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7.1 Introduction

The provincial Clean Energy Act (CEA) sets an objective for the province to “be a net exporter of electricity from clean or renewable resources with the intention of benefiting all British Columbians and reducing greenhouse gas emissions in regions in which British Columbia trades electricity while protecting the interests of persons who receive or may receive service in British Columbia”. Section 3 (1) of the CEA sets out the requirements for what the Integrated Resource Plan (IRP) must include with respect to meeting this objective:

(d) a description of:

(i) The expected export demand during a defined period,

(ii) The potential for British Columbia to meet that demand,

(iii) The actions the authority has taken to seek suitable opportunities for export of electricity from clean or renewable resources, and

(iv) The extent to which the authority has arranged for contracts for the export of electricity and the transmission or other services necessary to facilitate those exports;

(e) if the authority plans to make an expenditure for export, a specification of the amount of the expenditure and a rationale for making it.

These requirements are addressed in the balance of this Chapter.

7.1.1 Context

For decades, British Columbia has been a leading North American supplier of clean, reliable and competitively priced electricity. Traditionally, BC Hydro built its power system to meet domestic electricity demand, while Powerex conducted short-term trade using surplus capability in the BC Hydro power system, which provided benefits such as lower electricity rates and hundreds of millions of dollars toward Provincial revenue. This trade activity has, and continues to result in, both imports
and exports of electricity. Importantly, these exports are not the focus of the CEA’s objective to be a net exporter and BC Hydro and Powerex will continue this trade activity to the benefit of BC Hydro’s ratepayers and the Province.

The CEA’s reference to exports is in the context of developing new clean or renewable generation resources in B.C. beyond domestic need for the express purpose of exporting the energy from those resources to electricity markets outside of B.C. Therefore, it is necessary to always distinguish between:

(a) Exports that arise through the sale of surplus capability and the firm and non-firm energy associated with acquiring resources to meet domestic load self-sufficiency requirements; versus

(b) Exports that come from the acquisition of additional generation resources and investment in transmission for the purpose of selling electricity in the U.S. over and above the self-sufficiency requirements.

7.2 Market Opportunities

The following terms are used to describe market opportunities:

- **Electricity Market** – refers to the generation and usage of all electricity that does not have to meet a Renewable Portfolio Standard (RPS). It is and will continue to be the largest market for electricity. There are currently no restrictions on the type of generation that can be used to meet demand in this market. It is served by utilities’ self-generation, long-term contracts and spot market transactions.

- **Renewable Compliance Market** – refers to the generation and usage of renewable electricity that must meet a specified set of criteria, which can include generation type, geographic requirements and other specifications laid out in legislation or regulation. Of the 14 U.S. states in the Western Electricity Coordinating Council (WECC), nine have RPS specifications.
7.2.1 Electricity Market

Since 2002, Powerex has earned approximately $1.7 billion in income driven by leveraging its assets, which include the surplus capability of the BC Hydro system, a long-term North American transmission portfolio, proprietary Information Technology systems and a broad customer base in the U.S. and Canada to profitably move energy between markets. Exports from B.C. self-sufficient energy would be sold in this market.

Opportunities in this market are governed by the overall supply/demand balance and the price of natural gas. Because of North American shale gas developments, there appears to be a relatively flat price profile for natural gas (about $5/MMBtu in 2010 U.S. dollars over the next decade, as per the Low Gas forecast in section 4.4) which equates to $35/MWh to $50/MWh power prices using 7,000 to 10,000 heat rate power plants as the marginal price-setting units. With the exception of Alberta, the combination of the economic recession with the addition of electrical generation for renewable compliance purposes in neighbouring jurisdictions has resulted in an excess supply of generation in these jurisdictions with reserve margins at relatively high levels when compared to the past decade. This keeps prices relatively low due to capacity shortfalls. Lower prices generally imply lower spreads between market regions than has been experienced over the past decade.

There are two areas where positive market opportunities may arise. First, the increase in non-dispatchable generation (i.e., wind) to the grid has the potential to increase price volatility. Recent experience has shown that prices can be driven to low levels (even into negative market prices). This can create a daily spread (i.e., buying power during an hour when prices are lower and selling it back when prices are higher) and regional spread (i.e., buying in a lower-priced region and selling to a higher-priced region). However, these market opportunities now typically are of shorter duration and are much less predictable than in the past as a function of lower natural gas prices and other market conditions. Real-time market intelligence
systems and the ability to transact quickly are key to capturing opportunities in this area. These opportunities however relate more to system capacity and flexibility as opposed to outright energy sales. In a depressed market price environment, having a long energy position developed with exports in mind will reduce system flexibility and make it difficult to avoid selling into some low-priced periods.

