Introduction
Greater Victoria Harbour Authority (GVHA) invites proposals for a shore power/cold ironing feasibility study at its cruise ship terminal at Ogden Point (OP) in Victoria, British Columbia. Through this Request For Proposals (RFP), GVHA is seeking proposals to conduct a study to assess the feasibility and cost-effectiveness of shore power for cruise ships berthed at OP.

This RFP provides information and instructions for prospective Respondents. Proposals are due, as provided below, by July 29, 2011 at 4:30pm.

Scope of Work
The scope of this RFP includes but is not limited to a discussion on the following:

1. An assessment of the power requirements needed dockside, and power supply availability by BC Hydro for shore power;
2. An inventory of all cruise ships currently calling at Ogden Point capable of connecting to shore power, their power and connection requirements;
3. An assessment of the worldwide cruise ship fleet trend for shore power capability and estimated timeline for the worldwide cruise ship fleet conversion to shore based power;
4. Shore power infrastructure, including transformers, switchgear, conduits, and receptacle pits;
5. The impact of shore power on air quality and Greenhouse gas emissions;
6. An assessment of capital cost estimates of the shore power infrastructure required at Ogden Point;
7. An assessment of the cost-effectiveness and feasibility analysis of shore power systems, including a discussion of various options for shore power infrastructure for Ogden Point;
8. A potential schedule of implementation; and
9. Reporting and presenting results of the study to GVHA management and/or Board.

Proponents are urged to review the appendices for relevant information about GVHA and Ogden Point activities, as well as the shore power pre-feasibility study.

Submission Requirements
The submission of a proposal allows GVHA to evaluate objectively the capabilities of your firm and your approach to assess the feasibility and cost-effectiveness of shore power for cruise ships berthed at OP. Proponents are requested to limit their proposals to five (5) pages of original text double-sided and attachments (such as firm brochures, biographies etc.) are limited to three (3) pages double-sided. Any material exceeding this limitation will not be considered. The proposal should include:

a) A statement of qualifications with a profile of the Proponent;
b) Qualifications and experience of the team including the names of who will be completing the shore power feasibility study;
c) Details of direct experience of the team and knowledge of Port Authorities and/or port and marine related business, and any specialized areas of knowledge;
d) Identification and samples of previous related projects, including shore power feasibility studies completed for other ports around the world;
e) Identification of any actual or potential conflicts of interest;
f) Cost of services; and

g) Other matters that the proponent believes should be identified but which may have been omitted from the above description of services.

The names of three client references, noting a senior contact person and telephone contact for each, should be provided.
Selection Criteria
The following criteria will be used to select a proponent:

1. Expertise and qualifications of the firm, including related expertise and experience of key team members;
2. Experience in dealing with similar projects applicable to port related businesses;
3. Related knowledge of the marine power marketplace; and
4. Cost of service(s) (lowest bid is not a guarantee for the contract; however, cost is a consideration).

Submission Format
RFP responses are due in final form by July 29, 2011 at 4:30 pm. Responses are to be delivered in either hardcopy or electronic format to:

Greater Victoria Harbour Authority
Attention: Rebecca Penz
189 Dallas Road
Victoria, BC V8V 1A1
Telephone: 250-383-8300 Extension 225
Email: rpenz@victoriaharbour.org

If required, clarification or addenda documents will be issued by mail, fax, email or other means to the designated individual of each proponent and posted on the website. The clarification or addenda will be deemed to be part of the RFP document and must be so noted in any subsequent submission.

Proposed Timeline
The timetable for the RFP selection process is anticipated to be as follows:

<table>
<thead>
<tr>
<th>Event</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposal Submission Deadline</td>
<td>July 29, 2011</td>
</tr>
<tr>
<td>Evaluation Process Completion</td>
<td>August 10, 2011</td>
</tr>
<tr>
<td>Successful Proponent Notification</td>
<td>August 12, 2011</td>
</tr>
</tbody>
</table>
Terms and Conditions
The proposal to conduct a study to assess the feasibility and cost-effectiveness of shore power for cruise ships berthed at OP shall comply with the General Conditions and Terms set forth below:

Notice of Non-binding Solicitation
GVHA reserves the right to reject any and all proposals received in response to this RFP and is in no way bound to accept any proposal.

