



FUNDY OCEAN RESEARCH CENTRE FOR ENERGY

For more information about FORCE, please visit:

www.fundyforce.ca

Imagine the power of the highest tides in the world. Imagine the technology to harness it.

FORCE is Canada's leading research centre for in-stream tidal technology, located in the Bay of Fundy, Nova Scotia.

Like a windmill underwater, in-stream turbines convert the flow of the tide into electricity. FORCE is designed to test the performance and interaction of these turbines in the Bay of Fundy environment. FORCE allows developers to share costs, limit potential impacts, test under similar conditions, and supply power to the electricity grid (2011).

FORCE is a non-profit institute, supported by both public and private funding, including the Governments of Canada and Nova Scotia, and Encana Corporation.

Participants include Minas Basin Pulp and Power and its technology partner Marine Current Turbines, Nova Scotia Power with technology partner OpenHydro, and ALSTOM using its Clean Current Power Systems technology.

Additional developers and technologies may participate in the future.

Minas Basin Pulp and Power led the design and construction of the FORCE facility. FORCE is now administered by a board of directors, aided by environmental monitoring and community liaison advisory committees.

FORCE Test Site

FORCE's test site is in the Minas Passage area of the Bay of Fundy near Parrsboro, Nova Scotia.

At mid-tide, the current in Bay of Fundy is equal to the estimated flow of all the freshwater rivers and

streams in the world combined. With the incoming tide, about 14 billion tonnes of sea water flows through Minas Passage into the Minas Basin, creating the highest tides in the world.

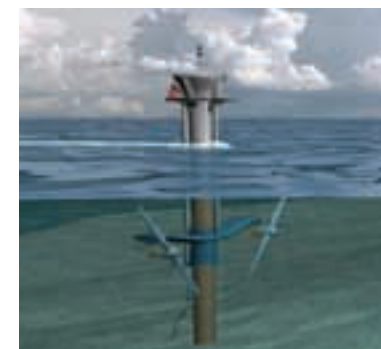
Fundy Power Potential

Research from California-based Electric Power Research Institute (EPRI) identifies the Bay of Fundy as potentially the best site in North America for tidal power generation.

In the Minas Passage alone, EPRI estimated a nearly 300 megawatt potential (equal to enough power for about 100,000 homes). Some estimates put the resource potential in the Bay of Fundy as high as 8,000 megawatts.

Tidal Technology

Tidal turbines tested at FORCE are designed to use the flow of the water as a source of power, the way a windmill uses wind.



Unlike a conventional dam, in-stream tidal technology uses the natural flow of water to generate power.

Tidal turbines do not need to spin as fast as windmills to generate power, because water is roughly 800 times more dense than air. The power output varies as the cube of the speed; in other words,

if the water flows twice as fast, it makes eight times the power.

Environmental Safety

Nova Scotia requires tidal devices to adhere to strict environmental safety standards. This included both a strategic environmental assessment in 2008 and a site-specific environmental assessment in 2009. An environmental monitoring program has been in place since 2009, and devices may be ordered removed if required. FORCE receives ongoing monitoring advice through an environmental monitoring advisory committee.

Nova Scotians want to understand the potential of this technology on a demonstration basis before considering any large-scale commercial development; demonstration will also allow for further technological refinement.

The Bay of Fundy is an important resource to Nova Scotia, and development must take place responsibly.

Climate Change Goals

Nova Scotia has strong motivations for pursuing tidal energy. Most of Nova Scotia's electric power is currently fossil-fuel based, accounting for nearly half of all provincial greenhouse gas (GHG) emissions.

In response, Nova Scotia created legal targets for GHG emissions: a 10 per cent cut below 1990 levels by the year 2020. That target is supported by the first and only hard caps on electricity emissions in Canada, and a deadline of 25 per cent renewable electricity by 2015.

The Fundy Standard

Tidal devices operating in the Bay of Fundy may experience tides moving at speeds up to 5 metres per second, expanding up to 5 kilometres horizontally, and rising up to 16 meters vertically—the height of a five-storey building.

If you can produce power under these conditions, and produce it safely and reliably, you can meet the Fundy Standard.



North America's first and only tidal generating station in Annapolis Royal, Nova Scotia.

A history of innovation

1607

A mill powered partially by tidal energy was built in Nova Scotia, converting roughly 25 to 75 kilowatts of power.

1935

Work began (but was later abandoned) on a proposed 350 megawatt Passamaquoddy Bay tidal project along the US-Canada border.

1984

Nova Scotia Power builds North America's first and only tidal generating station in Annapolis Royal, Nova Scotia. Still in operation, the plant produces about 20 megawatts when running—enough to power roughly 6,000 homes.

2008

Minas Basin Pulp and Power awarded contract to lead FORCE development.

2009

Nova Scotia Power begins testing a 1 megawatt OpenHydro turbine at FORCE. The 10-metre diameter Open-Centre in-stream tidal turbine is the largest of its kind anywhere in the world.

2012

Minas Basin Pulp and Power and ALSTOM scheduled to install commercial-scale turbines at FORCE.

Project Update



The FORCE observation facility (above). Construction as of June 3, 2010 (below), overlooking test site.

Building

Construction is underway at the FORCE observation facility, which overlooks the technology test site. The approximately 3,500-square foot FORCE facility will house a visitors centre with interpretive exhibits and a community room. It will also offer space for on-site research work, with eight independent Nova Scotia-based research projects already underway. The modular building can be completely disassembled and reconstructed, with other sustainable features that include passive solar

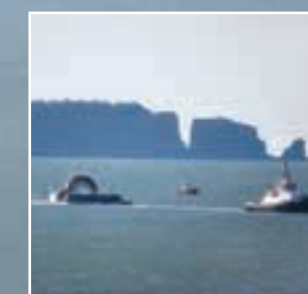


heat gain in winter, high performance glazing and solar shading to help cooling in summer, and storm water drainage and control. The facility should be complete by fall 2010.

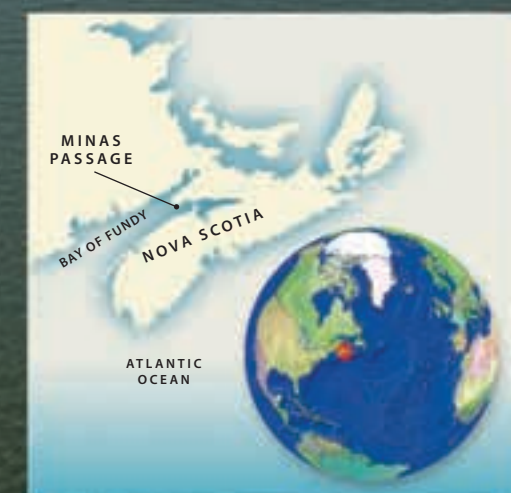
Turbine

NS Power's OpenHydro turbine remains in the Minas Passage where it was deployed in November 2009. The turbine will be recovered in fall 2010 for a complete engineering analysis to provide valuable technical information about the effects of the tidal regime on the turbine over the past year. The recovery will be a major milestone in understanding how turbines operate in the challenging Bay of Fundy environment. Following the completion of the engineering analysis, OpenHydro will review the design of the turbine and redeploy next year.

The FORCE test site is considered ideal for in-stream tidal devices, with an enormous tidal resource close to the existing electricity grid.



Above (and inset): North America's first commercial scale turbine is towed into position at the FORCE test site (map, right) in the Bay of Fundy (November 12, 2009).



Minas Basin Pulp and Power's technology partner is Marine Current Turbines.



Nova Scotia Power's technology partner is OpenHydro.



ALSTOM's technology is Clean Current.