The second opportunity would be associated with the potential passage of any U.S. federal climate change legislation or regulations and the Western Climate Initiative (WCI), all of which aim to reduce greenhouse gas (GHG) emissions and/or establish a price on carbon dioxide. The value of these opportunities will be affected by the specifics of the rules, but generally would involve market sales of clean energy to parties using GHG intensive energy such as coal and selling clean or renewable resources to displace those resources.

As discussed in Chapter 4, while U.S. federal GHG legislation appears to be stalled, the Environmental Protection Agency is intending to regulate GHG emissions of new power plants through an emissions standard, which could have an effect on the composition of the U.S. electricity fleet. This could create a market opening for sales of clean capacity-backed resources, but this market opportunity is expected to be quite limited given price competition from Combined Cycle Gas Turbine (CCGT) facilities which are lower priced than B.C.’s renewable resources. In addition, the types of clean or renewable resources that B.C. is best suited to provide to this market (e.g., large and small hydro) are not the types of resources that are currently acceptable in the renewable compliance market as discussed further below.

This carbon market opportunity is more aligned with the long energy position that arises from the B.C. self-sufficiency policy; however, there remains policy uncertainty.
7.2.2 Renewable Compliance Market

Powerex has been active in the renewable compliance market since 2002. The attributes sold into this market are generally referred to as Renewable Energy Certificates or Credits (RECs).

Given the current market conditions for electricity and the cost of B.C.'s renewable resources, the expectation is that exports beyond B.C.'s self-sufficiency energy would be sold into this market segment. Generally speaking this market is driven by compliance concerns rather than broad economic competition and as a result prices tend to be higher as they reflect the full cycle costs of new construction. There is also more room for deal customization in the compliance market than the regular electricity market. Some of the surplus energy arising from self-sufficiency and the 93 per cent clean energy objective will also be eligible to be sold into this market segment.

Market opportunities in the renewable compliance market will be defined by the rules passed in each jurisdiction. Many stakeholders in key states view RPS programs both as a step toward achieving GHG reduction targets and as an economic development tool promoting in-state development of clean resources. Some key stakeholders recognize that lower cost solutions may be needed and support the need for out-of-state resources to reach those objectives.

As discussed in Chapter 4, California remains by far the largest market for renewable compliance resources due to its sheer size and the aggressiveness of its compliance targets. However, California utilities are constrained in procuring certain B.C.-based resources such as run-of-river hydro which are not recognized as “renewable”. Historically, the California municipalities have had more flexibility in determining their eligibility rules and as a result have been a better market for B.C. resources. However, that has changed under the latest California legislation, Senate Bill 2 (1X) signed by Governor Brown on April 12, 2011. There are also several competitive threats related to this market.
First is the issue of restricting out-of-state resources to satisfy the demand in this market. Amendments to the California RPS program enshrined in recent legislation have increased the requirements for all load-serving entities (LSEs) to meet their renewable obligations, particularly from out-of-state resources. Senate Bill 2 (1X) requires that all LSEs in California, including the publically owned utilities, meet 33 per cent of their retail sales from eligible renewable resources by 2020. The bill establishes three product categories:

- Category 1 – bundled renewable energy;
- Category 2 – firmed and shaped renewable energy; and
- Category 3 – renewable energy credits (unbundled).

During RPS compliance periods, LSEs must meet minimum procurement percentages of category 1, which increase over time, and may purchase capped amounts of categories 2 and 3. Eligible out-of-state facilities may qualify as category 1 if the output is scheduled directly into California.

A second key issue is U.S. government tax incentives. Canadian resources are at a significant cost disadvantage, at least 25 per cent, due to various U.S. tax credit and accelerated depreciation programs. The U.S. federal government offers:

- An Investment Tax Credit (ITC) of 30 per cent of the initial investment to solar developers;
- A Production Tax Credit (PTC) of 2.1 cents per kWh to wind and geothermal developers;
- An accelerated depreciation under a five-year Modified Accelerated Cost Recovery System.

Canada offers accelerated depreciation on a less aggressive basis, but does not have an ITC or PTC. While the U.S. tax incentives are set to expire over the next few years, the U.S. Congress has acted several times in recent years to retain them.
Reduction of these incentives would improve the competitiveness of B.C. renewable energy in U.S. markets.

