



## Marine Renewables Canada Submission on Canada's Innovation Agenda

August 31, 2016

Marine renewable energy is largely an untapped resource that has the potential to provide new energy, economic, and environmental benefits for Canada. Harnessing the power of the tides, waves, and rivers can provide a clean, sustainable electricity source, contribute to action on climate change, and spur industrial growth by capitalizing on capabilities already present in other sectors. It is already beginning to spur market driven innovation – technology transfer, application of frontier science, and new technical careers and businesses into an emerging world marketplace.

The marine renewable energy industry is advancing in Canada and globally, showing great promise to be a new clean electricity industry that will contribute to a low-carbon economy and future. However, as a relatively immature industry, there are challenges working with new technologies in the marine environment—and in remote communities where marine renewable energy development has huge potential to decrease dependence on diesel generation.

On the other hand, these challenges present a prime opportunity to innovate and build a supply chain that will contribute to a clean economy. In order to realize the full environmental and economic benefits that marine renewable energy can bring to Canada, support for innovation and sector growth is essential.

### Canada's marine renewable energy opportunity

**Marine renewable energy is a clean electricity and economic development opportunity across the country.** Ocean waves and tides span our coastlines and rivers flow throughout each province. Marine renewable energy resources are not only clean, but predictable sources of energy that can help decarbonize Canada's electricity mix. Development of a fraction of the resource potential spanning the country from coast to coast to coast can contribute tens of gigawatts<sup>1</sup> of forecastable electricity supply.

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<sup>1</sup> The theoretical potential of wave, tidal, and river current energy is impressive with tidal reaching 370 TWh/year, near shore and off shore wave combined representing 1863 TWh/year, and river currents although not fully assessed yet, are assumed to range from 350 – 1500 TWh/year. The total extractable mean power potential from marine renewable energy resources is estimated at 35,700 MW according to [Canada's Marine Renewable Energy Technology Roadmap](#).



The beginnings of Canada's marine renewable energy industry are centred around the Bay of Fundy, which has attracted world-leading developers, resulted in significant investment, catalyzed world-class research and innovation, and opened up new opportunities for Canadian businesses. Over the next 25 years, development in Nova Scotia alone, could result in \$1.7 billion GDP, 22,000 jobs, and \$815 million in labour income<sup>2</sup>.

In addition to the great tidal energy potential from the Bay of Fundy, there are numerous untapped marine renewable energy sites in every province. Some resource rich sites present clean electricity and economic opportunities for remote and northern communities and industry. These offer potential to replace the use of expensive diesel with clean power, reducing carbon emissions, enabling economic development, and creating jobs in rural communities.

Canadian businesses, researchers, and communities are finding new opportunities across the country from development of marine renewable energy. Early projects provide an important opportunity to develop experience, innovations, and skills that can be applied to future development in Canada and internationally. Canada is home to ten device developers and an early supply chain is beginning to emerge with a growing number of Canadian businesses transferring and adapting skills and expertise to early marine renewable energy projects.

In fact, the Canadian marine renewables sector has been developing as a cluster that engages the innovation spectrum from researcher, technology developer, operating industry, utility and international project developer – focused on a world market opportunity that will emerge in the coming decades. The focus has been on placing Canada in an optimal position in this new sector as the demand for clean, renewable electricity becomes a part of worldwide climate action.

## A global market opportunity

**Canada can lead the world in marine renewable energy development if we act now.** The benefits that can be brought to Canada through marine renewable energy development do not end with opportunities for renewable electricity production and reducing carbon emissions, but also include the potential for significant industrial and economic growth. The global marine renewable energy market opportunity is significant, with the International Energy Agency's Ocean Energy Systems estimating that there is the potential to develop 748 GW of ocean energy by 2050, resulting in 160,000 direct jobs by 2030. In light of this potential, countries such as UK,

