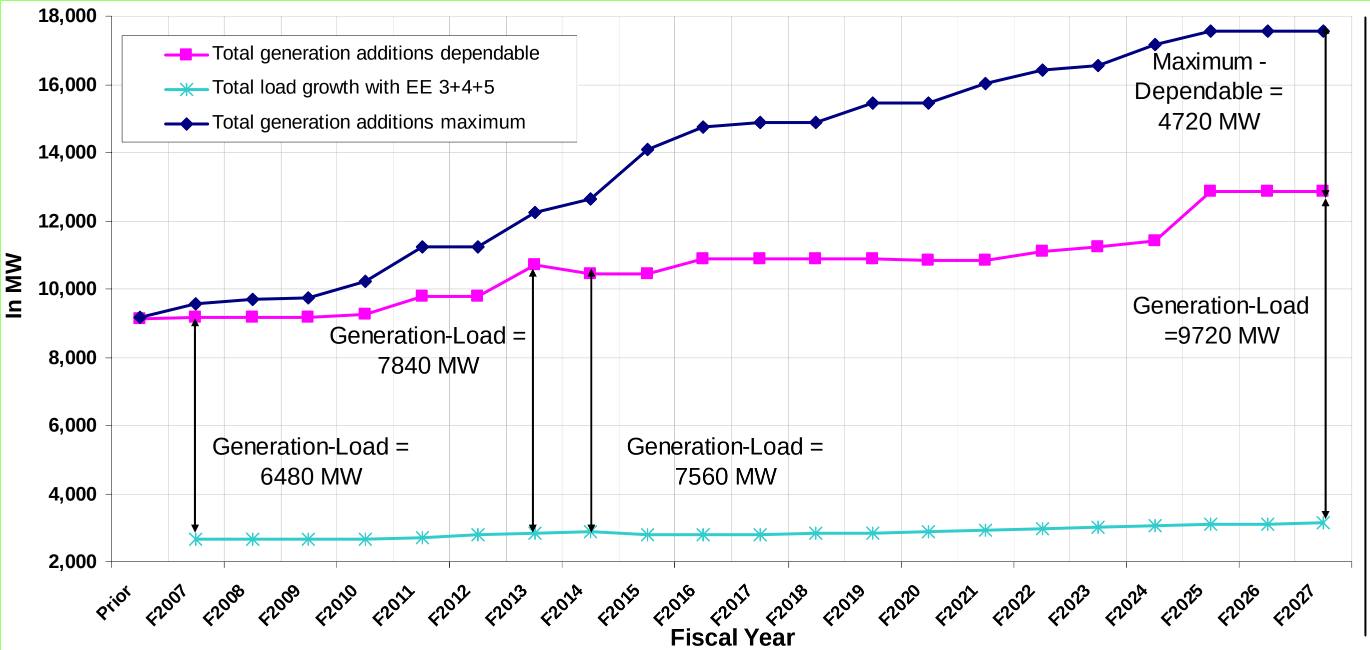
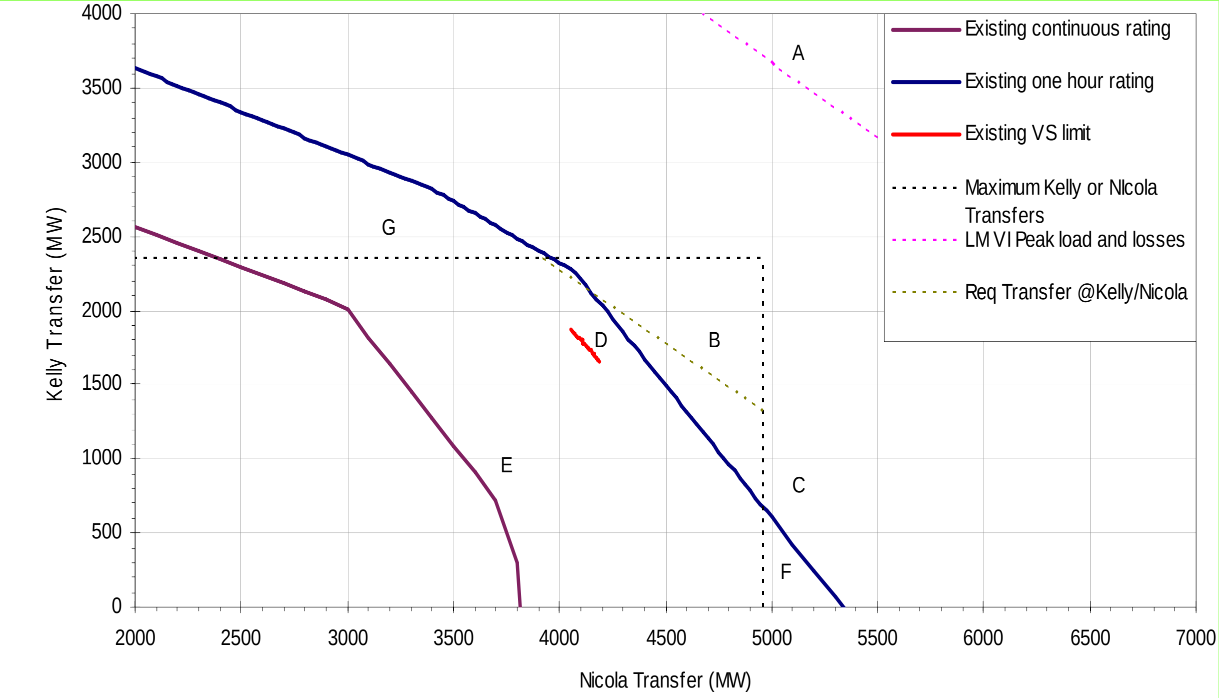