A third key issue is competition from other renewable resource producers within the WECC region. Certain states such as Wyoming and Montana have good wind regimes that coupled with the tax credits and a small local demand, create a very price competitive pool of resources located relatively close to the main RPS market in California. The disadvantages these states have are the lack of integration capability and the need for new transmission infrastructure (similar to B.C.-based resources). Furthermore, in recent years due to federal U.S. tax incentives, there has been an oversupply of wind energy in the Pacific Northwest. Within California, significant efforts have been made by state agencies to streamline siting and permitting of solar facilities, in particular, to take advantage of U.S. federal stimulus funding. Current compliance filings by the major California utilities show a major portion of future compliance demand will be met by in-state solar developments. Given the relative immaturity of this market segment, there is still a relatively higher attrition and/or cost risk associated with these projects.

7.3 Demand for Clean or Renewable B.C. Resources

BC Hydro retained Black & Veatch Corporation to examine the market competitiveness and acceptance of B.C. renewable energy products in the focused markets of California, Washington, Oregon, and Alberta. Their report is attached as Appendix 4S. Black & Veatch assessed the potential demand for renewable energy to meet both RPS requirements, as well as carbon markets in Alberta and the U.S. The competitiveness of B.C. renewable energy products was also tested against several market and product sensitivities using Black & Veatch’s Renewable Energy Market (REM) model.

7.3.1 Demand in Export Markets

The Black & Veatch study assessed the potential demand for renewable energy in three key U.S. states with RPS requirements, as summarized in Table 7-1.
### Table 7-1 RPS Market Potential

<table>
<thead>
<tr>
<th></th>
<th>RPS Target</th>
<th>Flat Growth (GWh)</th>
<th>High Growth (GWh)</th>
<th>Restrictions Impacting B.C. Renewable Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>California</td>
<td>By 2020</td>
<td>39,000</td>
<td>80,800</td>
<td>Require direct connection or dynamic transfer to the California balancing authority for category 1 producers. Firmed and shaped energy is required for category 2 producers. Eligibility of B.C.-based run-of-river hydro subject to CEC review.</td>
</tr>
<tr>
<td>Washington</td>
<td>By 2020</td>
<td>6,000</td>
<td>8,800</td>
<td>Delivery on a real-time basis.</td>
</tr>
<tr>
<td>Oregon</td>
<td>By 2025</td>
<td>3,500</td>
<td>8,100</td>
<td>Bundled RECs must be U.S.-sourced; unbundled RECs subject to utility cap.</td>
</tr>
</tbody>
</table>

In general, most U.S. states are more concerned about being able to economically meet their RPS requirements and carbon goals. Renewable energy from B.C. would be eligible as long as such purchases comply with existing state RPS rules and is demonstrated to be cost competitive.

7.3.2 Availability and Cost of B.C. Renewable Resources

Chapter 3 of the IRP provides a summary of BC Hydro’s assessment of the resource option potential in B.C. Based on this assessment, Figure 7-1 provides an energy supply curve for identified clean or renewable resources in B.C. The relevant energy price for export purposes is a function of BC Hydro’s domestic energy needs under various load scenarios. For the high incremental load scenarios (including the new load scenarios described in Chapter 2 and the general electrification scenario discussed in Chapter 6), BC Hydro’s energy gap could be over 20,000 GWh by F2021. Accordingly, the supply curve suggests that renewable resources developed explicitly for export markets would have a Unit Energy Cost (UEC) at point of interconnection (i.e., before any transmission-related and system integration costs) approximating $115/MWh and above.

The market competitiveness analysis in the Black & Veatch report was performed assuming that the lowest cost potential resources identified in B.C. are available for export. However, given other possible domestic load requirements, the actual cost of...
the resources available for export are likely to be higher than those assumed in the Black & Veatch analysis, making B.C. resources relatively less competitive.

Figure 7-1  Supply Curve for Potential Clean Resources in B.C.

7.3.3  Transmission Constraints

Transmission capacity from within B.C. to destination markets is required to export clean energy. Current transmission lines are fully subscribed by firm transmission rights holders. Furthermore, the availability of non-firm transmission capacity has been dwindling due to increasing competition from power producers. BC Hydro expects that it will be able to manage the export of electricity volumes available under the self-sufficiency policy although transmission limits could reduce the economic value received for those exports.
7.3.4 Competitiveness of B.C. Resources

The demand for B.C. renewable resources and their relative competitiveness in export markets can best be ascertained by referring to the “Summary of Findings” in the Black & Veatch report, as follows:

Demand for BC resources would increase if: (i) overall demand for renewables in the western interconnection increases or, (ii) the relative competitiveness of BC resources improves. The overall demand may increase if there are changes in one or more market conditions. Similarly, there are a number of factors that could change the relative competitiveness of BC resources.