Confidentiality
All information provided by GVHA as part of this RFP must be treated as confidential. In the event that any information is inappropriately released, GVHA will seek appropriate remedies as allowed. Proposals, discussions, and all information received in response to this RFP will be held as strictly confidential, except as otherwise noted.

Communication
All communications regarding this solicitation must be directed to the Environmental Researcher or Manager of Communications. Contacting third parties or any other GVHA employees or board members may be considered a conflict of interest and could result in disqualification of the proposal. GVHA’s Manager of Communications reserves the option to request clarification on any proposal submitted.

Acceptance
Acceptance of a proposal does not imply acceptance of its terms and conditions. GVHA reserves the option to negotiate on the final terms and conditions. We additionally reserve the right to negotiate the substance of the preferred proposals, as well as the option of accepting partial components of a proposal if appropriate.

Rights to Data
GVHA will have ownership rights to all data generated by the project.

Thank you in advance for your interest.
Appendix A – About Greater Victoria Harbour Authority

Greater Victoria Harbour Authority (GVHA)
Greater Victoria Harbour Authority (GVHA) was incorporated as a not-for-profit society in February 2002, and began operating its four port facilities, divested from Transport Canada, in April 2002. Acting as an advocate for the harbour, GVHA is working to improve its function as a working harbour and a marine transportation centre with a strong focus on tourism.

Vision
We envision a harbour where people live, learn, work, and play; a spectacular gateway into Victoria’s past and into its future, monumental in look and feel, linking communities and all people together.

Mandate
To be effective and respected advocates for best water, marine and marine-related use and development of the whole harbour while optimizing current and future harbour assets.

Guiding Principles
GVHA’s actions and decisions will be guided by the following principles:

1. **Accountability** - We commit to act in the best interests of Victoria Harbour on behalf of GVHA’s Member Agencies, their stakeholders and the citizens of the region.
2. **Working Harbour** - We commit to maintaining Victoria Harbour as a working harbour – “where commerce requiring the connection between the land and water takes place”.
3. **Sustainability** - We commit to incorporating and balancing the social, environmental and economic impacts of our activities on Victoria Harbour and the community.
4. **First Nations Relationship** - We commit to working in partnership with the Esquimalt and Songhees Nations to achieve a meaningful role for them in the economy of Victoria Harbour.

GVHA’s Board is comprised of Directors representing its member agencies and organizations (Esquimalt Nation, Songhees Nation, Provincial Capital Commission, City of Victoria, Township of Esquimalt, the Victoria/Esquimalt Harbour Society, Tourism Victoria, the Greater Victoria Chamber of Commerce, and the Capital Regional District). It also comprises four community directors.
Appendix B – Ogden Point, Victoria

Ogden Point (OP) is a deep water port facility with four docks able to handle very large vessels. The facility has become a major destination for cruise ships in the North West. OP is also an important depot for fiber optic cable repairs. A heliport provides direct services to Seattle, Vancouver and Vancouver International Airport. GVHA has undertaken significant improvements to OP in 2003, aimed at improving facilities for cruise ship passengers and crews.
Appendix C – Shore Power Pre-feasibility Study

Shore Power for Ogden Point: Pre-Feasibility Study

Table of Contents

1.0 Summary

2.0 Introduction
   2.1 Purpose of Report
   2.2 Key Decision-making Factors
   2.3 Shore Power Overview
   2.4 Driving Forces
   2.5 Information Gathered
   2.6 Opportunities
   2.7 Challenges

3.0 Project Concept
   3.1 Proposed Users
   3.2 Future Users
   3.3 Power Requirements
   3.4 Proposed Location
   3.5 Project Cost
   3.6 Project Financing
   3.7 Material Inputs
   3.8 Shore Power Equipment
   3.9 Alternative Power Sources
Summary

Shore power eliminates the need to run ship auxiliary engines and significantly reduces air emissions associated with the burning of marine fuels at berth including reduction of nitrogen oxides ($NO_x$), sulphur oxides ($SO_x$), particulate matter (PM), and volatile organic compounds (VOCs). In addition, when ships use shore power, they are significantly reducing emissions of greenhouse gases (GHG), which contribute to climate change.