Figure 5-10. ILM Nomogram for CRP1 F2015

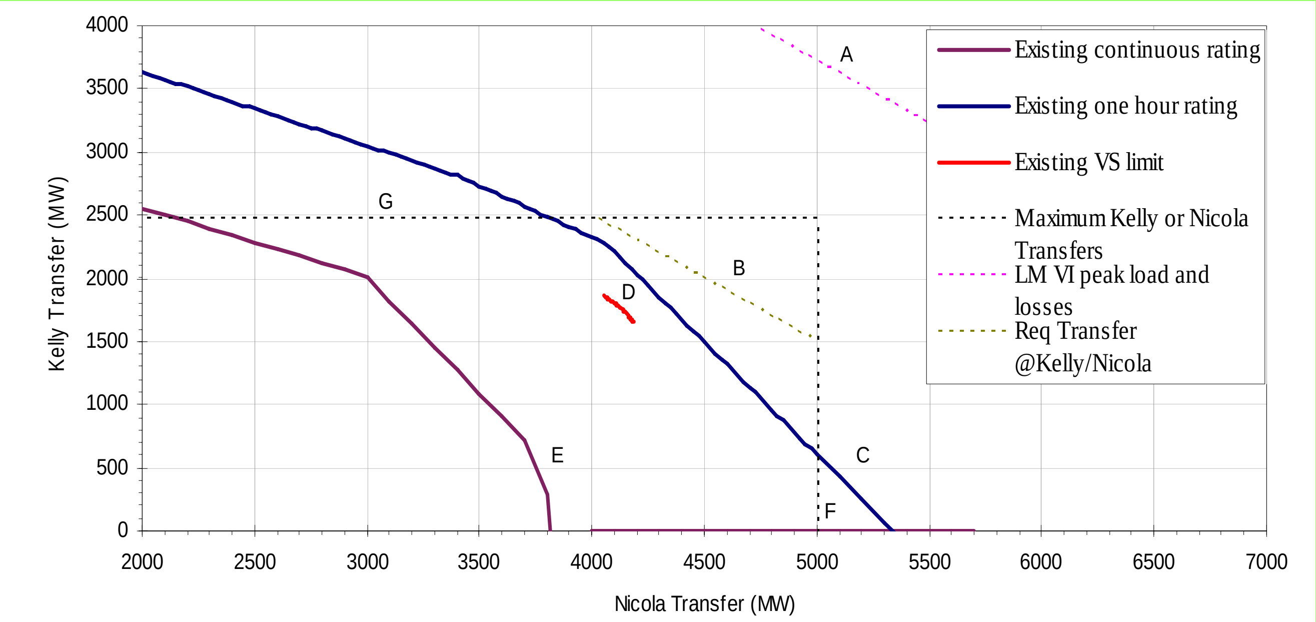


In 2014\15, Burrard Generating Station and the CE are no longer forecast to be available to be dispatched as Coastal Generation. The dispatch of the remaining dependable Coastal Generation results in the KLY and NIC transfer line (line B) being above the continuous rating of the system (line E) and the voltage stability limit (line D). Under this scenario, the ATC is negative by about 1250 MW and illustrates the need for increased transfer capability on the ILM grid in 2014.

