

Nova Scotia Tidal Energy

**The power of the highest tides in the world.
The plan to harness it.**

Fundy Power

Nova Scotia is home to the Bay of Fundy, where more than 160 billion tonnes of water flow twice a day. That's more than four times the combined flow of every freshwater river in the world.

Tides moving from the outer Bay into the smaller Minas Basin can reach peak surface speeds of five metres per second, and rise up to 16 metres vertically—the height of a five-storey building. The flow of each tide delivers commercial potential of approximately 2,500 megawatts of power.

Nova Scotians have long been aware of the power of the Bay of Fundy, building tidal mills as early as 1607, and constructing a tidal power plant in 1984—one of only three in the world. New research suggests Fundy tides have the potential to play a much larger role in Nova Scotia's energy future.

A Plan to Harness It

To help realize the Bay of Fundy's potential, the Province of Nova Scotia has taken a number of strategic actions:

- Supporting the Fundy Ocean Research Center for Energy (FORCE)
- Establishing green rules & incentives
- Continued research & monitoring
- Developing the Marine Renewable Energy Strategy & legislation



Annapolis tidal barrage installed in 1984. The plant generates up to 20 megawatts, enough power for up to 6,000 homes.



Bay of Fundy

"One of the best places for tidal power in the world."

James Ives, CEO, OpenHydro

FORCE

FORCE—the Fundy Ocean Research Center for Energy—was established as Canada’s leading test center for tidal energy technology. FORCE works with developers, regulators, and researchers to study the potential for tidal turbines to operate within the Bay of Fundy environment.

FORCE provides a shared observation facility, submarine cables, grid connection, and environmental monitoring at its pre-approved test site. The site is ideal for testing, with water depths up to 45 metres at low tide, a sediment-free bedrock sea floor, straight flowing currents, and peak surface speeds of up to five metres per second.

Nova Scotia has permitted three participants to test devices at FORCE:

- Alstom
- Atlantis (Lockheed Martin/Irving Shipbuilding)
- Minas Energy (Marine Current Turbines/Siemens)

A request for proposals for the fourth berth was released in 2012. In 2009, Nova Scotia Power with OpenHydro deployed the first commercial-scale device (one megawatt) in North America at the FORCE test site. The successful deployment and removal of the device resulted in a greater understanding of the environment in the Minas Channel and of the operational challenges of working in the strong currents of the Bay of Fundy.

FORCE has received funding support from the Government of Canada, the Province of Nova Scotia, Encana Corporation, and participating developers. More information is available at fundyforce.ca

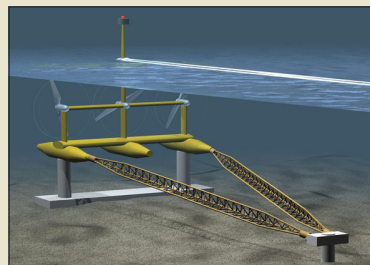
Developers & Technologies at FORCE:



*Atlantis Resources Corporation
(with Irving Shipbuilding/
Lockheed Martin)*



Alstom



*Minas Energy
(with Marine Current Turbines/Siemens)*

A Plan Forward

In May 2012, the province released its Marine Renewable Energy (MRE) Strategy. The Strategy sets out broad policy, economic, and legal conditions for renewable energy projects, technologies, and services from the ocean in anticipation of commercial development and the establishment of a new industry.

The Strategy consists of three main plans—research, development, and regulatory. These plans will help to achieve Nova Scotia’s vision to be a global leader in the development of technology and systems that produce environmentally sustainable and competitively-priced electricity from the ocean.

To view the Strategy, visit novascotia.ca/energy



*New Energy micro-tidal
device being tested in
Brier Island, Nova Scotia.*

Green Rules & Incentives

The province has created a number of policies to ensure our electric utility uses more renewable content. The motivation is simple: until recently, nearly 90 per cent of Nova Scotia's electricity supply came from imported fossil fuels, most of it coal. This meant spending electricity dollars outside the region, and exposing customers to both volatile market prices and harmful emissions. In response, the province has put in place a number of initiatives, outlined below.

Working together, these policy tools spur the potential of tidal technology to play an increasing role in Nova Scotia's future energy mix.

Greenhouse Gas (GHG) Caps

Nova Scotia set North America's first and only hard caps on greenhouse gas emissions from electricity, which increase in intensity from 2010 through to 2020.

Targets

Nova Scotia set out—in law—targets of 25 per cent renewable electricity supply by 2015 and 40 per cent by 2020. The utility faces penalties for not meeting the deadlines.

Feed-in Tariffs (FIT)

The Community Feed-in Tariff (COMFIT) Program provides projects owned by community-based entities the opportunity to participate in the production of renewable electricity. Eligible groups receive price certainty (65.2 cents per kilowatt hour) for a period of 20 years for smaller-scale distribution-connected tidal projects.

The Developmental Tidal FIT for single devices or arrays greater than 500 kilowatts, connected to the transmission system, will be set by the Nova Scotia Utility and Review Board (UARB) in 2013.

“Nova Scotia's commitment to tidal energy has put our province in a leadership position in the global tidal energy industry.” *John Woods, VP Energy Development, Minas Energy*

Research & Monitoring

In-stream tidal is a new technology, and the Bay of Fundy is an important environmental, biological, and socio-economic resource to Nova Scotia. Research and monitoring plays a critical role in determining public understanding and acceptance of this new industry and its possible impacts on the environment. Therefore, it represents one of the province's strategic priorities in developing tidal energy.