Shore power can give a port a competitive advantage, particularly when air emissions reduction targets of the North American Emissions Control Area (ECA) of the International Maritime Organization begin in August 2012. With two-thirds of the major cruise lines converting their vessels to be shore-power capable and the industry looking for ways to reduce their fuel costs and environmental impact, shore power is an attractive offering for a port.

However, Ogden Point’s shore power potential is limited by several key factors:

- Short stays (on an average call of 7 hours, a ship will only be plugged in for 5.5 hours).
- BC Hydro electric grid would require a significant upgrade at an estimated cost of $10 – 11 million.
- Shore power infrastructure would cost an estimated $5 – 9 million.

Funding partners would be essential for advancing this project. In order to secure funding partners, a comprehensive feasibility study is required to confirm these costs at a cost of approximately $20,000. Management was not able to find any research and development funding to cover the costs of a feasibility study.

Given the estimates of the huge capital and infrastructure investments required for shore power installation, management will not be proceeding with a shore power feasibility study unless research funding is secured.
Introduction
Greater Victoria Harbour Authority (GVHA) is committed to incorporating and balancing the social, environmental and economic impacts of its activities on the Victoria harbour and the community.

Purpose of Report
The purpose of the pre-feasibility study is to gather readily available information in order to determine the value of conducting a shore power feasibility study.

Key Decision-making Factors
Environment
Shore power eliminates the need to run the auxiliary engines and significantly reduces air emissions associated with the burning of marine fuels at berth including reduction of NO\textsubscript{x}, SO\textsubscript{x}, PM, and VOCs\textsuperscript{1}. In addition, when ships use shore power, they are significantly reducing emissions of greenhouse gases (GHG), which contribute to climate change. The actual emissions reduced depend on the type of engine and engine technology, and the type of fuel that is being burned. This reduction of air emissions will benefit the dock workers, people working on board and the neighbouring communities. Table 1 below illustrates the estimated mid-range values of emission reduction efficiencies of shore power.

<table>
<thead>
<tr>
<th>Measure</th>
<th>% Emissions reductions (-)/Increase (+) per vessel</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NO\textsubscript{x}</td>
</tr>
<tr>
<td>Shore power (compared with 2.7% S Residual oil)</td>
<td>-97%</td>
</tr>
<tr>
<td>Shore power (compared with 0.1% S Marine Distillate)</td>
<td>-97%</td>
</tr>
</tbody>
</table>

Table 1. Emission Reduction Efficiencies.

Social
Shore power eliminates the need to run ship auxiliary engines thereby reducing air emissions associated with the burning of marine fuels. Consequently, shore power increases the quality of life for residents in the port area, port employees and passengers, who would otherwise be subjected to these air emissions.

Shore power will also provide economic benefits to the shipping and power industries that will ensure healthy growth continues in Victoria.

\textsuperscript{1} It is important to note that while ships are manoeuvring in port, air emissions reductions as a consequence of shore power connections are not registered as emissions reductions are only attributed to ships while they are docked at berth and connected to the shore power installation.
Financial

A potential shore power installation will improve the marketability of Victoria to the cruise lines. This is because an increasing number of cruise lines are considering installing shore power in light of the new international regulations mandating the use low-sulphur fuel or alternatives. Depending on the sources of funding for such an initiative, GVHA may be financially affected as installation costs are significant. GVHA would therefore need to engage with both private and public sector partners to share this financial responsibility.

