Island Residents Against High Voltage Overhead Lines

Final Submission

British Columbia Transmission Corporation
2005 Transmission System Capital Plan
F2006 to F2015

July 6th, 2005
IRAHVOL’s over 1500 members and supporters fully understand and agree with the need for increased capacity on Vancouver Island and do not oppose an additional transmission link in principle.

Based on the load forecast for Vancouver Island issued by BC Hydro (October 2004), it appears that the need for increased capacity on Vancouver Island, the main objective of Vancouver Island Transmission Reinforcement Project (VITRP), could be addressed in the short term by a combination of strategies other than the VITRP, such as side demand management, local generation, other transmission projects.

If the Commission and intervenors are provided with sufficient evidence that an additional transmission link is required between the Mainland and Vancouver Island, then BCTC should select a route that satisfactorily addresses the objectives of VITRP, the concerns of affected communities and the requirements of the regulatory agencies involved, using the best technology available.

From initial notification of the project on January 20th, 2005 IRAHVOL, representing Gulf Island residents, have been seeking a better alternative to VITRP. BCTC has not provided sufficient evidence to prove that the choice of Alternating Current (AC) technology is the most cost effective, reliable, and least impactfull to communities and the environment in comparison to High Voltage Direct Current Light™ (HVDC Light™) technology, a trademark of Asea Brown Boveri (ABB), at the currently available ratings. IRAHVOL recognizes the difficulty in keeping abreast of a technology that is rapidly improving, however IRAHVOL believes it is BCTC’s duty to reconsider its planning decision of the last few years as better options become available.

IRAHVOL has presented directly and through the BCUC intervenor’s process its findings to BCTC and has requested to participate in the planning process for increased capacity on Vancouver Island. However, BCTC has not allowed for effective public consultation and participation, has not responded satisfactorily to our requests and, by planning to submit an application for a certificate of public Convenience and Necessity unchanged from its original plans, appears to not have considered the compelling evidence submitted by IRAHVOL and other intervenors during the 2005 Capital Plan proceedings.

IRAHVOL therefore finds that the only way to see efforts and public money be redirected to the best option available is to request the Utility Commission NOT to approve funding to continue and complete the definition phase for the VITRP and request BCTC to engage in a multi-stakeholder evaluation of alternatives using Multiple Account evaluation methods to address Vancouver Island increased electricity requirements in a cost effective, reliable manner that satisfactorily addresses all stakeholders needs.
Application

BCTC has filed its 2006 to 2015 Capital Plan with the British Columbia Utilities Commission (“BCUC”)

- The Plan includes expenditures related to VITRP and other system expenditures on the Lower Mainland and Vancouver Island areas.

- As part of its filing BCTC is asking for an order approving VITRP “Post-2005 Definition Phase” expenditures in the amount of $5,182,000.

- As part of its filing BCTC is also asking for an order approving several other capital expenditures, some of which may not be necessary or may be deferred with the installation of HVDC Light™ converter stations on the Mainland and on Vancouver Island.

Some of the above mentioned expenditures are: Ingledow – 230 kV Static Var Compensator (Definition Phase) expenditures in the amount of $524,000, Meridian Substation – Land Purchase expenditures in the amount of $160,000 for the future installation of a static Var Compensator, Goward Substation – 230/138 kV Transformer Addition expenditures in the amount of $5,539,000, Colwood Substation – 138/25 kV Transformer Addition expenditures in the amount of $1,060,000, Unidentified Future Capital plan expenditures in the Lower Mainland and Vancouver Island: Unidentified Future Area Reinforcement projects in the amount of $95,000,000, unidentified Station Expansion and Modifications in the amounts of $9,000,000, Unidentified Future Transformers in the amounts of $15,000,000, Underground and Submarine Cable Life Extension and Rating Restoration Program in the amounts of $5,300,000, VIT and Arnott Cross Contamination Issues expenditures in the amounts of $3,208,000.

- VITRP proposes to replace two 138 kV transmission lines using a fifty year old right of way. The first phase (projected for 2008) would have two new transmission AC circuits, one operating at 230kV and the other at 138kV. The second phase proposes to upgrade the 138kV circuit to 230kV.

- The main objective of the entire project is to provide 1200 MW of capacity to supply Vancouver Island loads

- The existing transmission infrastructure crossing Galiano, Parker and Salt Spring Islands is at or near the end of its useful life.

- VITRP is deficient in the following respects:
  - It will perpetuate and intensify the harmful qualities of the existing system, to the continuing detriment of the communities through which it passes

  - BCTC's case for increased supply to Vancouver Island does not give adequate or any weight to a number of strategies, including:
    - Demand-Side Management by commercial and domestic customers
    - purchase of electricity generated on Vancouver Island using renewable resources (Knob Hill Wind Farm on Vancouver Island as an example, has already received an Environmental Certificate for generation of 450MW)
    - supply from the Juan de Fuca inter-connector planned to be in service in December of 2007 (see schedule A1)
- HVDC Light™ is superior to the proposed AC technology in terms of reliability, ancillary system benefits, impact on communities and the environment but BCTC has not adequately analysed or considered HVDC Light™ as an alternative for VITRP. HVDC Light™ is a voltage source converter technology, developed in the 1990s, fundamentally different from traditional High Voltage Direct Current (HVDC) in its valve components, its ability to independently control active and reactive power, and in its polymer solid core cables used for underwater and underground transmission between two modular converter stations.

- The costs of the two proposed technologies have not been compared on the basis of a complete build-out of phases one and two of BCTC’s VITRP proposal or the use of HVDC Light™ Modules M6, M8 or M9 (single circuit transmission systems rated at 550MW, 720MW and 1100MW respectively).

- Approval of VITRP in its present form commits BCTC to the use of AC technology for the next 50 years or more and eliminates the possibility of adopting a more desirable alternative

- BCTC has not allowed for effective public consultation and participation nor has it responded satisfactorily to IRAHVOL’s requests for information and co-operation

- The use of HVDC Light™ can meet the objectives of VITRP and other planned transmission projects, the requirements of regulatory agencies, and satisfy the concerns of communities directly affected by VITRP

- IRAHVOL’s preferred alternative is a 300kV 720MW single circuit HVDC Light™ transmission link between the Mainland and Vancouver Island. This would permit the removal of all existing HVDC circuits and terminals, removal of all existing submarine AC cables and removal of all AC overhead lines from the lower mainland to the Salt Spring Island substation. Electricity would be supplied to the southern Gulf Islands from Vancouver Island using the existing right of way from the Vancouver Island Terminal near Duncan to the Salt Spring Island substation.

- BCUC should deny BCTC further funding for continuation of the VITRP definition phase and should require BCTC to engage in an objective evaluation of alternatives to address the needs VITRP is designed to satisfy. It is crucial that such an evaluation include an independent assessment of the technical and cost aspects of the various alternatives, that it be respectful of and responsive to the needs of interested parties and that it give those parties every opportunity for meaningful participation in the process.

- BCUC should deny BCTC further funding of other planned transmission projects that could be replaced or deferred by the installation of HVDC Light™ converter stations on the Mainland and Vancouver Island until they have been assessed by facilities studies.