In 2007, with provincial funding, the Offshore Energy Research Association of Nova Scotia (OERA) carried out a Strategic Environmental Assessment (SEA) focused on tidal energy in the Bay of Fundy. OERA consulted with communities, the fishing industry, and others with interest in the Bay of Fundy to provide input on whether, and how, to proceed with potential development.

In 2013-2014, OERA will manage the development of a SEA for the Cape Breton coastal region including the Bras d'Or Lakes as well as update the Fundy SEA given advancements in the industry, progress in research and development as well as the potential for commercial development. Additional OERA research includes tidal resource assessment, sediment dynamics, animal behaviour,



Scientific research is a key part of developing tidal energy technology that is compatible with the Bay of Fundy. Photo courtesy of Minas Energy.

near and far field effects, potential effects of ice and debris, and potential effects of tidal lagoons.

FORCE has ongoing environmental effects monitoring in place for the test site, with a particular emphasis on fish and mammals. This ranges from fish tagging and acoustic monitoring for mammals to marine bird and mammal surveys, as well as fish migration echo sounder and netting trials. Monitoring data is available to the public at fundyforce.ca/monitoring

Continued research will be vital to Nova Scotia's acceptance of possible future development.

Legislation

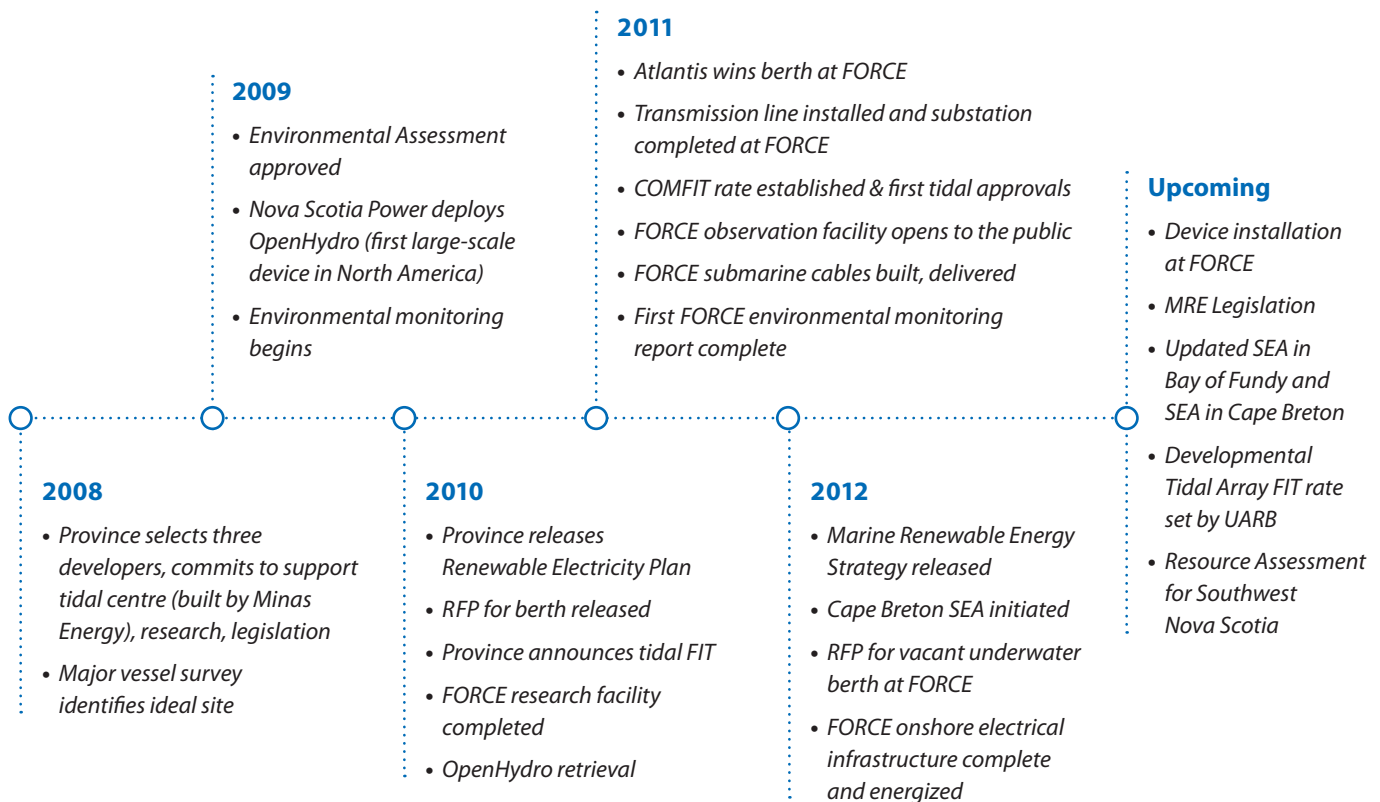
Nova Scotia is also putting new legislation in place—for tidal and other marine renewables—that will outline a clear path to move from demonstration to larger projects. This will give developers and the public more certainty around what is required to ensure any development is safe, viable, and acceptable.

The legislation will address the design of the licensing system, how to award development rights, and how to coordinate various government entities to ensure the process

is clear and efficient. These issues will affect developers' business models as well as the public interest. Effective legislation will attend to both.

The province's MRE Strategy outlines a regulatory plan to ensure the sustainable and responsible development of the industry in Nova Scotia. The Strategy focuses on phased and progressive development over the next five to 10 years with a goal of producing 300 megawatts of power in the longer term.

Timeline



Contact

Sustainable and Renewable Energy Branch
Nova Scotia Department of Energy
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novascotia.ca/energy