Shore Power Overview

While in port, ships use their engines to produce electricity for hotelling, unloading and loading activities. Shore power enables ships to turn off their engines while docked and connect to electric power that travels to ships using specially designed equipment to power the ship’s load (e.g. lighting, air conditioning, communication equipment etc.). The electrical power is transmitted from a shoreside transformer to the ship via a cable management system. The length of time needed to connect a ship to shore power and shut down the ship’s diesel engines is under 40 minutes. Once connected, the ship’s engines are powered down and, simultaneously, the corresponding amount of power is provided by the utility company to power the ships load.

Shore power enables ships to reduce the emission of air pollutants and greenhouse gases (GHG), which in turn reduces contributions to climate change and helps maintain and improve air quality.

The feasibility and cost effectiveness of reducing hotelling emissions via a shore power installation may be dependent upon the dockside load profile, safety requirements, and marine engineering design specifications of the ships in question.

To date, utilization of shore power has been concentrated on the North American west coast and in Europe. Shore power connections are now available at the US ports of Los Angeles, Long Beach, San Francisco, San Diego, Seattle and Juneau, at Metro Vancouver in Canada and at ports in Germany, Sweden, Finland, The Netherlands, Australia and China.

Driving Forces

While docked at berth, most ships turn off their propulsion engines and use auxiliary engines to provide power to electrical equipment onboard the ship. Combustion of marine fuels with high sulphur content contributes to air pollution in the form of sulphur oxides (SO\textsubscript{x}) and particulate matter (PM), harming human health and damaging the surrounding environment.

\[2\] The period of time when the vessel is at the dock is referred to as “hotelling” (Cold Ironing Study, San Diego. May 2007).
A key driving force behind shore power is the international directive *MARPOL Annex VI* and subsequent North American Emission Control Area (ECA) that comes into force August 1, 2012. The ECA directive requires that emissions from shipping should be limited by reducing sulphur content in the marine fuels to 1.0% (2012) and 0.1% (2015) by weight within a 200nm distance from shore. Cruise lines such as Princess Cruise Lines (PCL), Holland America Line (HAL) and Disney Cruise Lines (DCL) have already retrofitted some of their fleet to ensure ships are shore power capable to limit the impact on human health and the environment, while ensuring they adhere to aforementioned international directives. In addition, increasing fuel costs are beginning to make shore power a more attractive investment, which in turn will facilitate ships' compliance with these new emissions standards.

**Information Gathered**

1. Frequency of calls by cruise ships equipped to connect to shore power.
2. The availability of an adequate supply of electricity at a reasonable cost.
3. Availability of the same dock and pier facility for these vessels for every call.
4. Adequate dock and uplands space for equipment.
5. Cost of conducting a shore power feasibility study (such as BC Hydro costs, consultant fees, etc.).
6. Funding contributed to other Canadian ports for shore power installations.
7. Probability of cruise lines to transition ships to shore power capable.

**Opportunities**

The Ports of Los Angeles and Seattle, as well as the Onshore Power Supply project of the World Climate Ports Initiative on shore power, have published studies that outline the advantages associated with the installation and use of shore power. The following are the list of benefits that are important to the Greater Victoria region:

1. Helps in mitigating the health impact that ship air pollution is known to cause from the use of diesel fuel in ships by eliminating the pollutants ships produce while in port including Nitrogen Oxides (NO$_x$), Particulate Matter (PM), Sulphur Dioxide (SO$_2$). In addition, shore power installations significantly reduce greenhouse gas (GHG) emissions while ships are docked.

---

3 On March 26, 2010, the International Maritime Organization (IMO) amended the International Convention for the Prevention of Pollution from Ships (MARPOL) designating specific portions of U.S., Canadian and French waters as an Emission Control Area (ECA). The proposal for ECA designation was introduced by the U.S. and Canada, reflecting common interests, shared geography and interrelated economies. (US EPA Regulatory Announcement, March 2010).