**BCTC’s Submission:** BCTC prepared a summary document entitled “Vancouver Island Transmission Reinforcement (VITR) - Gulf Islands Alternatives Evaluation”. This was made available at a public meeting held June 4, 2005 on Salt Spring Island and is assumed to represent BCTC’s most current thinking. This document, especially as it relates to HVDC Light™ and routing options, is biased and inaccurate. The analysis of the alternatives is incomplete or flawed and viable options have not been presented. The following table and the accompanying schedules contain IRAHVOL’s detailed analysis and critique of that document.
<table>
<thead>
<tr>
<th>Issue</th>
<th>BCTC Position</th>
<th>IRAHVOL Position</th>
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| Community Involvement       | BCTC announced its plans for VITRP in January of 2005. It held two public meetings on Salt Spring (February and June 2005) | BCTC (and BC Hydro before it) has had VITRP under development for a number of years. It is a project of great significance to the residents of the Gulf Islands and we must be given every opportunity to understand the proposal, to ask questions, to have reliable answers to those questions and to have our suggestions and points of view treated with respect. We must live with the consequences of this project for the rest of our lives.  
It is IRAHVOL’s position that there has been a deficient public participation process with far too little time for the issues to be thoroughly presented, understood, challenged and resolved. Local government representatives have not had the chance for meaningful consultation nor has there been adequate regard paid to the unique nature of the Gulf Islands.  
There is an opportunity now for this project to be redirected so that those affected can be confident that the entire process has been conducted fairly and openly without any predetermined outcomes. |
| Options presented           | BCTC recommends a base case as well as Options 2 to 5, which were all shown to be deficient in various aspects (see schedule “A”) | There are at least four viable options that BCTC failed to present or analyze (see schedule “B”). Each comprises a 550 MW (Modules M6) or 720 MW (module M8) single circuit HVDC Light™ system underground along roadways and/or existing rights of way on the mainland and Vancouver Island and having a submarine component as follows:  
• Option 6: Ingledow Terminal (ING) to Pike Terminal - Boundary Bay through US waters, south of Saturna and Pender Islands and into Saanich Inlet via Satellite Channel (using a portion of the right of way previously surveyed for the proposed GSX pipeline)  
• Option 7: Arnott (ARN) to Vancouver Island Terminal (VIT) - English Bluff in Tsawwassen to underground crossing on Northern Galiano, north of Salt Spring Island to Crofton  
• Option 8: Cypress to VIT – across the Georgia Straight to underground crossing on Northern Galiano, north of Salt Spring Island to Crofton,  
• Option 9: Cypress to Harmac – across the Georgia Straight, north of Gabriola to Duke Point. |
<p>| Existing overhead HVDC Line | Existing HVDC circuits will remain in all cases                                | BCTC intends to zero-rate the existing HVDC circuits for planning purposes in 2007, but continue to operate them at 240MW to supply Vancouver Island. |</p>
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<td></td>
<td>ABB’s HVDC Light™ single circuit ratings of 720 MW (modules M8) and 1100MW (module M8) would permit the decommissioning of the existing HVDC circuits:</td>
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<td>(a) Module M9 would provide 1100MW capacity with one single circuit comprising two cables and two converter stations. This would provide the capacity planned for VITRP in one phase and eliminate the need to maintain the old HVDC System</td>
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<td>(b) Module M8 would provide 720MW capacity with one single circuit comprising two cables and two converter stations. This would provide capacity equivalent to the proposed 230kV first circuit plus the existing HVDC circuit and thus permit the immediate removal of that circuit.</td>
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<td>Both of these options would result in cost savings through the reduction of operating costs for maintenance of the old and technically obsolete HVDC system. The first option would avoid the duplication of some capital costs that would result from phasing VITRP.</td>
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<td>138kV lines now in place</td>
<td>Under the four BCTC options (other than its base case), one or both of those lines would remain</td>
<td>BC Hydro engineers who prepared “BC Hydro Project Planning Report 230kV Transmission Circuit From ARN to VIT”, submitted by BCTC as a response to 2005 TSCP IR#1 Page. 16 (see schedule “C”) as well as professional engineers who were consulted directly disagree with BCTC. If sufficient new capacity is available on Vancouver Island to supply Salt Spring and Galiano, there is no need to retain 138kV cables and overhead lines from Salt Spring Substation (SAL) to ARN. Salt Spring can be supplied with the same reliability via existing 138kV lines from VIT and all Southern Gulf Islands, including Galiano, can be supplied from SAL by new higher capacity 25kV lines and cables. All existing 138kV cables and overhead lines between SAL and ARN can be decommissioned. This would result in considerable revision of statements made by BCTC in tabulation for options 3,4,5 under “comments”, “environmental effects”, “visual impacts”, “first Nations” and “electromagnetic fields”</td>
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<td>Environmental Effects</td>
<td>Low for the base case and higher for all other options</td>
<td>The most evident environmental effects of the existing transmission link are relative to the footprint of the submarine cables, the overhead lines and converter stations. In BCTC’s base case, three new 230kV cables would replace three of the existing 138kV cables. The remaining four AC cables and the five DC cables laid in Georgia Strait and Trincomali Channel would be retained. The existing two sets of overhead AC lines and towers would be replaced by single steel poles carrying both circuits. The existing HVDC overhead lines and towers would be</td>
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The base case environmental impacts would not materially change from the existing ones; with the marine cables occupying an area of roughly 30Km X 10Km and the overhead lines continuing to occupy a corridor 60m (175ft) wide and 35Km long right of way, with about 4Km underground in Tsawwassen.

The base case would perpetuate the impact on natural vegetation cover originally cleared when the existing overhead lines were installed. This clearing has led directly to the proliferation of Scotch Broom, now a common invasive species in the Gulf Islands. Broom has not only choked out native species but its presence has contributed, in unmanaged areas, to a significant increase in fire hazard by providing an extremely flammable path for fire to move across the Gulf Islands during dry summer months.

IRAHVOL’s preferred option is a 300kV 720MW HVDC Light™ transmission link with supply to the southern Gulf Islands from Vancouver Island.

IRAHVOL’s preferred option would feature the following:

- removal of all existing HVDC circuits and terminals
- removal of all existing submarine AC cables
- removal of all AC overhead lines from the lower mainland to the Salt Spring Island substation, with the retention of existing 138kV circuits from VIT to SAL substation (about 13 km)
- return of a substantial portion of the rights of way to natural vegetation
- direct burial of two bundled HVDC Light™ cables in a single 1-3 ft. wide trench along roadways or existing right of way
- a submarine installation of two bundled HVDC Light™ cables laid on the sea bed or in a single 1-3 ft. wide trench
- Converter stations at existing terminal locations with a smaller footprint than conventional HVDC stations - see Schedule “D” for specific details.

It is unclear what basis BCTC has used for these assessments.