5.2.2.2 ILM Nomogram for CRP 2

ILM transfers for CRP 2 for the years 2013 and 2014 are shown in Figures 5-11 and 5-12, respectively.

Figure 5-12. ILM Nomogram CRP2 F2015



In 2014\15, Burrard Generating Station and the CE are no longer forecast to be available to be dispatched as coastal resources under CRP 2. The dispatch of the remaining Coastal Generation results in the KLY and NIC transfer line (line B) being above the continuous rating of the system (line E) and above the voltage stability limit (line D). The ATC of the ILM grid is negative by about 1500 MW and this illustrates the need for the ILM reinforcement in 2014.

5.2.2.3 ILM Cut-Plane Observations for LTAP and Contingency Portfolios

(a) An increase in ILM transfer capability is needed at its earliest in-service date of 2014 for the Amended LTAP portfolio as well as for the Commission approved CRPs 1 and 2.

(b) In the absence of Burrard Generating station and the CE by 2014, all three portfolios exceed the existing continuous thermal limits of the existing ILM grid.

(c) All three portfolios exceed the existing voltage stability limits without Burrard Generating Station.

The need for increased transfer capacity on the ILM grid was also analyzed in the 2004 NITS studies, in studies prior to the submission of the BC Hydro's 2006 IEP application, and in studies during BC Hydro's 2006 IEP/LTAP proceeding. All of these studies used the N-1 thermal nomogram with one hour thermal overload rating of the existing ILM grid to determine timing of the peak hour negative ATC of the grid. Each study was conducted based on the latest set of available load forecasts, the most likely resource scenarios, and the firm export possibilities at the time of study. The analysis data and assumptions are listed in Table A-3.

Table A-3. Analysis Data and Assumptions

	Studies	**Load Forecast**	**Resource Portfolios**	**Export Western Inter-tie**
1	NITS2004 (8 scenarios)	October 2004 coincidental normal and high	Base resource plan, Alternative 1, Alternative 2, Alternative 3	230 MW and 730 MW
2	Before 2006 IEP Submission (17 scenarios)	December 2005 coincidental normal and high	Coal, Low air impacts, Low land impacts, Diverse technology, 100% Green, Low cost (mid GHG), Low cost (GHG@ $10/tonne), Maintain Burrard, Low cost (3000 GWh import), Maintain Burrard for capacity, Low cost without Site C, Burrard re-powering, Low cost (up to 6000 GWh imports), Security of supply with insurance, Low air impact w/o EE3 or 4 or 5, Security of Supply, Low cost impact w/o EE3 or 4 or 5	230 MW
3	During 2006 IEP Submission (18 scenarios)	December 2006 coincidental normal and high	LTAP+Max Interior Dispatch, CRP1+Max Interior Dispatch, CRP2+Max Interior Dispatch, LTAP+Max Interior Dispatch+BGS repowering, CRP1+Max Interior Dispatch+BGS repowering, CRP2+Max Interior Dispatch+BGS repowering, LTAP+Max Interior Dispatch+BGS repowering+CE, CRP1+Max Interior Dispatch+BGS repowering+CE, CRP2+Max Interior Dispatch+BGS repowering+CE, LTAP+Dep Interior Dispatch, CRP1+Dep Interior Dispatch, CRP2+Dep Interior Dispatch, LTAP+Dep Interior Dispatch+BGS repowering, CRP1+Dep Interior Dispatch+BGS repowering, CRP2+Dep Interior Dispatch+BGS repowering, LTAP+Dep Interior Dispatch+BGS repowering+CE, CRP1+Dep Interior Dispatch+BGS repowering+CE, CRP2+Dep Interior Dispatch+BGS repowering+CE	230 MW

These nomograms illustrate that 5L83 and UEC alternatives provide higher incremental ILM thermal transfer capabilities from the NIC side. The 5L46 circuit enhances thermal transfer capabilities from the KLY side but has limited impact on the NIC side.

In BC Hydro's Amended LTAP, CRP1, and CRP2, most of the future resources would be in the South Interior region. Transferring dependable capacity of these resources to the LM and VI would require improvements in the transfer capability of the ILM grid from the NIC side. Consequently, 5L83,and UEC would better match the LTAP, CRP1, and CRP2 requirements from a thermal perspective and 5L83 would be a better voltage stability match. In a longer planning horizon, it is likely that 5L46 will still be needed to address requirements for increased transfer capability from the NI, but that is not the present need.

