

## Input – Climate Leadership 2015

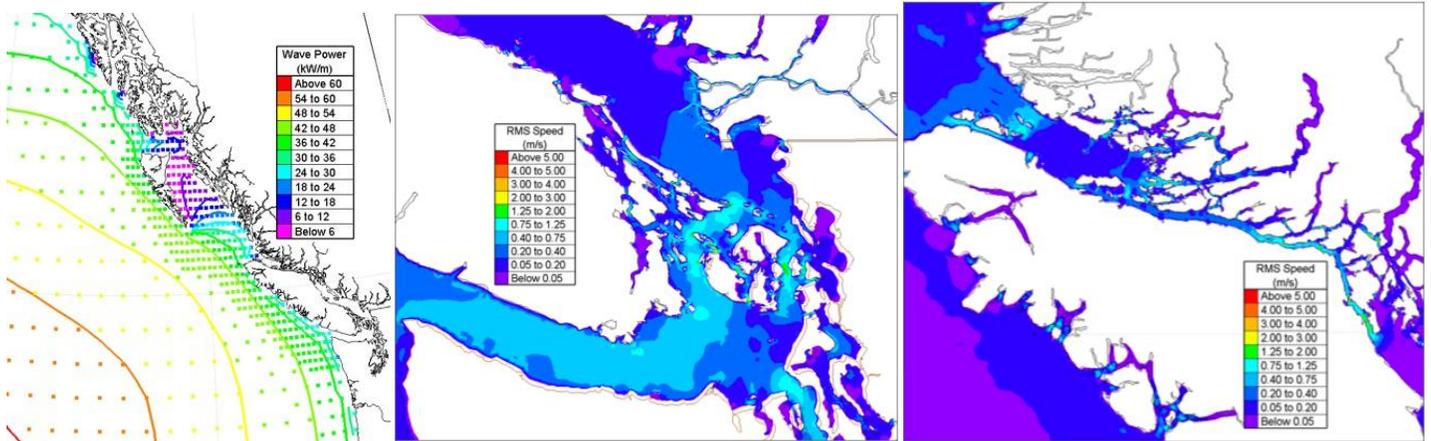
### An action focus

1. Recognise the critical need to develop renewable electricity resources that maybe independent of climate change and provide for security of supply.
2. Address this within the climate/economic action plan, by adopting a strategy to capture the energy diversification and economic opportunities offered by using wave, river and tidal energy to meet climate action goals.
3. Recognise that the huge resource opportunity + the fit with BC marine, power technology and IPP industry + the currently open market leadership opportunity = a strategic advantage unique to renewable marine renewable energy creating a global economic development opportunity as well as a local energy diversification opportunity.
4. Recognize that the needs of 2025 and 2050 can only be met if development begins in 2015.
  - a. Instruct BCUC and BC Hydro to develop an Emerging Energy Standing Offer to complement the Standing Offer for commercially proven technology - commit them to power purchase agreements that enable project development of 50 MW each of wave and tidal capacity by 2025 (already enabled in the Clean Energy Act).
  - b. Challenge BC Hydro to implement an emerging energy development pathway – R&D by Powertech Labs, support for academic research chair and Centre of Excellence, enabling partnerships in development projects aimed at improving costs of production and proving reliability.
5. Ensure that a permitted, grid connected tidal development site near Campbell River, and a similar wave energy site near Ucluelet are developed within 2 years.
6. Ensure that any Cap and Trade, Carbon or emissions trading scheme is incented to diversify the energy portfolio – renewable energy credits from strategic resources be more valuable so that more expensive emerging energy opportunities attract the offsets on a preferential basis with commercial initiatives.

### The BC Opportunity

British Columbia's economic history is vested in its use of the ocean to supply a world seafood market and its seaways to deliver resources to industry and goods to market. These natural resources were developed through the evolution of

the Province from pre-contact to recent social, economic and industrial growth. **As the world moves to reduce climate change causes and to mitigate impacts, once again the ocean provides BC with a strategic advantage. BC is almost uniquely endowed with enormous resources in wave, tidal and in-stream river energy. These perpetual renewable resources can be a significant part of the climate action toolbox. They can also be the basis of a new low-carbon opportunity for the businesses, communities and economy of the coast.**