It is clear that HVDC Light™ sea cables are preferable to the proposed fluid filled AC cables because of the hazards of alkyl benzene fluid that fills the cables. The existing
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<td>around islands</td>
<td>cables have been leaking for a number of years. BCTC proposes to replace them all by 2018 but the new cables will also be fluid filled and subject to leaking through deterioration or physical damage. In contrast, HVDC Light™ cables have a solid core. They can be bundled and micro jetted or trenched under the sea floor to a depth of 6 feet in 12” wide trenches. This placement avoids damage from ships’ anchors. Additionally, in areas where there are sensitive marine ecosystems, cables can be installed using directional drilling techniques.</td>
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**Electromagnetic fields (“EMF”)**

For the base case EMF would be lower than existing levels at the edge of the right of way and would not change from present levels for the HVDC light™ options

Assuming all existing 138kV cables and overhead lines can be decommissioned from ARN to SAL, as explained above, EMF levels would be substantially reduced in all options 4,5,6,7,8,9.

HVDC Light™ is a direct current technology which does not generate Extremely Low Frequency (ELF) EMF. Static EMF, generated by DC current, cancel out since cables are laid in pairs with currents in opposite directions.

Generally speaking, IRAHVOL has found BCTC’s responses to questions about EMF incomplete and not supported by facts. As an example:

- The report commissioned by IRAHVOL submitted to BCTC as part of 2005 TSCP IR#1 showed average approximate readings of 6 to 11 mGauss under the existing AC circuits and 1 to 2 mGauss at the edge of the right of way

- BCTC provided IRAHVOL with EMF estimates for its base case proposal, which would increase existing levels almost ten folds (about 80 mGauss under the lines and 8 to 16 mGauss at the edge of the right of way). These estimates were also submitted as part of 2005 TSCP IR#1.

- On May 20, 2005, BCTC in its response to IR#1 advised IRAHVOL it did not have sufficient information to comment on the reported readings

- At the June 4, 2005 public meeting held on Salt Spring Island, BCTC’s representative stated estimated EMF levels would be about 80mGauss under the lines but only 2mGauss at the edge of the right of way, much less that what was initially estimated.

IRAHVOL questions the accuracy and credibility of BCTC’s claims regarding estimated and existing EMF levels.
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| Visual Impact       | Reduced for base case because of fewer and narrower structures to replace existing lattice poles. HVDC Light™ options would have the same visual impact as the current facility | In assessing the HVDC Light™ options, BCTC again assumes that both 138kV overhead lines would remain. As stated, IRAHVOL’s preferred option would allow removal of all existing HVDC lines and aged converter stations. The present 138kV lines would be removed from ARN to SAL thus leading to the eventual elimination of all visual impact from overhead lines along a substantial portion of the right of way.  
The land portion of the HVDC Light™ circuit on the lower mainland and Vancouver Island would be buried along roadways or existing right of ways. No electric or magnetic clearance is required from the cables. HVDC Light™ converter stations will be enclosed in a warehouse style building with all AC and DC filters and converter reactors out of sight. |
| First Nations Interests | Low impact for base case and medium to high impact for HVDC Light™ options | BCTC’s assessment seems to be an assumption unsupported by any evidence seen by IRAHVOL.  
First Nations communities may share the concerns of all other communities affected by VITRP. IRAHVOL would expect they would also support the alternative HVDC Light™ technology on the basis of its superior environmental, health, and socio-economic impacts. |
| Seismic Stability   | Good for base case poor and very poor for HVDC Light™ options                  | IRAHVOL’s preferred options 6, 8, and 9, rate well for seismic stability of both the converter stations and the routing between the lower mainland and Vancouver Island which minimizes transit through liquefaction areas of the Fraser delta and fault lines in Georgia Straight.  
There is no evidence that BCTC has compared the seismic stability of its proposed alkyl-benzene filled cables with solid-core HVDC Light™ cables, which are, according to ABB, “relatively flexible and can withstand vibration. At the opposite extreme are oil-insulated, pipe-type cables.” Additionally, costs of repair and delay in case of damage have not been compared. |
| Construction Access | Medium for base case and poor for all HVDC Light™ options                     | Comments on construction access are dependent on the choice of route. No comparison was provided for any of the four options IRAHVOL has proposed.  
IRAHVOL has attempted to collect sufficient bathymetric data so that an engineering firm could be retained for a feasibility study and cost estimate of IRAHVOL’s preferred option. To date we have been declined by several firms, on the basis that undertaking such a study could jeopardize their chances for work from BC Hydro or BCTC. Schedule |
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<tr>
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<td>“H” has copies of e-mails from engineering firms declining requests for feasibility studies.</td>
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<td>From IRAHVOL’s limited knowledge of the route options it appears that land portions for Options 6, 7, 8 or 9 could be placed underground along roadways or existing rights of way. Marine portions could be directional drilled or trenched through inter-tidal areas and in high marine traffic areas and laid on the ocean floor in deep water. No difficult passes or high cliff landings would be required for Options 6, 7, 8 or 9.</td>
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<td>Right of Way Acquisition</td>
<td>No issues for the base case and very high degree of difficulty for all HVDC Light™ options</td>
<td>Comparisons must be carried out for IRAHVOL’s proposed Options 6, 7 and 8. It does appear that some portion of the right of way for IRAHVOL’s preferred Option 6 could make use of the GSX right of way already surveyed by BC Hydro. IRAHVOL questions the viability of existing right of way agreements being utilized for VITRP, given the vastly increased scale of the Project, dramatically changed uses of adjoining properties over the last fifty years, the potential for adverse EMF effects on adjoining property and decreased property values. In particular IRAHVOL would like to point to the controversial nature of the intended use of the existing right of way in Tsawwassen for undergrounding as described in the base case (see Schedule &quot;I &quot;).</td>
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<td>Permitting</td>
<td>Medium for base case and high or very high for HVDC Light™ options</td>
<td>BCTC has given no basis for this assessment nor is there any analysis of Options 6, 7, 8 and 9 put forward by IRAHVOL.</td>
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<td>Cost and Schedule Uncertainties</td>
<td>Medium and low for base case and extreme or very high for HVDC Light™ options</td>
<td>IRAHVOL believes that BCTC has not given any serious attention to the currently available HVDC Light™ technology supplied by ABB. IRAHVOL representatives have had extensive discussions with ABB and have found that there are ready answers to the cost and schedule deficiencies suggested by BCTC. There are several examples: * BCTC provided a cost estimate for Option 4 of CAD$401M. As part of 2005 TSCP IR#2 Sea Breeze Corporation submitted a capital cost estimate for HVDC Light™ module 6 (150kV, 530MW ratings) along the existing right of way which is less than half of that amount and is lower than BCTC VITRP base case. * Schedule &quot;K&quot; addresses the issue of scheduling and</td>
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|              | suggests a 20 month period from order to hand-over for HVDC Light installations | • Schedule “L” describes the efficiencies of the HVDC Light™ technology in cable handling and laying  
• To summarize, ABB has advised IRAHVOL that it firmly believes the use of HVDC Light™ for this application is the most cost effective option. ABB provides the same availability and reliability guarantees as with conventional HVDC for higher ratings than those installed to date, and it also provides comparable redundancy in all respects. Schedule “M” contains an e-mail from ABB dated June 2, 2005  
It is IRAHVOL’s position that BCTC’s review of the HVDC Light™ options is biased, out-dated, incomplete, and inaccurate. IRAHVOL recognizes the difficulty of keeping abreast of a technology that is rapidly improving, however we believe it is BCTC’s duty to reconsider its planning decisions of the last few years because better options have become available. IRAHVOL regrets that BCTC has so far missed the opportunity to seriously evaluate the credible options offered by this technology and appears to be narrowly focused on a technology that has many disadvantages. It is surprising that BCTC, with all its resources, has apparently been unable or unwilling to assemble and assess the HVDC Light™ data and costs obtained by our poorly-funded, unpaid volunteer organization. |
| Operating Costs | Lowest with base case and significantly higher with all HVDC Light™ options. | During IRAHVOL’s discussions with ABB, ABB stated that the costs for maintaining HVDC Light™ are less than those for conventional HVDC as there are fewer, simpler transformers and no need to switch reactive power compensation with load variation.  
IRAHVOL has no indication of the basis on which BCTC made its comparison of operating costs but states that such a comparison should include:  
• maintenance of oil-filled cables, overhead lines and substations  
• transmission losses (including losses from shunt reactive compensation and phase angle regulators)  
• operating costs from installations of components used for voltage support and system stability that can be replaced by HVDC Light™ converter station’s ancillary benefits |
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<tr>
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<td>Relative Cost</td>
<td>As stated above, BCTC's conclusions as to construction and operating costs are not reliable as they are based on out-of-date, incomplete, inaccurate or suspect information. The assessment of relative costs, which is built on that base, is equally unreliable.</td>
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<td>Other Factors</td>
<td>IRAHVL believes that BCTC has not included consideration of safety, system stability and completion of both phases of VITRP at the same time. Safety concerns in regards to overhead lines include hazards to humans from falling towers or lines, vehicle collisions with towers, aviation and large bird hazards. Because all cables are buried HVDC Light™ systems are safer. All of the proposed options must be assessed on the basis of system stability which will have both quality and cost consequences over the lifetime of the chosen option. It is IRAHVL’s contention that such an assessment will demonstrate the superiority of the HVDC light™ options in this additional fashion. BCTC has proposed a two phase project. Recent indications are that there is an intention to substantially accelerate Phase 2. (see page 8, “System Impact Study For BC Hydro Distribution NITS 2004 – Stage 3 (Final) Report # SP2005 – 06 May, 2005”) IRAHVL suggests that an analysis of the project using an HVDC Light™ system to deliver the currently planned ultimate rating will support the use of that technology, not only on an overall cost basis, but also for all the other benefits that are of critical importance to the well being of our communities.</td>
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The Bonneville Power Administration and the Office of Electricity Delivery and Energy Reliability, both organizational units within the U.S. Department of Energy, have received requests for approval of a proposed international transmission line that would link Vancouver Island, British Columbia, with the Olympic Peninsula in Washington state. Both BPA and OEDER need to respond to these requests.