4 During a 10-hour stay in port, the diesel engines of a single cruise ship can burn 20 metric tons of fuel and produce 60 metric tons of carbon dioxide. This is equivalent to the total yearly emissions of 25 average-sized European cars, which can be eliminated by supplying the ship’s infrastructure with shore-side power (Source: *ABB Group*. Accessed from: [http://www.abb.com/cawp/seitp202/84051796b5d6f141c1257715004882a3.aspx](http://www.abb.com/cawp/seitp202/84051796b5d6f141c1257715004882a3.aspx)).
2. Improved working conditions at the port.
3. The ability for the ships to contribute energy back to the grid in the event of an emergency.
4. Improve the marketability of Victoria to the cruise lines. More lines are considering installing shore power in light of the new International Regulations to use low-sulphur fuel or alternatives.

Challenges
Some of the draw-backs of implementing shore power in Victoria include:

1. Significant installation and maintenance costs.
2. The short stays in Victoria, combined with the length of time required to connect to shore power.
3. Currently, the cost of electricity from the shore is greater than that derived by ship fuel, often by a factor of two or more. This is because shoreside electricity has to cover the costs of the transmission and distribution infrastructure, the generation capacity required for the ship, and, in some cases, profit for the utility.5
4. The need to ensure the compatibility of ship and shore power systems across a range of ports. Given the wide variety in the technical standards associated with onboard electricity generation and the current lack of an international standard governing shore connecting systems, this can be problematic.
5. The need to ensure a smooth transition from ship to shore power, and vice versa, in view of:
   a. Sensitive electronic equipment onboard.
   b. The ability of fixed shore connection points to accommodate a wide variety of ship sizes.
   c. The large power demands of particularly busy cruise and ferry ports.
6. Ensuring shore power is available on the appropriate side of the vessel.
7. Managing labour concerns.
8. The North American Emissions Control Area will ensure that the ships use low-sulphur fuel in ports (1% by 2012 and 0.1% by 2015).

The Project Concept
A shore power installation at the Ogden Point terminal would drastically reduce the emissions of air pollutants and GHGs that would otherwise emanate from diesel powered engines on

---

6 However, the reducing price gap between fuel costs for ships and onshore electricity prices means a fast return on investment (ROI). In addition, with the introduction of the North American Emission Control Area, cruise ships will be mandated to use 1% S (August 2012) and 0.1% S (January 2015). These costs of these fuels are rising and therefore ROI periods will tend to be shorter rather than longer.
cruise ships that dock at the Ogden Point terminal. Reduction of such pollutants would increase:

- The quality of life of the surrounding community.
- The marketability of Ogden Point to the cruise lines.

**Proposed Users**

All Princess Cruise Line ships, most Holland America Line ships, and the Disney Cruise Line ship on the Alaska run are equipped with shore power. PCL believes that the shipboard electrical standards they have established will become the industry standard. Based on the 2011 cruise ship schedule (see Table 2 below), around 70 ship dockings could potentially use shore power, representing a third of total cruise ship visits to Victoria\(^7\). This would have an important and positive human-health and social impact on the Victoria community.