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[energy/publications/2888](#) Assessments for hydrokinetic/river current energy can be accessed here: [http://canmetenergy.nrcan.gc.ca/sites/canmetenergy.nrcan.gc.ca/files/files/pubs/NRCanCHC\\_Assessment\\_of\\_Canada\\_as\\_Hydrokinetic\\_Power\\_Potential\\_FinalReport\\_EN.pdf](http://canmetenergy.nrcan.gc.ca/sites/canmetenergy.nrcan.gc.ca/files/files/pubs/NRCanCHC_Assessment_of_Canada_as_Hydrokinetic_Power_Potential_FinalReport_EN.pdf)

<sup>2</sup> *Value Proposition for Tidal Energy Development in Nova Scotia, Atlantic Canada, and Canada.* Gardner Pinfold Consultants Inc. & Acadia Tidal Energy Institute, 2015. [http://www.oera.ca/wp-content/uploads/2015/04/Value-Proposition-FINAL-REPORT\\_April-21-2015.pdf](http://www.oera.ca/wp-content/uploads/2015/04/Value-Proposition-FINAL-REPORT_April-21-2015.pdf)



France, Ireland, the United States, and various countries in Asia and South America establishing supportive policies and investing in the sector for both clean energy and economic reasons.

As the global marine renewable energy industry grows, new innovations and technologies are needed everywhere. At this early stage in industry development, a global supply chain does not exist. This is a major opportunity for Canada to establish a supply chain that can export innovation, technologies, and expertise to an estimated \$900 billion global market<sup>3</sup>. Capturing even 10% of the marine renewable energy global market share results in \$4-5 billion by 2050<sup>4</sup>. Already, Canadian companies (ex. New Energy Corporation, Rockland Scientific, MilAero, Instream Energy Systems) are providing solutions to international markets and as the global industry evolves, opportunities for exports will only increase.

Canada has led and delivered a strategic approach to developing the marine renewable energy industry that has placed Canada among the global leaders in tidal energy. To ensure this renewable energy resource plays a role in climate action and economic development for Canada, early tidal energy projects need to be followed through to industrialization and a similar strategy is needed to realize the full potential of wave and river current energy, as well as tidal energy resources in other parts of the country.

## Poised for action

**Canada has a strong foundation that can be built upon to advance the marine renewable energy industry.**

World-leading activities in Nova Scotia around tidal energy development can act as an incubator for the Canadian sector, engaging strengths in marine, hydropower, ocean technology, and oil and gas industries.

Canadian utilities and power project developers have experience at home and abroad that make the potential for export of clean electrons and expertise a significant growth opportunity for the Canadian economy.

Canadian universities and academia are engaged with industry on technical and environmental research to support marine renewable energy development.

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<sup>3</sup> Carbon Trust. (2011). Accelerating Marine Energy: The potential for cost reduction – insights from the Carbon Trust Marine Energy Accelerator. Retrieved from: <https://www.carbontrust.com/media/5675/ctc797.pdf>

<sup>4</sup> Gardner Pinfold Consultants Inc. & Acadia Tidal Energy Institute. (2015). Value Proposition for Tidal Energy Development in Nova Scotia, Atlantic Canada, and Canada. Retrieved from: [http://www.oera.ca/wp-content/uploads/2015/04/Value-Proposition-FINAL-REPORT\\_April-21-2015.pdf](http://www.oera.ca/wp-content/uploads/2015/04/Value-Proposition-FINAL-REPORT_April-21-2015.pdf)



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Canada also has a major strategic advantage in the operations of three initiatives/centres focused on critical research and the testing/demonstration of each type of marine renewable energy technology –Fundy Ocean Research Center for Energy (FORCE) in Nova Scotia (tidal energy), West Coast Wave Initiative in British Columbia (wave energy), and the Canadian Hydrokinetic Turbine Test Center in Manitoba (river current energy).

Adoption of this strategic movement for enhanced cluster development can expand the engagement across Canada's science, technology and business community. The ultimate scale of engagement in the international marketplace will depend on the breadth and depth of engagement in the next five years.

## Challenges bring opportunities

**Addressing challenges faced by the marine renewable energy industry can result in new opportunities for Canada.** Many challenges present an opportunity for Canadian businesses and researchers to innovate and find solutions that are also needed by the global market.