Project Description

Sea Breeze Pacific Juan de Fuca Cable LP is proposing to install a high voltage direct current electric power transmission line between Vancouver Island in Canada and Port Angeles on the Olympic Peninsula in the United States. This 550-megawatt transmission line would cross the international border beneath the Strait of Juan de Fuca, and would be constructed using a combination of underground and submarine cables.

Proposed Agency Actions

BPA’s proposed action for this project is to execute an agreement with Sea Breeze that would allow interconnection of the project with the Federal Columbia River Transmission System. The interconnection would be in the vicinity of BPA’s Port Angeles Substation, in Washington, and would include construction of a new converter substation. OEDER’s proposed action is to issue a presidential permit for the proposed project. If granted, the presidential permit would allow construction, operation, maintenance and interconnection of the project at the United States International Border.

Working with the Community

DOE works with public agencies, interest groups, tribes and private property owners to determine project issues and impacts. DOE would like to hear your concerns so that they can be incorporated into our consideration of the proposed project.

Environmental Documentation

DOE is now beginning preparation of an Environmental Impact Statement under the National Environmental Policy Act. This EIS will address the potential environmental impacts of DOE’s proposed actions related to the proposed project.

As part of the EIS process for this project, DOE is conducting public scoping to help determine the scope of issues to be addressed and potential significant impacts to be analyzed in the EIS. Written comments will be accepted at any time during the public scoping period for the EIS. To ensure that your comments are reflected in the EIS, please submit your comments by June 8, 2005. Comments should be mailed to: Bonneville Power Administration, Communications – DM-7, P.O. Box 14428, Portland, OR, or e-mailed to comment@bpa.gov.

Proposed Schedule

DOE expects to release a Draft EIS to the public in winter 2005/06, and a Final EIS by summer 2006. DOE’s decisions concerning the proposed project would be documented in a Record of Decision issued no sooner
than 30 days after release of the Final EIS. If DOE decides to proceed with its proposed actions for the project, Sea Breeze proposes that construction of the project could start as early as June 2006 with an operation date of December 2007.

Questions or Comments

If you have questions or would like more information about the project, or would like to receive future announcements on the project, please contact BPA toll free at 1-888-276-7790 or visit BPA’s TBL Web site at http://www.transmission.bpa.gov/PlanProj/Transmission_Projects/.
### VANCOUVER ISLAND TRANSMISSION REINFORCEMENT (VITR) – GULF ISLANDS ALTERNATIVES EVALUATION