<table>
<thead>
<tr>
<th>Cruise line</th>
<th>Name of Vessel</th>
<th>Gross Tonnage</th>
<th>2011 Visits (Projected)</th>
<th>Passengers</th>
<th>Shore power Capable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carnival Cruise Lines</td>
<td>Carnival Spirit</td>
<td>88,500</td>
<td>18</td>
<td>2,124</td>
<td>No</td>
</tr>
<tr>
<td>Celebrity Cruise Line</td>
<td>Celebrity Century</td>
<td>71,545</td>
<td>1</td>
<td>1,808</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Celebrity Infinity</td>
<td>91,000</td>
<td>19</td>
<td>2,000</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Celebrity Millennium</td>
<td>91,000</td>
<td>2</td>
<td>2,034</td>
<td>No</td>
</tr>
<tr>
<td>Crystal Cruises</td>
<td>Crystal Symphony</td>
<td>51,044</td>
<td>11</td>
<td>922</td>
<td>Unknown</td>
</tr>
<tr>
<td>Disney</td>
<td>Disney Wonder</td>
<td>83,000</td>
<td>2</td>
<td>2,400</td>
<td>Yes</td>
</tr>
<tr>
<td>Holland America Line</td>
<td>Amsterdam</td>
<td>62,735</td>
<td>12</td>
<td>1,380</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Oosterdam</td>
<td>82,305</td>
<td>21</td>
<td>1,840</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Statendam</td>
<td>55,451</td>
<td>3</td>
<td>1,270</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Westerdam</td>
<td>81,811</td>
<td>21</td>
<td>1,840</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Zaandam</td>
<td>61,396</td>
<td>2</td>
<td>1,440</td>
<td>No</td>
</tr>
<tr>
<td>Norwegian Cruise Line</td>
<td>Norwegian Pearl</td>
<td>93,502</td>
<td>20</td>
<td>2,200</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Norwegian Star</td>
<td>91,740</td>
<td>1</td>
<td>2,240</td>
<td>Yes</td>
</tr>
<tr>
<td>Oceana Cruises</td>
<td>Regatta</td>
<td>30,277</td>
<td>4</td>
<td>684</td>
<td>Unknown</td>
</tr>
<tr>
<td>P &amp; O Cruises</td>
<td>Arcadia</td>
<td>83,500</td>
<td>1</td>
<td>1,952</td>
<td>Unknown</td>
</tr>
<tr>
<td>Princess Cruise Lines</td>
<td>Golden Princess</td>
<td>109,000</td>
<td>19</td>
<td>2,600</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Sapphire Princess</td>
<td>116,000</td>
<td>20</td>
<td>2,600</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Sea Princess</td>
<td>77,000</td>
<td>13</td>
<td>1,950</td>
<td>Yes</td>
</tr>
<tr>
<td></td>
<td>Island Princess</td>
<td>91,627</td>
<td>2</td>
<td>1,970</td>
<td>Yes</td>
</tr>
<tr>
<td>Regent Seven Seas</td>
<td>Seven Seas Navigator</td>
<td>28,550</td>
<td>2</td>
<td>500</td>
<td>Unknown</td>
</tr>
<tr>
<td>Royal Caribbean International</td>
<td>Rhapsody of the Seas</td>
<td>78,491</td>
<td>15</td>
<td>2,000</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td>Radiance of the Seas</td>
<td>90,090</td>
<td>1</td>
<td>2,500</td>
<td>No</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>210</td>
<td>412,698</td>
<td></td>
</tr>
</tbody>
</table>

\(^7\) For a single dedicated shore power installed.
**Table 2.** Draft 2011 Cruise ship schedule for Victoria.
*Source:* Western Stevedoring.

**Future Users**
In industry discussions with the cruise lines in February of 2011, Carnival Cruise Lines and Norwegian Cruise Lines indicated that they are likely to transition some or all ships to shore power capable. Those two lines represent around 20 percent of total calls. Royal Caribbean International and Celebrity Cruise Line indicated to GVHA that they are unlikely to retrofit their ships to become shore power enabled (they are studying alternative methods to reduce emissions).

**Power Requirements**
Princess Cruise Lines, Holland America Line, and Disney Cruise Line ships have similar shore power connectors and power requirements. According to discussions with Princess and Disney, the potential shore power installation should ideally have the following components:

1. 20 MVA load capacity per shore power connection.
2. Dual-voltage capacity of 6.6 kV/11kV.
3. 60 Hz power frequency.

A dedicated line of 20MVA is strongly preferred per shore power connection, with 60 Hz being preferential frequency of the electricity used. Princess officials also indicated a preference for a dual-voltage capacity of 6.6 kV/11kV on any new shore power installation. Given these specifications, BC Hydro officials believe that the James Bay electrical grid will need to be upgraded to ensure that these needs are met.

**Proposed Location**
Pier B at the Ogden Point terminal receives the largest number of cruise ships and is therefore the most practical location for a possible shore power installation. Ideally, both the North and the South berths at Pier B would each have dedicated shore power lines installed to meet the needs of the cruise ships. However, a feasibility study is required to determine the cost of 2 shore power lines.