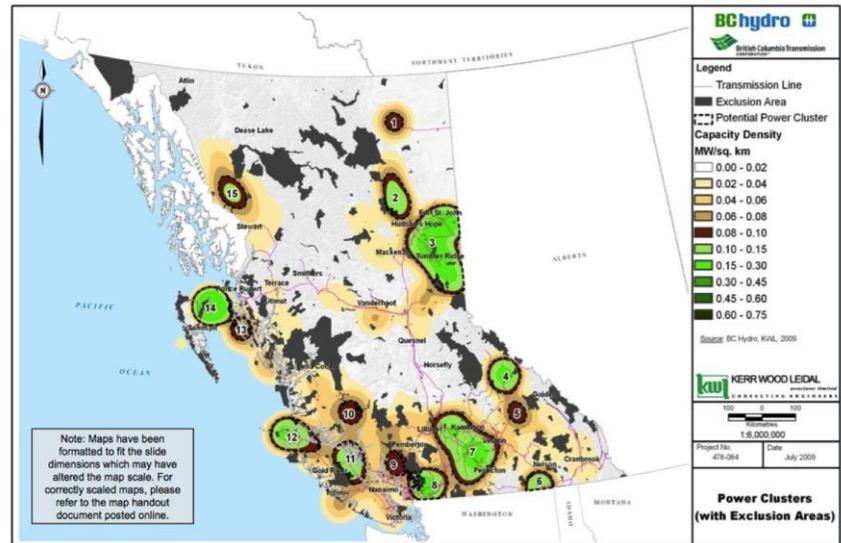
- Wave
  - Offshore - 40,000MW
  - Vancouver Island shoreline - 10,000MW
  - Queen Charlotte Islands shoreline - 10,000MW
- Tidal stream
  - 100 sites
  - 4,000MW
- Rivers and canals?
  - (BCH Capacity ca 11,000MW)

- ### Strengths of marine energy
- Energy density up to 50 times that of wind, and 100 times solar PV
  - 2 knot tidal stream - 500 W/m<sup>2</sup>
    - Flow and timing predictable
  - NW Pacific - 20-50 KW/m wave front
    - Forecastable 5+ days
    - Endures longer than wind events
  - Rivers
    - 24 hr, 365 day flow
    - Forecastable seasonality
- www.OREG.ca

In undertaking action on climate change, British Columbia can diversify its electrical resource options and attract economic benefits directly from development of new energy infrastructure. However, government, utilities, industry and the research community must move toward implementation of a regionally focused marine renewable energy development initiative.

**The high-point in recent climate and energy discussions was the inclusion of wave, tidal and river energy as targets for an “emerging energy” feed-in-tariff regime enabled by the Clean Energy Act of 2010.**

In the preparation for the BCUC Long-term Transmission Enquiry, BC Hydro incorporated marine renewable energy into its clean energy resource cluster analysis. Its significance is that marine renewable energy is a significant part of several of these clusters and the cluster distribution suggests that the longer-term architecture of the BC electricity system will make the coastal region into generation centres rather than load at the end of the existing system.



The Standing Offer Programme and the Feed-in-Tariff provision in legislation could be departure points for action on climate impact mitigation, energy diversification and economic diversity.

## Opportunity recognition elsewhere

An emerging strategy for Canada, as marine renewable energy development emerges globally has led to adoption of a focus on the industry development in Nova Scotia. A renewable electricity plan (and specific marine renewable energy legislation this year), facilitated permitting of an industry incubation site and its establishment with 64 MW of offshore cabled interconnection has attracted the world leading project developers to join the local utility (Emera) and bring most of the lead tidal technology developers to the Bay of Fundy. Emera in partnership with OpenHydro and the government of Nova Scotia are expecting the pioneer developments to be extended into industrial scale tidal at 300MW, and perhaps as much as 2 GW, backed by hydro and aimed at a recovering US electricity market.

While the UK and France are also working on the launch of the tidal energy industry, British Columbia's wave energy expertise and resource opportunities can still be a focus for the world industry.

## Climate Leadership – 2015

### Departure points

#### 1. The Climate Action agenda

The agenda has clearly advanced to impact mitigation. **Surely diversification is needed for a provincial electricity system that is almost entirely dependent on precipitation. Off-grid diesel power must be reduced or eliminated.** Industry has benefitted from its "powered by clean electricity" base and new industry should have the opportunity to use renewables. The clean electricity agenda in neighbouring provinces and states will have demands that cannot be met domestically. BC Hydro has looked at long-term resource development potential and needs to redevelop this perspective.