<table>
<thead>
<tr>
<th>Date</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
<th>Option 4</th>
<th>Option 5</th>
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<tr>
<td><strong>June 4, 2005</strong></td>
<td><strong>BASE CASE</strong></td>
<td><strong>Same as BASE CASE</strong></td>
<td><strong>Conventional HVDC</strong></td>
<td><strong>&quot;HVDC Light&quot; on Existing ROW</strong></td>
<td><strong>&quot;HVDC Light&quot; submarine bypass</strong></td>
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<td><strong>230 kV overhead line on Existing ROW (VIT to ARN), UG in Tsawwassen</strong></td>
<td><strong>except for underground in selected areas on Salt Spring and Galiano Islands</strong></td>
<td><strong>Galiano and Salt Spring Islands, VIT to Inglisow</strong></td>
<td><strong>VIT to Inglisow</strong></td>
<td><strong>Galiano and Salt Spring Islands, VIT to Inglisow</strong></td>
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<td><strong>COMMENTS</strong></td>
<td><em>In all cases, the existing overhead HVDC Line would remain</em></td>
<td><em>One of the existing 138 kV lines would remain until 2018</em></td>
<td><em>Both existing 138 kV lines would remain, new overhead HVDC lines on VI, in Delta</em></td>
<td><em>Both existing 138 kV lines would remain</em></td>
<td><em>Both existing 138 kV lines would remain</em></td>
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<td><strong>ENVIRONMENTAL EFFECTS</strong></td>
<td>Low</td>
<td>Medium (blasting &amp; excavation, wells, stream crossings, etc.)</td>
<td>Much higher impact in marine environment and high for 2 large converter stations, one new cable terminal on VI and a new corridor to VIT</td>
<td>High impact for third submarine crossing, 2 large converter stations, two new cable terminals (near Crofton or Cowichan FN), and new corridor on Salt Spring and VI (plus blasting &amp; excavation, wells, stream crossings, etc.)</td>
<td>Much higher impact in marine environment and for 2 large converter stations, one new cable terminal on VI (near Crofton or Cowichan FN) and a new corridor to VIT (plus blasting &amp; excavation, wells, stream crossings, etc.)</td>
</tr>
<tr>
<td><strong>MARINE HAZARDS</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>Very High</td>
<td>High</td>
<td>Very High</td>
</tr>
<tr>
<td><strong>Electromagnetic Fields (EMF)</strong></td>
<td>Lower at edge of ROW</td>
<td>Lower at edge of ROW</td>
<td>Same on Existing ROW</td>
<td>Same on Existing ROW</td>
<td>Same on Existing ROW</td>
</tr>
<tr>
<td><strong>VISUAL IMPACT</strong></td>
<td>Reduced - Fewer and narrower structures, farther from edge of ROW</td>
<td>Reduced - One existing line removed; one remains</td>
<td>No Change</td>
<td>No Change</td>
<td>No Change</td>
</tr>
<tr>
<td><strong>FIRST NATIONS Interests</strong></td>
<td>Low Impact</td>
<td>Low Impact</td>
<td>Medium to High Impact</td>
<td>Medium Impact</td>
<td>Medium to High Impact</td>
</tr>
<tr>
<td><strong>SEISMIC STABILITY (ability to withstand earthquakes)</strong></td>
<td>Good</td>
<td>Good</td>
<td>Good for HVDC-1; very poor for HVDC-2</td>
<td>Poor</td>
<td>Good for HVDC-1; very poor for HVDC-2</td>
</tr>
<tr>
<td><strong>CONSTRUCTION ACCESS</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>Poor on Vancouver Island, very poor in Active or Portier Passes</td>
<td>Poor for submarine crossing of Sansum Narrows and on Vancouver Island, medium elsewhere</td>
<td>Poor on Vancouver Island; very poor in Active or Portier Passes</td>
</tr>
<tr>
<td><strong>ROW ACQUISITION (Degree of difficulty)</strong></td>
<td>None</td>
<td>Medium – add underground rights</td>
<td>Very High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td><strong>PERMITTING (Degree of difficulty)</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>High</td>
<td>Very High</td>
<td>Very High</td>
</tr>
<tr>
<td><strong>COST and SCHEDULE UNCERTAINTIES</strong></td>
<td>Schedule – Low Costs – Medium</td>
<td>Schedule – Low Costs – Medium</td>
<td>Extreme</td>
<td>Very High</td>
<td>Extreme</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS - Stage 1</strong></td>
<td>$226 million</td>
<td>$200 - $332 million</td>
<td>$444 - $466 million</td>
<td>$401 million</td>
<td>$480 - $510 million</td>
</tr>
<tr>
<td><strong>CONSTRUCTION COSTS - Stage 2</strong></td>
<td>$162 million</td>
<td>$240 - $311 million</td>
<td>$191 million</td>
<td>$210 million</td>
<td>$250 million</td>
</tr>
<tr>
<td><strong>Incremental – Both Stages - NPV @ 7% (2008 &amp; 2018)</strong></td>
<td>Base Case</td>
<td>Over the Base Case</td>
<td>Over the Base Case</td>
<td>Over the Base Case</td>
<td>Over the Base Case</td>
</tr>
<tr>
<td><strong>OPERATING COSTS</strong></td>
<td>Lowest</td>
<td>Marginally Higher</td>
<td>Significantly Higher</td>
<td>Significantly Higher</td>
<td>Significantly Higher</td>
</tr>
<tr>
<td><strong>Relative Costs - Overall</strong></td>
<td>Lowest overall cost</td>
<td>Additional cost for each UG segment = approx. $2M + $4M per km</td>
<td>Extremely high cost</td>
<td>Extremely high cost</td>
<td>Highest overall cost</td>
</tr>
</tbody>
</table>
Supply to the Gulf Islands

The purpose of providing a new supply to the Gulf Islands is to free up transmission right-of-way across Galiano Island between TBY and MTG. A secondary benefit is to free-up transmission right-of-way east of SAL on Saltspring Island to mitigate the installation of the 230 kV circuit. Appendix 7 lists the options available to supply the Gulf Island Loads, namely via SAL and GLS. The recommended option is to ultimately supply SAL with two 138 kV connections from VIT. Two 25 kV feeder positions would be installed at SAL and 25 kV circuits would connect SAL to GLS, using the existing DC1 cables and a new 25 kV submarine cable for the Trincomali Channel crossing. With this installed Disconnect the GLS transformer. This would provide a dual 14 MVA supply to GLS at the 25 kV level.

Initially, until the second stage of the 230 kV project proceeds, the two circuits supplying SAL will be existing circuit 1L18 from VIT and the second circuit of the double circuit 230 kV transmission line, operated at 138 kV. The second 230 kV circuit operating at 138 kV could supply SAL and GLS from VIT or ARN. When the second 230 kV circuit is placed into service a second 138 kV connection from VIT to SAL is required. This could take the form of a new single circuit 138 kV transmission line constructed along the new 230 kV or the existing DC1 corridor. Construction of the overhead 230 kV line and terminal stations could have an impact on whether the 25 kV supply to the Gulf Islands proceeds during the first or second project stages.
Daria,  
I have encountered problems in assisting you and your group involved in the route selection process of the proposed addition of transmission to VI.

The main problem lies in the fact that the company that I founded, IHI, is active in the field of conventional overhead transmission typical of what BCTC have in mind for the reinforcement of the supply to VI - 230 kV AC Double Circuit O/H lines with connecting submarine cables. They could be involved in such a project with the result that there could be a perception of a conflict of interest if I were to assist you and your group in assessing other routes despite the fact that I no longer have a direct interest in IHI.

Secondly, and of less consequence, I was anxious to help you receive a fair hearing at a May meeting on the line routing with BCTC. At your invitation I agreed to accompany your group to this meeting having appraised you that I was sceptical as to the other route options that were proposed. In the event the meeting took place without my participation and I saw fit to discard the background material that you provided me at our initial meeting in Duncan in early May.

Frankly I propose that I withdraw my offer of support for your objectives but wish to add that I have considerable respect for your efforts to bring about the results that you seek.

Regards,
Ian Hayward
Mme Zovi,

Taking into account the new corporative orientations concerning the suspension of the marketing activities on the international market and considering the reconcentration of our experts on the internal projects of Hydro-Quebec, we will not be able to answer your request. However, I strongly recommend that you contact the engineering firm of Montreal, SNC-Lavalin which is one of the world’s leading engineering firm and construction companies. This firm works since long years with Hydro-Quebec and could certainly provide the necessary services.

Please contact
Mr. René Couture, 514 393-1000
rene.couture@snclavalin.com

Best Regards,

Raynald Ostiguy

Principal Director Commercialisation
Hydro-Quebec International
Phone: 514 282-8401 ext. 232
Fax : 514 861-6625
740 Notre-Dame Ouest, Quebec, Canada
H3c 3x6
Specifically we would like to receive the estimated cost of a feasibility study for a submarine and underground interconnector from the Lower Mainland to Vancouver Island with capacity for 2X550kV circuits with some routing options. We have a deadline for submission with the Utility Commission Capital Plan application of June 27, 2005.