The reduction of electricity costs that have accompanied the industrialization of solar energy will come for marine renewable energy as well. Technologies used to harness energy from waves, tides and river currents are new and require demonstration and refinement. The equipment and infrastructure to deploy, operate, and maintain a marine renewable energy generator can be costly. Ongoing research and monitoring is also required to understand interactions between marine renewable energy generating devices and the marine environment. All of this combined currently results in high project costs, which translates to electricity that is not yet competitive with traditional resources and some other forms of renewable energy. However, the energy densities in tidal and river currents and waves are higher than solar and wind, which is expected to help the industry realize competitive power solutions in the near future.

Innovation will be critical to bringing down the cost of electricity produced from marine renewable energy resources – and it will also provide Canada with an opportunity to export innovation to a new, growing global market. By building on strengths and advantages, particularly from Canada's history and expertise in related offshore, marine, and energy sectors, Canada could be highly competitive in the world marketplace while contributing to national and regional energy and environmental goals.

## Actions to realize Canada's marine renewable energy potential

Marine renewable energy is a new industrial opportunity for Canada, where our country can lead —a rare and valuable opportunity. We need to work together, with government, to realize the opportunity and ensure marine renewable energy contributes to climate action. Marine renewable energy development can help meet several provincial and federal goals:

The power to think bigger.



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- A low-carbon, climate resilient economy
- Pan-Canadian climate plan & commitments under the Paris Agreement
- North American Climate, Clean Energy, and Environment Partnerships
- Mission Innovation
- Goals of the Premiers' Canadian Energy Strategy
- Provincial mandates such as Quebec's Plan Nord, BC's Climate Leadership Plan, Nova Scotia's Marine Renewable Energy Strategy and Electricity Plan, and the emerging strategies from Alberta and Ontario.

To support marine renewable energy development and ensure it plays a role in addressing clean growth and Canada's climate challenges, the following actions should be taken:

- Adopt a national strategy to exploit Canada's advantage in renewable electrification to meet climate action targets while developing new economic opportunities. Within that strategy, recognise that Canada's extensive tidal, wave, and river current energy opportunities are an incubator for a new domestic and international industry, by:
  - Establishing a collaborative working group of government (relevant federal and provincial departments), industry, and researchers to address the challenges in developing this industry, focus strategic actions, and develop and align effective support mechanisms.
  - Making a marine renewable energy cluster a focus in the Innovation Agenda, bringing together existing industry strengths to develop tools and programs that focus on cost reduction through innovation, building volume and scale, and gaining experience through a learn by doing approach.
  - Establishing strategies and support mechanisms that 1) help tidal energy in Nova Scotia move beyond 25 MW and achieve the next stage of development towards industrial-scale projects and 2) begin accessing wave, small-scale tidal, and river current opportunities in other regions of Canada. This could include:
    - *Innovation funding*: Establish and apply funding that will accelerate innovation critical for industry advancement, leading to a competitive



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cost of electricity from marine renewable energy and new technologies and services with export potential.

- *Access to finance:* Align fiscal (CRA) and risk reduction (Regional Development agencies, BDC and EDC) mandates to attract Canadian institutional finance into emerging renewable industry development.
- *Market creation:* Work with and/or partner with provinces to develop tools that signal a future market path for marine renewable energy, making it easier for industry to attract private sector investment (ex. Power production incentive, feed-in tariff, etc.)
- *Price on carbon:* Use carbon pricing and/or regulations to signal that hydrocarbon-fuelled electricity generation is at best a short-term solution or a stranded asset.

#### **About Marine Renewables Canada**

Marine Renewables Canada is the national industry association for wave, tidal, and river current energy, representing technology and project developers, utilities, researchers, and the energy and marine supply chain. Since 2004, the association has worked to identify and foster collaborative opportunities, provide information and education, and represent the best interests of the sector to advance the development of a marine renewable energy industry in Canada that can be globally competitive.

More at [www.marinerenewables.ca](http://www.marinerenewables.ca)