### **Capacity – Grid infrastructure**

As British Columbia moves to incorporate more power from distributed generation and supplies that are more variable than heritage hydro resources, structural and other constraints due to grid design, age and capacity will limit ability to realize the potential. In fact this constraint was recognized in launching the cancelled Transmission Inquiry before BC Utilities Commission

**Proposition:** Launch studies now in order to ensure that planning accommodates marine renewable energy resources.

**Action:** Priorities are

- Refining studies for British Columbia to access its resource potential
  - Refine studies of wave, tidal stream and river/estuary in-stream resource opportunities
  - Studies matching this to British Columbia grid capacity and constraint analysis
  - Studies addressing potential competitive/complementary developments in wind and other sectors

### **Capacity – Off-grid solutions**

British Columbia's off-grid and regional grid needs are typical of large numbers of worldwide ocean energy applications. Refinement of suitable approaches for British Columbia will demonstrate Canadian capacity and solve cost, reliability and GHG issues.

There has been interest in the Queen Charlotte Islands as a model project incorporating tidal stream power. There are a number of remote lodge and aquaculture sites currently being looked at. In all cases, the ICE (or a new technology) fund or carbon tax could help

**Proposition:** Launch incubation projects now assessing the renewable ocean energy resources, permitting, engineering and other challenges while allowing technology and project developers to focus on their more narrow needs.

**Action:** Priorities are

- Establish Public/Private leadership team for each project
- Confirm project/site focus for off-grid tidal and wave energy project development based on
  - Interconnection and integration feasibility study
  - Strategic environmental assessment/facilitated permitting of project sites
  - P3 business/transition plan
  - Site/project engineering
- Establish enabling power sale/market access agreement
  - Commitment to purchase and distribute power
  - Feed in Tariff or other financing mechanism
- Establish enabling financing mechanisms
  - Support for infrastructure
  - Levering individual project financing
- Establish project monitoring for the benefit of technology developers, project developers, regulators, remote communities and the power distribution sector.

## 2. BC's place in a new clean energy economy

Diversifying the marine industry supply chain potential, including the National Shipbuilding Procurement Strategy (NSPS) was one of the objectives of the multi-year infrastructure development intended to extend the marine fabrication industry into new markets. Marine renewable energy will create new supply chain demands that can benefit from the marine operations and construction experience of the primary contractor, and provide them with a new market. The international suppliers will have Industrial Regional Benefits and skills and experience that could be combined in joining development efforts of enormous benefit for the marine energy sector.

The region has a strong network of ocean science and technology companies with technologies, experience and knowledge that will become critical in moving marine energy forward. The experience in taking some of those tools into a new arena in the cabled observatories (VENUS and NEPTUNE) has led to a large monitoring system development project at FORCE in Nova Scotia – the Fundy Advanced Sensor Technology Platform project (FAST). Activity in the west may help test approaches on the way to the Bay of Fundy or Fundy results may be able to be exploited in BC in ways that accelerate development of the industry.

First Nations, remote community and sustainability needs could coincide with the BC Hydro strategy. For example, BC Hydro identified 50 communities in need of a renewable solution to a low diesel-electricity future. Many First Nations find themselves in this group. Others are looking for energy options to re-establish coastal and river communities for eco-education, tourism and other industrial needs (the Atlin, China Creek, and others projects are now well understood). Some recognise that river and tidal currents, or waves, might be resources that can provide careers and revenues that will sustain their communities. The matching of needs and resource options has yet to be addressed systematically by First Nations, but past work by BC Hydro and marine energy resource prospectors might be accessed.

There are a number of technology development players who can be promoted for local and other projects. The range of technical solutions being offered in the region extends from a few kilowatts to several hundred. This is a niche that Canadian companies occupy in the international wind industry. It is a massive market in the developing world, many communities lying along rivers or the ocean.

There is also regular interest from technology developers (and sometimes, power project developers) in the region's resources. These are connections we need to keep alive until such time as cost and price meet.

The West Coast Wave Initiative led by University of Victoria, with community engagement by Ucluelet is strengthening the understanding of the west coast wave resources and the potential for the regional grid to absorb it. An essential part of the project will look at integrating wave energy into a remote community micro-grid, which makes it one prototype for remote community projects for First Nations and other coastal communities. It is also advancing the art of wave resource assessment and wave convertor performance assessment. It is keeping a number of Canadian and international wave technology developers interested in these resources. Another role is the development of the young professionals who will lead in the launch of this industry. This project has the capacity to draw in more partners and to extend its geographic focus. We need to build out from it.

## Conclusion

**Climate action can be a source of industrial and economic transformation, if approached with a view to meeting needs and exploiting regional strengths. Marine renewable energy is an excellent fit for this climate action transformation.**