**Project Cost**
BC Hydro officials believe that the James Bay electrical grid will need to be upgraded to ensure that cruise ship power requirements can be met. According to discussions with BC Hydro officials, upgrading the electrical grid would cost in the region of $11 million. In addition, BC Hydro would need a deposit of $15,000 to construct a detailed design for the utility component of the potential shore power installation. Other costs that would need to be reviewed in greater

---

8 Inflation-adjusted value for BC Hydro electrical grid upgrade construction costs for a single 20MVA line (2 circuits).
detail in a feasibility report would include the installation costs from the utility service entrance location to shoreside, a cable management system, and yearly operation and maintenance of the shore power installation. Table 3 below provides rough cost estimates for these key project components.

<table>
<thead>
<tr>
<th>Component</th>
<th>Range of Costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Grid upgrade</td>
<td>$10 - 11 million</td>
</tr>
<tr>
<td>Site installation costs &amp; Cable management system</td>
<td>$5^9 - 9^10 million</td>
</tr>
<tr>
<td>Yearly operations</td>
<td>(dependant on operator)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>15 – 20 million</td>
</tr>
</tbody>
</table>

Table 3. Rough Cost estimates for Shore power.

Sources: Port of San Diego, Port Metro Vancouver.

Port Metro Vancouver and BC Hydro have developed a rate tariff\(^{11}\) that could be applied at Ogden Point\(^{12}\).

---


1. Electrical Design & Engineering
2. Utility Engineering and Connection Fees
3. Electrical Gear and Equipment
4. Transformer
5. Infrastructure
6. Ship Cables and Connectors
7. Cable Management
8. Electrical Permit


1. Installation of primary switchgear (including BC Hydro meters) at the property line on the southeast corner of Canada Place.
2. Installation of overhead conduit and high voltage cables over the roadway on the east side of Canada Place at the underside of the 10-kilometre level.
3. Site preparation, including minor demolition on the west berth.
4. Construction of a rated enclosure for each transformer, one on the east berth and one on the west berth.
5. Installation of secondary switchgear and a capacitor bank for each berth.
6. Installation of a jib crane at the dock face for each berth.
7. Installation of conduit and cables under the dock on the east and west side of Canada Place.
8. Commissioning and testing.

\(^11\) BC Hydro made an application to the BC Utilities Commission for a special shore power rate which was approved on the basis of the power being interruptible (If the power was needed elsewhere, the shore power connection can be terminated within 60 minutes). (Source: *Electrifying the Port – Switching to Clean, Green Electricity*. Accessed from: [https://www.cleanenergybc.org/media/Port%20Metro%20Vancouver%20-%20Darrell%20Desjardin%20-%20November%202010.pdf](https://www.cleanenergybc.org/media/Port%20Metro%20Vancouver%20-%20Darrell%20Desjardin%20-%20November%202010.pdf)).

\(^12\) Ships utilizing shore power are directly billed by BC Hydro.
**Project Financing**

A survey was made of Canadian ports that currently have shore power installed to determine the range of costs for implementing shore power. The shore power installation at Port Metro Vancouver was made possible by a $9 million cooperative investment by the Port, Transport Canada, Western Economic Diversification Canada, BC Ministry of Transportation and Infrastructure, Princess Cruise Lines, Holland America Line and BC Hydro. Table 4 below illustrates the role played by each key entity.

<table>
<thead>
<tr>
<th>Partners</th>
<th>Roles</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Canada</td>
<td>• Funding</td>
<td>• 1/3 Federal government, up to $3 million</td>
</tr>
<tr>
<td>Western Economic Diversification Canada</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The province of British Columbia</td>
<td>• Funding</td>
<td>• 1/3 British Columbia government, up to $3 million</td>
</tr>
<tr>
<td>Port Metro Vancouver</td>
<td>• Provide real estate for siting shore power equipment and on-lock infrastructure (structural dock reinforcement, conduit &amp; cables).</td>
<td>• 1/3 Industry ($2 million shared equally between Princess Cruises, Holland America, and Port Metro Vancouver), plus all costs in excess of $9 million</td>
</tr>
<tr>
<td>Princess Cruise Lines</td>
<td>• Project management support, coordination, civil &amp; structure engineering support</td>
<td></td>
</tr>
<tr>
<td>Holland America Lines</td>
<td>• Shore power equipment on dock (incl. Transformers, electrical gear and equipment)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Shore power equipment/infrastructure on vessels (incl. Ship cables &amp; connectors, crane and chain winch.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Project &amp; technical support, best practices, consultation</td>
<td></td>
</tr>
<tr>
<td>BC Hydro</td>
<td>• Delivery of power to Canada Place.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Approved power rate structure (interruptible, off-peak).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Project &amp; technical support, consultation</td>
<td></td>
</tr>
</tbody>
</table>