Best Regards,

Daria Zovi
164 Norton Rd.
Salt Spring BC V8K 2P5
CANADA
ph/fax (250) 537-1429
e-mail:zovi@telus.net

Ted Bishop and Daria Zovi
164 Norton Rd.
Salt Spring BC V8K 2P5
CANADA
ph/fax (250) 537-1429
e-mail:zovi@telus.net
Dear Ms. Zovi,

I am replying on behalf of Mr. R. Couture who is away from the office at the present time.

We have reviewed your request and the background data provided in the two web-sites you gave us.

After careful consideration, we must decline your request to submit a proposal for Consultant services for this project.

Regards,
Tony Turner
Senior Power Systems Engineer
SNC Lavalin. Montreal

-----Original Message-----
From: Daria Zovi [mailto:zovi@telus.net]
Sent: Tuesday, May 10, 2005 12:29 PM
To: rene.couture@snclavalin.com
Subject: Vancouver Island Transmission Reinforcement Project

Hello Mr. Couture, our request for a feasibility study on the alternatives of an all submarine route through the Gulf Islands was referred to you by Mr. Ostiguy of Hydro-Quebec. Please review the information provided and let us know if you would consider this possibility. If you require further information please contact me directly by phone,

Thank you and Best Regards,
Daria Zovi
164 Norton Rd.
Salt Spring BC V8K 2P5
CANADA
ph/fax (250) 537-1429
e-mail:zovi@telus.net
Tsawwassen Residents Against Higher Voltage Overhead Lines
C/O 1558 – 53A Street
Delta, BC V4M 3G2

June 9, 2005

Attention: The Honourable Richard Neufeld, Minister of Energy and Mines

Dear Minister,

Re: Recent BCTC Announcement Regarding Power Line Route in Tsawwassen

Tsawwassen Residents Against Higher Voltage Overhead Lines (TRAHVOL) are seeking clarification from your department on a number of issues regarding the recent announcement by the British Columbia Transmission Corporation (BCTC) to utilize the existing right-of-way in residential areas of Tsawwassen, for new underground high-voltage transmission lines.

As you are aware, BCTC’s recommendation is for these new 230kV lines, with 23 times the power running through them, to be placed through the middle of the private properties of over 170 homes, under the sports field of our high school, under several neighborhood parks, near a day care and extended care facility.

BCTC also announced that one of the two overhead sets of lines will remain in place until 2018, so our community will be burdened with both aerial and underground power lines in the same right-of-way.

We believe, as we believe you do, that the Tsawwassen corridor is a unique situation requiring a unique solution. We continue to work toward a resolution that addresses these specific circumstances.

We would appreciate answers to the following questions:

1. **Is the government going to stand by the commitment made March 17th to the residents of Tsawwassen, that BCTC will not proceed with construction of overhead lines in the existing right-of-way?**

   As per the attached letter, a commitment was made from your department and on behalf of the Premier due to community concerns “BCTC has decided it will not construct new overhead 230 kilovolt lines on the 4-kilometre section of the existing right-of-way in Tsawwassen”. We have since learned from BCTC, who stated on both the Bill Good show June 2 and in the South Delta Leader June 4, that “residents pushing for a more costly underground option could ultimately find themselves back to square one with overhead lines”.
Our MLA, Valerie Roddick indicated to us that she believes these aerial lines are no longer under consideration. Please clarify that your department and the Premier are prepared to stand by this very public commitment made to thousands of residents of Tsawwassen.

2. Why is BCTC proposing a route for which they do not have underground legal rights?

BCTC acknowledges that they currently do not have the legal right to route the new 230 kV lines underground through private properties and that these rights would have to be negotiated with approximately 179 homeowners. They also acknowledge that it is going to be extremely challenging to obtain consensus among the majority of homeowners as these lines will run directly through the middle of many yards and will severely hamper usability and enjoyment of these properties due to a number of concerns and restrictions.

They have recommended this route without rights while at the same time telling residents that we should pay an additional and unsubstantiated $5M to relocate this system to the streets, the logical and proper place for such infrastructures.

Recommending a route to which they have no legal right, then proposing that residents pick up an unsubstantiated amount of additional costs to move it to the streets does not appear to make sound business sense. Surely negotiating for underground rights would not only be costly, but tremendously time consuming and difficult, thus nullifying any purported cost savings, let alone a public relations nightmare. Further, BCTC has provided no assurances that they would consider restoring yards to pre-construction conditions or that residents would have any flexibility on the use of this extensive portion (~75 feet) of our yards.

3. Does BCTC plan to use other means of legal enforcement such as expropriation to force these underground lines through private properties where residents are unwilling to provide consent?

Bruce Barrett, the Project Manager at BCTC has indicated, “there may be other legal means to acquire access rights to properties” (South Delta Leader, June 3).

We wish to make you aware that this statement concerning residents’ homes and properties has raised considerable alarm and ire in the community about BCTC’s intentions and the methods by which they could secure this route. (e.g. expropriation). The suggested potential for expropriation of so many urban residential properties is completely untenable in the 21st century, especially when other alternatives are available.
We ask for clarification from your government that expropriation of urban residential properties, given that several viable alternatives are available, is not appropriate in this situation.

4. Why isn’t BCTC complying with the World Health Organization Precautionary Principle, Prudent Avoidance and other guidelines as previously stated?

BCTC has publicly stated with respect to this project: “We can assure people that we will comply in all respects with the recommendations of the World Health Organization.”

We note that the BCUC recognizes the WHO Prudent Avoidance principle, as stated in the Aquila decision, “The Commission has maintained its policy of “Prudent Avoidance” and recognizes that EMF levels at the closest residence are very low.” (in this case 2mG).

BCTC has stated: “They are well within the internationally accepted EMF exposure limits of 830mG set by the W.H.O.” Sadly they fail to mention that these limits are for short term exposure. This poses a contradiction as the Tsawwassen situation is unique in its close proximity to the lines and is a very long term situation.

TRAHVOL discussed the project details again yesterday with BCTC. They are recommending to the BCUC the construction of two underground systems through the middle of residential backyards and are not considering any sort of EMF mitigation in their engineering plan. We find this callous disregard for mitigation reprehensible considering there are very low cost and effective means by which to reduce EMF levels. For example, a recent PG&E project in San Francisco was installed by simply burying the lines deeper in sensitive residential areas. This reduced the EMF at ground level by 63% with a cost impact of less than 0.45%.

A recent study in the U.S. showed that less than 1% of homes are exposed to EMF levels exceeding 6mG. BCTC has confirmed that the EMF levels of the new underground line will be approximately 150 mG. In addition, we will be subjected to EMFs from the remaining overhead lines currently between 25 and 50 mG in yards and homes along the ROW. These are extreme levels of EMF compared to 99% of residential properties in North America. In addition the proposed high-voltage underground line would run directly under the high school sports field and four local parks subjecting many of the students and teachers of South Delta Secondary and children playing in the parks to excessive levels of EMF on a daily basis.

The World Health Organization classifies EMF as a 2B carcinogen “based on a fairly consistent doubling of risk of childhood leukemia at magnetic exposures above 4 milligauss”. The recently released WHO “Framework to Develop Precautionary Measures” released Oct, 2004 states: “Siting decisions should consider ways to reduce people’s exposure. This includes changes to planning procedures for accessing the
need for siting new lines and changes to planning regimes that effect homes and schools already situated or proposed near new lines”.