Market Conditions

- Certain scenarios show that REC prices may increase higher than currently established ACP [Alternative Compliance Payment] levels if either (i) the PTC goes away, (ii) energy prices are relatively low, or (iii) there is a strong RPS demand due to high load growth. In some states, utilities have the option to pay the ACP in lieu of procuring renewable energy or do not have to procure renewable energy if the rate impact limit is exceeded. In order for renewable energy projects to be built under these particular market conditions, there must be strong political will by states to achieve RPS targets at any cost by setting aside ACP caps or rate impact limits.

- If BC Hydro could demonstrate direct connection to California balancing authorities or be able to dynamically transfer more energy, the province would qualify for a larger market segment, instead of just the firmed/shaped product portion. This could be achieved through building additional transmission capacity or increasing the utilization of existing transmission to the U.S.¹

- Limitations on the amount of shaped/firmed products that can be sold into markets like California need to be lifted, though this alone does not determine whether BC projects can be competitive with projects from Washington and Oregon state that are also supplying shaped/firmed products to California.

¹ See subsequent discussion regarding a new transmission line in section 7.4.2.
Relative Cost of BC Resources

- The scenario in which U.S. projects receive no special tax incentives provides a level playing field for BC renewable resources compared to U.S. renewable resources. The ACP caps or rate impact limits currently in many of the RPS states would also need to be lifted or increased.

- Some higher class resources in Montana and Wyoming appear to be more attractive than wind from BC. Thus, in order for BC resources to compete, there needs to be a change in the assumptions about the costs of developing remote resources in Montana and Wyoming. For example, a lack of development of transmission capacity to deliver remote resources to load could make access to the very best resources in Montana and Wyoming more difficult or costly than expected.

- If the cost for solar PV [photovoltaic] projects after 10 years does not drop as significantly as assumed in the REM model and solar PV projects are not developed to the level modeled, especially in California, this would potentially be of benefit to the competitiveness of BC resources.

BC Hydro can try to sell REC-only products, though this market segment is expected to be highly competitive and much lower value, since there is no delivery requirement and it is limited to 10 per cent of the total RPS for California.

As for using BC renewables to address the carbon market in the U.S., there is considerable uncertainty as to how that will play out in the future since carbon markets in the west (including California) are either not well defined (outside of California) or details are still being developed (in California). Alberta will not be an export market for carbon offsets, given restrictions on imported offsets.

7.4 Export Activities and Actions

BC Hydro and Powerex have undertaken a number of actions, and are involved in a number of activities aimed at realizing the objective of being a net exporter of clean or renewable energy.
7.4.1 Anchor Tenant Transaction with PG&E

Powerex and Pacific Gas & Electric (PG&E) held discussions regarding the potential for a sale of approximately 4,000 GWh/year of RPS-eligible energy that would be the anchor transaction for the Canada-Northwest-California (CNC) line. Given the changes in California’s RPS eligibility as set out by the California Public Utilities Commission (CPUC) and in legislation (Senate Bill 2 (1X)), the current oversupply of RPS eligible renewable supply within the WECC and PG&E’s success in procuring in-state RPS eligible resources, the energy transaction was abandoned.

7.4.2 New Transmission

To facilitate exports beyond the self-sufficiency volumes, BC Hydro pursued the development of a new transmission line from a location near Castlegar in south-eastern B.C. to San Francisco, California. This CNC line would allow 1,500 MW to 3,000 MW of power to flow from B.C. to markets in the south. The line is expected to cost $4 billion to $7 billion and take eight years to 10 years to permit and construct. This project was being pursued in partnership with PG&E and Avista Corp. Attempts were made to get the Bonneville Power Administration to support and participate in the project; however, that support was not forthcoming.

BC Hydro’s approach to developing this transmission line was contingent on the outcome of the anchor-tenant energy transaction with PG&E. In the absence of securing an energy deal, the transmission line becomes a significantly more risky undertaking. As a result, the CNC partners have abandoned the CNC project for the foreseeable future.

7.4.3 Firming and Shaping Transactions

Powerex has been pursuing various firming and shaping transactions to build a portfolio of renewable resources and services and customer relationships to advance its ability to make future sales. These can be stand-alone transactions or transitional sales to the anchor tenant transaction.
7.4.4 Low Carbon Energy Sales

With the defeat of the California ballot proposition to repeal Assembly Bill 32, California continues to push forward on implementing its cap-and-trade program. Powerex is pursuing arrangements that would benefit from the implementation of California’s cap-and-trade program and continues to work with the B.C. Climate Action Secretariat as B.C. considers a similar program.