Table 4: Port Metro Vancouver Shore Power Partners and Funding.

Shore power in the Prince Rupert Port Authority’s Fairview Terminal was made possible by a $3.6 million cooperative investment by Transport Canada, Western Economic Diversification Canada, the province of British Columbia, Prince Rupert Port Authority and its partners CN Rail and Maher Terminals. Table 5 below illustrates the funding breakdown by each partner.
<table>
<thead>
<tr>
<th>Partners</th>
<th>Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Canada (Marine Shore Power Program)</td>
<td>$1.8 million</td>
</tr>
<tr>
<td>Western Economic Diversification Canada</td>
<td>$700,000</td>
</tr>
<tr>
<td>The province of British Columbia</td>
<td>$200,000</td>
</tr>
<tr>
<td>Prince Rupert Port Authority and its partners CN Rail and Maher Terminals</td>
<td>$900,000</td>
</tr>
</tbody>
</table>

**Table 5**: Prince Rupert Port Authority Shore Power Partners and Funding.


Given that shore power installations require huge capital and infrastructure investments, it is essential that GVHA engage with all relevant stakeholders to secure partners in this venture including all levels of government, cruise line owners, and any other private sector enterprise(s).

**Material Inputs**

A shore-power system consists of three basic components:\(^{13}\):

**Shore-side Electrical System and Infrastructure**

A land-based power source, transmission system, and related infrastructure are required to provide electricity to a hotelling marine ship. The shore-side electrical and infrastructure requirements include an industrial substation to receive power transmitted from the local grid and a transformer to bring the voltage down to be compatible with the ship’s electrical specifications. On-shore infrastructure include distribution switchgear, circuit breakers, safety grounding, underground cable conduits, electrical vaults, and power and communications receptacles and plugs.

**Cable Management System**

An electrical cable system is required to bring shore-side power to the ship during hotelling. A cable management system consists of cables, reel, and connectors.

**Ship-side Electrical System**

Ships participating in a shore-power electrification program require the installation of shore-power cable receptacles and an associated electrical management system. For ships already in service without shore-power capabilities, retrofitting of the current system is necessary. For newbuilds, the ship owner can request an on-board shore-power ready system be included as part of the ship’s electrical system design.

---

Shore Power Equipment
There are many shore power service providers in the market today. These include (but are not limited to) the following:

1. Cochran Marine Inc.\textsuperscript{14} - Ports of Seattle, Metro Vancouver, San Diego, San Francisco.
2. Cavotec Group Inc.\textsuperscript{15} - Ports of Los Angeles, Long Beach, Alaska, Stockholm, Gothenburg and Helsingborg and ports in Australia and China.

Depending on the findings of a feasibility study, GVHA would need to initiate an open procurement process to determine the best shore power service provider for the OP terminal (as per the procurement policies and procedures of the organization).

Alternative Power Sources
GVHA is developing a conceptual plan to investigate the potential for the generation of alternative power sources at Ogden Point. The power needs for the vessels are so significant that it is unlikely that any source will be identified that will generate enough energy to power cruise ship auxiliary systems. The conceptual plan will consider the potential of solar, tidal and wind power, geothermal, and hydrothermal.

\textsuperscript{14} Cochran Inc: http://www.cochraninc.com/marine-electrical
\textsuperscript{15} Cavotec Group Inc: http://www.cavotec.com/