A recent study published June 3, 2005 from Oxford University (The Draper Report) confirms this strong connection to exposure to power lines and childhood leukemia. This study, one of the largest ever conducted, examined medical records of 70,000 children over a thirty year period and found that children under 15 years of age living within 200 meters of high-voltage power lines were 70% more likely to develop the disease and those living within 600 meters were 20% more likely. The researchers concluded “there is an association between childhood leukemia and proximity of home address at birth to high-voltage power lines. The apparent risk extends to a greater distance than would have been expected from previous studies”. This study is getting worldwide media and public attention.

Many countries and communities around the world have enacted regulations and legislative banning high voltage power lines from residential areas including Connecticut, California, Germany, Sweden, Spain, Italy and Australia to name a few.

5. Why does BCTC expect the community to fund $5-$13 million dollars for this transmission project to service Vancouver Island?

On May 31st, BCTC also announced that routing the lines through city streets and removing the existing overhead lines in 2008 rather than 2018, would cost approximately $13.5 million dollars, which would need to be funded through the residents.

The Vancouver Island Reinforcement Transmission Project is a massive, provincial project required to provide electrical energy and reliability to Vancouver Island. The total cost to provide this energy includes the Duke Point and Elk Falls Generating Station values at over $500 million and the new line through Delta valued at $230 million for a total of over $700 million.

We do not understand why this kind of project designed primarily to service Vancouver Island residents, should be funded by Tsawwassen families. Given that this project is projected to generate $40 billion in revenue for BC Hydro over the next 60 years, why is such a very small percentage of the capital costs for this massive project falling on Tsawwassen residents, who should not be expected to finance a government initiative that has no benefit whatsoever to the community? Given that $120 million was expended on the failed GSX Pipeline project, it is appalling that BCTC are now asking 200 hard working families to fund a transmission project we are not responsible for nor benefit from.

In addition to the above questions, we would also like to express how deeply disappointed and disturbed this community is with the treatment we have received from BCTC. Despite a
commitment from the former CEO and your ministry, there has been no public consultation with the residents or the municipality on the feasibility and impacts of the route options prior to the public announcement May 31st. In addition we feel we have been given misleading information on the facts associated with EMF, property values, viable alternatives and the implications of the proposed underground route. For example, BCTC has stated that our property values will increase with the installation of this new underground line. Recently, a local credit union declined a mortgage application for a home listed for sale along the right-of-way because of the impending transmission project. This certainly does not support BCTC’s claim of increased value to residents.

We do not feel that alternative route options that would safely relocate this project away from residential areas have been given adequate attention or consideration nor have we been given satisfactory or detailed explanations as to why other proposed routes are not considered feasible. We are also concerned that BCTC has not provided enough time for public input following the May 31st announcement, given that they plan to submit recommendations to the BC Utilities Commission late June. Considering this proposal has been in the works for over twelve years, we feel that rushing this important stage of community consultation for a route we are going to live with for the next 60 years, is not effective or responsible planning.

We have been told that if we don’t either grant legal access and forfeit our rights to our properties, or open our wallets, we will be again be faced with the high voltage 100 feet steel towers our community spend four months fighting against. These heavy-handed, bullying tactics by a crown corporation are appalling and are unacceptable.

We thought our valid concerns about why an industrial scale transmission system is both out-of-place and out-of-scale in a residential neighborhood were understood and accepted. We were led to believe that social, health and economic concerns would be addressed and that BCTC would establish a new route that mitigated impacts on the community. We do not believe that reusing a right-of-way granted over fifty years ago when Tsawwassen was a rural area, fulfills your personal commitment to consider social and health impacts and to “find the route with the least impact on human beings”.
(The Province, March 11)

Sadly, many people in Delta feel that these promises made, were nothing more than a public relations ploy to secure a seat in the recent provincial election. This is unfortunate and is a unfounded negative reaction that has been generated by the tactics of BCTC.

We have come to believe (by our experiences) that BCTC as a large crown corporation feel they can threaten and bully their way to a solution. We request that your government bring reason and consultation back to the table. We remain available for continued consultation to ensure that this project can be built on time, while meeting the needs of the communities impacted.

Since the announcement May 31st there has been a great deal of stress and anxiety in our community regarding the future health, safety and financial security of the residents.
We would appreciate answers to the above questions as soon as possible. Thank you for your consideration.

TSAWWASSEN RESIDENTS AGAINST HIGHER VOLTAGE OVERHEAD LINES

Neil Atchison, P.Eng.
Co-chair
T (604) 318-2825
neil.atchison@telus.net

Cecil Dunn
Co-chair
T (604) 943-9276
cec.dunn@telus.net

cc:
Premier Gordon Campbell
Honourable Richard Neufeld – Minister of Energy and Mines.
Honourable Bill Barisoff – Minister of Water, Lands and Air Protection
Honourable George Abbott – Minister of Sustainable Resource Management
Honourable Shirley Bond – Minister of Health
Honourable John Cummins – Member of Parliament
Honourable Valerie Roddick – MLA Delta South
Honourable Carole Taylor – MLA Vancouver Langara
Honourable Carol James, Leader of the NDP Party
Mayor Jackson and Council – Corporation of Delta
Joan Hesketh - Executive Director, BCEAO
George Harvie – CAO – Corporation of Delta
Delta School Board
Michael Costello, Vice Chair, BCTC
BCTC Board of Directors
Bob Elton – President and CEO – BC Hydro
Jane Peverett, President and CEO - BCTC
Dennis Maniago- Vice President –System Planning- BCTC
Bruce Barrett – Project Manager VITR-BCTC
The Vancouver Sun
The Vancouver Province
Business in Vancouver
The Delta-Optimist
South Delta Leader
3.11 Undergrounding
Except for back-to-back, HVDC Light® always employs HV cables for the DC power transmission. The cables are buried all the way into the DC part of each converter building. When the landscape has been restored after the cable laying, the transmission route quickly becomes invisible.

3.12 No magnetic fields
The two HVDC Light® cables can normally be laid close together. As they carry the same current in opposite directions, the magnetic fields from the cables cancel each other out. The residual magnetic field is extremely low, comparable to the level of the Earth’s magnetic field. Magnetic fields from DC cables are static fields, which do not cause any induction effects, as opposed to the fields from AC cables and lines.

The electromagnetic field around an HVDC Light® converter installation is quite low since all apparatus is located in a building designed to be a very efficient shield. The shielding is needed to minimize emissions in the radiofrequency range, i.e. radio interference. The background is that the HVDC Light® operates with high internal current derivatives and a commutation frequency in the order of 1-2 kHz. Such transients and frequencies might cause radio interference if not properly controlled and shielded. Considering these conditions, the overall and detailed design has been done to ensure proper mitigation of radio interference and corresponding fields. The electromagnetic field levels around the installation are therefore well below values stipulated in appropriate standards for human exposure.

The performance is verified through measurements.