7.4.5 BC Hydro’s Generation Regulation Tariff

BC Hydro is developing a Generation Regulation Tariff to help design a product that meets market requirements and does not negatively impact ratepayers consistent with the government’s directions under the CEA. Similar, tariff provisions are being considered by the FERC as it works to develop mechanisms to deal with the integration of variable energy resources. Given that current market conditions have reduced the pressure to get this tariff in place quickly, the timetable for development of the tariff has been adjusted to coincide with other changes that are planned for the Open Access Transmission Tariff.

7.4.6 Policy Advocacy

BC Hydro and Powerex have been supporting the B.C. Government with its policy advocacy work with California. Consultants were retained to continue to advance B.C. interests regarding resource eligibility within California. Powerex continues to work with the Western Renewable Energy Generation Information System (WREGIS) on the registration of renewable resources.

7.4.7 Ongoing REC Transactions

Powerex continues to engage in short-term REC transactions in the WECC. These transactions provide experience to understand and influence emerging markets such as the California RPS. Powerex also applied to the California Energy Commission (CEC) to have the Dokie Wind power facility in B.C. certified as “renewable”; this certification is now in place such that energy from this facility is now eligible to be
sold in the California renewable compliance market. As part of Senate Bill 2 (1X), the
CEC was directed to conduct a study of B.C.’s run-of-river hydro resources to
determine whether they should be considered to be RPS eligible; the study is due in
July 2012.

7.5 Conclusions

Since the enactment of the CEA, the prospects of export sales of renewable energy
in excess of that required to meet self-sufficiency requirements have diminished
considerably. Further, the prospects of such sales are not expected to materially
improve over the short term. The reasons are complex, but include a significant
recent increase in renewable energy resources in the Western Interconnection, the
persistence of tax incentives available to U.S. producers, and the enactment of
renewable energy portfolio standards in potential markets, particularly California,
that exclude many renewable B.C. resources.

Table 7-2 summarizes how the four export-related elements contained in
Section 3 (1)(d) of the CEA have been addressed in this IRP chapter.

BC Hydro concludes that aside from monitoring, there are no actions BC Hydro
should be taking because there are no suitable opportunities for the export of
electricity from clean or renewable B.C. resources for the foreseeable future.
Consequently, BC Hydro does not perceive, at this time, any value in continuing to
investigate and develop potential market opportunities for export sales in excess of
self-sufficiency requirements. In response to section 3 (1)(e) of the CEA, current
market conditions do not warrant expenditures for export, and no expenditures are
planned as part of the 10-year Action Plan.
### Table 7-2 Meeting CEA’s Export-Related Requirements

<table>
<thead>
<tr>
<th>Required Section 3 (1)(d) Description</th>
<th>How Met in the IRP?</th>
</tr>
</thead>
</table>
| (i) The expected export demand during a defined period | - The Black & Veatch report identified potential demand for 48,500 GWh to 97,700 GWh of RPS energy in California, Washington and Oregon  
- Additional carbon market opportunities exist for B.C. renewable resources to displace GHG-intensive electricity in the U.S.  
- Access to the RPS and carbon markets in the U.S. is constrained by out-of-state restrictions and energy delivery rules |
| (ii) The potential for British Columbia to meet that demand | - BC Hydro’s resource options assessment identified a large potential for development of clean or renewable resources with an estimated UEC cost of at least $115/MWh at the point of interconnection  
- Ability to serve U.S. demand is subject to the availability and cost of transmission capacity  
- Competitiveness of renewable B.C. resources is hampered by out-of-state restrictions, U.S. tax incentives and competition from other energy producers in WECC that are closer to the prime U.S. markets |
| (iii) The actions the authority has taken to seek suitable opportunities for export of electricity from clean or renewable resources | - No further export-focused actions are warranted beyond those already taken to date  
- Conducted anchor tenant discussions with PG&E  
- Pursued development of CNC transmission line  
- Pursuing various firming and shaping transactions  
- Pursuing transactions that would benefit from cap-and-trade programs in California and B.C.  
- Developing a Generation Regulation Tariff  
- Supporting Province’s policy advocacy in California  
- Engaging in short-term REC transactions in WECC to potentially influence emerging RPS markets |
| (iv) The extent to which the authority has arranged for contracts for the export of electricity and the transmission or other services necessary to facilitate those exports | - BC Hydro pursued contracts for the proposed CNC transmission line and an anchor tenant transaction with PG&E; these initiatives have been abandoned due to changes in RPS eligibility in California and the current oversupply of eligible renewable energy within WECC |