5L46 would also not reduce system losses to the same extent as 5L83. Estimated annual losses, at 6750 MW ILM flow and 2000 MW flow from KLY, are forecast to be 1009 GWh for a 5L46-reinforced ILM grid as compared with 882 GWh with a 5L83-reinforced grid.

5L46 would likely require new ROW for most of its 203 km. 5L46 was also found to require more double outage generation shedding and load shedding than 5L83 or alternatives addressing ILM transfer capability from the NIC side.

2.3 New Line NIC to ING

NIC to ING is expected to have similar performance to 5L83 from a one-hour thermal, continuous thermal, and voltage stability perspective. Therefore, it would address the need for incremental TTC of the ILM grid. NIC to ING would also be expected to have similar loss performance to 5L83 and, as discussed below, would be superior to UEC in this respect.

Terminating the new line at ING would increase the firm transfer capability to ING relative to 5L83 (terminating at MDN). This could facilitate additional electricity trade opportunities on the western inter-tie. However, the domestic load requirements and firm export commitments would be met by the increased transfer capability provided by 5L83.

Comparison of these two alternatives indicated that:

(a) For peak hour operating points when KLY transfers are between 1000 MW and 2000 MW, the continuous thermal capabilities of the UEC and 5L83 alternatives vary between 6000 MW and 6570 MW for UEC and between 6220 MW and 6750 MW for 5L83.

(b) For most peak hour operating points, the thermal overload capacities of the 5L83 and UEC alternatives are similar.

(c) With the addition of 470 MVAr reactive power support, the 5L83 and the UEC alternatives would increase the voltage stability of the ILM grid to 7120 MW and 6355MW respectively. Higher voltage stability levels for both alternatives would require excessive reactive power reinforcements and are not considered efficient.

(d) Compared to the UEC alternative, 5L83 would save approximately 307 GWh/yr in the ILM transmission losses.

(e) For energy valued at $74.0/MWh, the PV of costs for 5L83 would be $373.4 M less than the PV of costs for UEC alternative. The difference in the PV of costs is mainly attributed to lower transmission energy losses associated with 5L83.

(f) Building 5L83 in 2014 and following it by a limited number of UEC upgrades in 2020 would be less expensive than implementing the UEC in 2014 and delaying 5L83 to 2019. The difference in the PV of costs between the two long-term planning sequences would be approximately $150 M and would be mainly attributed to the 5L83 transmission loss savings between 2014 and 2019.

(g) Double outage generation shedding requirements for 5L83 would be between 450 MW and 1255 MW less than similar requirements for the UEC alternative.

(h) Double outage load shedding requirements for 5L83 would be between 325 MW and 1060 MW less than similar requirements for the UEC alternative.

(i) Both 5L83 and UEC reinforcement alternatives would make similar improvements in the EENS performance of the bulk transmission grid.

not be able to increase the voltage stability limits of the system beyond approximately 6272 MW to 6355 MW and a new transmission line would eventually be required in combination with new reactive reinforcements to maximize the capability of the ILM grid.

In the second part of the study, the ILM voltage stability limits are determined if 5L83 were added. Voltage stability and thermal reinforcements are then determined to maximize the capability of the five line system.

Finally, voltage stability and thermal limits are determined should 5L46, a sixth line, be added to the ILM grid and further reactive and thermal enhancements are determined to maximize the voltage stability and thermal limits of the six line system.

The 500 kV transmission system configurations in 2016, 2026 and 2036 are provided in Appendix A.

Horizon year studies by their very nature are forward-looking and uncertain. The selection of future options is determined by using BCTC's knowledge of the transmission system and by examining the most likely and practical reinforcement options with existing information. In the absence of full information, horizon year studies provide important information to demonstrate that mid-term reinforcements are compatible with a long term vision of the transmission system.

2 STUDY ASSUMPTIONS

2.1 The Study Year of Interest

To assess the voltage stability limit of the existing ILM grid and compare the voltage stability limits among several possible transmission system upgrade options in near-term, all of the near-term study cases were developed from the original F2009 PSS/E heavy winter base case. 2016 is selected as the mid-term case and 2026 and 2036 are the horizon year study periods.