

# The Pearson College-EnCana-Clean Current Tidal Power Demonstration Project at Race Rocks

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## Introduction

“Lester B. Pearson United World College of the Pacific is a unique two year pre-university school for two hundred students selected from around the world based solely on their personal merit, potential and demonstrated commitment to engage actively in creating a better world. All students attend on a full scholarship and live together while studying the International Baccalaureate program and pursuing explicitly the mission of the United World Colleges to make education a “force to unite people, nations and cultures for peace and a sustainable future” (Pearson College 2009).

While at the College, students have the unique opportunity to help manage Race Rocks Ecological Reserve, located 15 minutes south of the college by boat, or 22 kilometres (10 nautical miles) southwest of Victoria. Race Rocks contains an amazing diversity of life – terrestrial, avian and marine, benthic and pelagic. The set of islands also have great historical, cultural and anthropological significance. The lighthouse was constructed in 1860 to help mariners navigate the treacherous waters of the Juan de Fuca Strait, and for centuries, First Nations people have used the islands as a rich marine resource. 2000 year old burial cairns on Great Race Rock stand as a testament to this.

Currently, Race Rocks is managed on a 30 year lease from BC Parks by Pearson College. Students and faculty at Pearson College play crucial role, from conservation efforts to research and development, to storing decades long records and raising funding for the Reserve. The College also employs a full time Eco-Guardian who maintains a human presence on the Reserve.

## The traditional energy system

Electricity at Race Rocks is, and always has been, an important resource needed for the complex computer system with integrated weather data and remote controlled cameras allowing for all to view the island with no ecological footprint. It is also needed to support the full time Eco-Guardian who maintains a human presence on the Reserve.

Electricity at Race Rocks has traditionally been generated by two fixed, 15kW diesel generators. However, when Pearson College took over management in 1997, operating costs were passed onto the College. These costs were originally CAD \$11 000 a year; however, this soon rose to CAD \$20 000/year.

Environmental impacts were also great: at about 50 000L/year marine grade diesel combustion, the system contributed 133.5 tonnes/year of CO<sub>2</sub> to the atmosphere. This figure does not include the emissions associated with extraction, refinement and transportation. Also, the possibility of an equipment failure during transport, pumping of fuel oil across the island or combustion in the generators could have a significant ecological impact if fuel ever escaped from the system.

Generator noise was also a concern—the impacts of noise on communicative behaviour on animals and birds are not fully known, although it can be speculated that there may be an impact on predator response capability and mating/nesting behaviour. Furthermore, the diesel tanks, although adhering to environmental standards, are vulnerable in an earthquake, and severe weather and tidal currents common to the area would make containment of a spill impossible.

## **The Pearson College – EnCana-Clean Current Tidal Power Demonstration Project at Race Rocks**

In 2001, A feasibility study conducted by master's program candidate Taco Niet through the Institute of Integrated Energy Systems at the University of Victoria identified that *“sufficient renewable resources (tidal, wind and solar) were available to develop an integrated energy system that was capable of providing a reliable power supply to Race Rocks”* and that, *“tidal energy would have the least environmental impact due to the size of the system required and would provide the most reliable power source with the least amount of required storage”* (Niet and McLean 2001).

In 2005, EnCana Corporation sponsored Clean Current Power Systems Incorporation of Vancouver to build, install, operate and monitor a 65kW free-stream tidal generator in 13 metres of water at Race Rocks. Thus, the Pearson College-EnCana-Clean Current Tidal Power Demonstration Project at Race Rocks was born. From January to September 2006, drilling, piling installation and cable laying for the turbine took place in the water surrounding the Reserve. Then, on September 27, 2006 the turbine was delivered and finally installed at Race Rocks. For the first time, the islands fell silent as the generators ceased operation.

In January 2007, 38 solar panels delivering 6.5kW of electricity in total were installed on the roof of the Integrated Energy Center. They were funded by a grant from the BC Ministry of Mines and Energy.

In April 2007, the turbine removed from the water for upgrades. The generators began operation again. Then, on October 17, 2008, the turbine was reinstalled at Race Rocks. Upgrades included stainless steel bearings, a new lubricating system with environmentally friendly lubricants, a new electrical wire protection system, better blade configuration, reinforced augments duct and ring, and reinforced central struts.

This new deployment will enable a further test of the seaworthiness of the turbine. Perfecting the structure and its operation in difficult ocean conditions is the goal of the experimental phase of the project. However, although the turbine is mounted in the water, it is not currently generating electricity. Upgrades are being completed in the land-based system of the project (the starter motor is being replaced). It is hoped that operations should begin soon. The idea will be to start slowly by running the turbine for a few hours each day, then slowly increasing the amount of time it is run for until it is fully operational.

## **Environmental impacts of the tidal energy program**

A report by *Archipelago Marine Research Ltd. (AMR)* in 2006 identified environmental impacts of the tidal turbine project before construction, during construction and after construction. During construction, *AMR* notes that *“Overall results from these observations suggested that there was very little impact on the wildlife within the Reserve”* (Archipelago Marine Research 2006).

After construction (data collected 45 days after drilling), *AMR* notes that there were some ongoing impacts from dredging that extend 20 metres along the cable route and west along the direction of tidal flow. Also present are some exposed areas of bedrock and clay. Organisms had begun to inhabit the submarine cable exterior. Some evidence is present that the cable anchor block had dislodged giant acorn barnacles, although the impact was very limited and localised. There was no impact to vegetation or other sensitive invertebrate species (Archipelago Marine Research 2006).

It is not fully known at this time what impact the turbine itself has on the organisms, especially cetaceans and pinnipeds. However, Glen Darou, president and CEO of Clean Current Power Systems Inc., and other experts note that the effect is negligible, as *“The only things that can swim in fast moving currents are things that can”*; that is, they will be able to manoeuvre around it (Dove 2008). At a spin of roughly 60 rpm with no suction, there is little threat to organisms. It is hoped to install a camera on the turbine someday to monitor how animals react to it and the low hum it produces.

## **The future**

Glen Darou, president and CEO of Clean Current Power Systems Inc., notes that *“We believe it is highly exportable technology, with strong potential to succeed in international settings”* (Skilling 2005). And more recently, *“A 200-tonne turbine is being developed for the Bay of Fundy in Nova Scotia...Some European countries are starting to take interest”* (Dove 2008). Clean Current is also working on turbines for shallow tidal areas or rivers that would be able to fit on a flatbed truck and could be plugged in on land.

However, Race Rocks won't be Clean Current's laboratory forever. Eventually Pearson College and BC Parks will be responsible for the turbine.

In the meantime, the Race Rocks Tidal Energy Generator has been an immense success. At Race Rocks, we are now able to generate electricity from a renewable source, negating the huge traditional energy system concerns. And for the students of Pearson College, the turbine is a huge learning experience; with students from 100 countries around the world, the turbine serves as a unique demonstration of the potential for alternative energy. Highly committed citizens of the world, Pearson students will take their experiences with the tidal turbine to their home countries when they leave Canada. Hopefully, some will put these ideas into action, developing alternative energy sources in their own countries.

## **Bibliography**

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