The HVDC Light® converter installation is connected to the AC power grid/system through AC overhead lines or AC cables. Effective filtering prevents current harmonics from loading into the connected AC lines/cables. This means that they can be considered as normal AC lines/cables installed within the power grid/system.

3.13 Low environmental impact
The fact that no electric or magnetic clearance from the cables is needed, and that the converter stations are enclosed in a building, makes the impact of the transmission system on the environment very low. The building can be designed to resemble other buildings in the neighborhood, and the cables are not even visible.

3.14 Indoor design
To avoid high steel support structures, to facilitate maintenance and to improve personal safety, the AC filters, converter reactors and DC filters are mounted directly on low foundations/supports and are kept within a simple warehouse-style building with lockable gates and doors. The building will keep high-frequency emissions and acoustic noise low and protect the equipment from adverse weather.

3.15 Short time schedule
The converter valves and associated control and cooling systems are factory built in transportable enclosures. This ensures fast installation and on-site testing of the core systems.

The building is made up of standardized parts, which are shipped to the jobsite and quickly assembled.

A typical delivery time from order to hand-over for operation is 20 months or less, depending of course on local conditions for converter sites and cable route.
- Deep sea waters
HVDC Light® cables are the best cables for large water depths, by following reasons:

- The polymeric insulation is mechanically robust.
- The HVDC cables are generally less heavy than AC cables for the same transferred power, see above. This gives lower tensile force during laying of the cables.
- It is advantageous to use galvanized steel wires for tensile armour. A galvanized steel wire has better tensile properties than most amagnetic materials that can be used.

- Laying and repair
HVDC Light® cables are very flexible with respect to various installation methods, due to its robust and flexible insulation material. Should a repair be required, the availability of suitable cable ships is thus good.

- The cable can be coiled on a cable laying ship (except for cables with double cross laid armour for large depths). The possibility to coil the cables makes it possible to lay the cable from small barges and transport the cable by freight ships without turntables for the cables.
- It is in most cases possible to lay the two bipolar cables close to each other (e.g. by bundling of the cables) in one common trench.
- The bending radius of the polymeric insulated HVDC Light® cable is smaller compared to paper insulated cables, which makes it possible to use laying ships with smaller pay-off wheel, and also smaller trenching equipment.

- Good resistance when installed
Particularly when comparing with paper-oil insulated cables, the HVDC Light® cables can resist repeated bending without fatigue of the insulation. This is critical for cables hanging in spans over uneven bottoms.

A P P L I C A T I O N S

Typical laying and trenching operation

Coiled cable on small cable laying barge
Daria,  

Here are some comments on the "no viable competition for HVDC Light" argument put forth by BCTC which we discussed the other day. Other comments address your questions on the reliability, availability and maturity of the technology at the higher ratings.

Competition:
ABB is a supplier of both AC and DC solid dielectric cables. ABB is also a supplier of mass-impregnated paper insulated cables. If BCTC goes with AC cables as planned, the number of cables required increases by 50% (3 v 2 cables per 600 MW circuit). Furthermore, each 230 kV AC cable would have to carry about 67% more current than its 300 kV DC counterpart. This means there is actually more potential cable business for ABB with AC cable than with DC cable even if the DC cable route is significantly longer. ABB does not supply a broad range of oil-filled cables in NA, however, if BCTC were to go in that direction.  
ABB is a supplier of AC substation equipment, phase angle regulators, protective relaying and other products which BCTC would be in the market for with their proposed AC cable solution.  
ABB provides both conventional HVDC and HVDC Light technology. Either would work for this application although HVDC Light would provide additional system benefits, e.g., ac system voltage control similar to that provided by a generator. HVDC Light is an alternative to conventional HVDC transmission for cable projects where the length is long enough to pose operational problems for AC. There are competitors for conventional HVDC. Converter station pricing for HVDC Light is comparable to that for HVDC especially when proper credit is allocated to its additional features, e.g., reactive power support, voltage control, no minimum power restriction, lower price cable, relative ease of installing land cables.  
In summary, HVDC Light competes with conventional HVDC and AC transmission. ABB feels that HVDC Light offers BCTC the best value and operational flexibility for the upgraded Georgia Strait transmission with the least impact on the environment.  

It is ironic that BCTC shies away from using an effective solution simply due to a perceived lack of competition when they are the monopoly transmission provider. They could ensure competition by issuing a functional specification for delivery of 600 MW from point A to point B with certain guaranteed performance requirements. Bidders would then be free to offer AC, HVDC or HVDC Light. BCTC et al might be pleasantly surprised by the results.
Rating, Reliability and Availability:
ABB has established a reference list for HVDC Light projects of progressively higher ratings. As the technology has matured reliability and availability have improved. This is true for the more recent projects even though the voltage ratings have doubled and the power ratings have increased sixfold.
ABB guarantees the same level of reliability and availability for HVDC Light systems as it does for conventional HVDC systems.
A higher voltage and power rating than what is in service today is required for HVDC Light to transmit the 600 MW per circuit required by BCTC. The technology remains the same, however. The only difference is in the number of IGBT positions connected in series in the converter and the thickness of the insulation on the cable. The cable is equivalent to commonly used 230 kV ac XLPE cable in terms of its insulation thickness.
ABB is willing to guarantee the same level of reliability and availability for a 600 MW system as for a 300 MW system.
When BC Hydro bought VI pole 2 in the mid '70's, there were only two suppliers in the world of high voltage dc transmission with solid-state (thyristor) valves. At that time neither supplier had ever built a high voltage DC transmission project. Previous experience had been limited to one low voltage back-to-back system and a mercury arc valve replacement. There have been three decades of progress and a broad range of experience since then.

Hope this helps,

Mike

Message from "Daria Zovi" <zovi@telus.net> received on 05/30/2005 10:35 AM

To: Mike P. Bahrman/TPS/USTRA/ABB@ABB
cc: 
Subject: Vancouver Island Transmission routes

Hello Mike, members of our group and local government met with BCTC last week to discuss alternative options. Their point of view is still that the
alternative options are too expensive, not reliable, technically not possible. Unfortunately all their cost estimates are still based on a 330MW HVDC Light system which would require 4 cables to reach the desired capacity of 600MW for phase 1 of the project. We have requested they consider the 550MW or 700MW capacity now commercially available, but the response was that the technology at this capacity is unproven as no project is in service to date.

Would the project be guaranteed by ABB? What are the terms of the guarantee? How does the 550MW and 700MW system differ from the 330MW? Can it in fact be considered a different technology or is it simply a different size cable?

We have approached Transenergie, and SNC Lavalin, without success. We would still like to proceed with a feasibility study done by ABB, which you mentioned could be done in about 2-3 weeks. I have approached a local company called Terra Remote Sensing for a desk top survey of possible routes but would like to have a preliminary look with you at the options to narrow down our route alternatives.

Can you also give us an estimate of the cost of the feasibility study? It may be commissioned to you by IRAHVOL, the Capital Regional District and the Islands Trust our two local governments.

There will be a public meeting with BCTC on Saturday June 4th on Salt Spring to discuss alternatives. Will anyone from your team at ABB be in our neighbourhood, and be able to attend? Can you recommend an engineer that knows the HVDC Light technology that would be able to answer technical questions?

I will call you later, Thanks Daria

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