

Ocean Energy – Tidal Energy Areas of Interest

description

Ocean energy refers to the energy that can be harnessed from the ocean's tides, currents and waves. The creation of electricity through harnessing tidal energy is possible due to the natural and predictable rise and fall of the tides, which can create a substantial 'flow' of water twice a day. Depending on the surface and sub-surface topography and the location on earth relative to the gravitation pull of the moon, tides and tidal currents can vary considerably. Tidal energy generators (or devices) generally fall into one of the following categories. Turbine-style devices use blades and a rotating shaft to turn a gearbox, and are aligned in either vertically or horizontally. Hydrofoils are generators designed more like a fish tail and are forced up and down by stream flow, driving a generator.

In BC, the numerous straits, passages and fjords make it a world class region for tidal energy. In 2006, North America's first in-stream tidal energy demonstration project was installed at Race Rocks near Victoria. Project developers are now considering a number of areas on the coast of British Columbia for future tidal energy developments. Estimates of the mean annual exploitable power range from 2,700 GWh/annum to 20,000 GWh/annum (Triton Consultants, 2002).

In order to get a more comprehensive depiction of tidal energy development potential in British Columbia, the BC Marine Conservation Analysis, in cooperation with the Ocean Renewable Energy Group, convened a workshop on November 17, 2008 with industry representatives, scientists and resource managers.

Seven of the workshop participants (1) reviewed existing maps illustrating wave energy potential, (2) developed criteria additional to energy potential that influence the potential of sites for energy capture developments, and (3) individually mapped the areas of interest or promise for energy development on the BC coast, assigning measures of relative importance (value) to each area they mapped.

Workshop participants identified numerous criteria that factor into their perspectives on the potential of sites for energy development. These criteria related to the proximity of support services and transmission infrastructure, the compatibility of energy projects with other environmental or socio-economic values in the site area, and physical site characteristics like substrate and proximity to land.

Participant's maps were digitized then overlaid and weighted through addition of participants' assigned values to show the composite map represented here. The data are displayed using equal interval categories, meaning that the data are divided into 5 equally spaced classes where each class may contain a different number of grid cells.

The map also shows tidal current power potential for 92 sites in British Columbia with potential mean power greater than 1 MW. These data, developed by Triton Consultants for the National Research Council's Canadian Hydraulics Centre, are part of a Canada-wide dataset based on information from Canadian Sailing Directions, nautical charts and tide books, tide and tidal current constituent data and numerical tidal modelling data (Cornett, 2006). The points are shown using equal interval categories. It is important to note that most of the points reside in the bottom category with only six above 200 MW.



PHOTO: CLEAN CURRENT POWER SYSTEMS



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data sources

- Areas of Interest (AOI): Expert knowledge
- Tidal current power potential: Triton Consultants Ltd., for Canadian Hydraulics Centre of the National Research Council, Natural Resources Canada (funded by BC Hydro and Natural Resources Canada)

data resolution

- AOI: Participants drew their areas of interest using pen on 11x17 maps which ranged in scale from 1:700,000 in the south to 1:900,000 in the north.
- Tidal current power potential: unknown

date compiled

- AOI: Workshop, November 2008. GIS mapping, April 2009
- Tidal current power potential: 2006

reviewers

- Jessica McIlroy, Ocean Renewable Energy Group
- Chris Campbell, Ocean Renewable Energy Group (AOI Map)
- Participants in the Renewable Ocean Energy Workshop (November 2008) provided comments on the tidal potential mapping portion of the map

reviewer comments

- The map should be verified against up-to-date resource information found online at the Ocean Renewable Energy Group.
- AOI comments:
 - The type of data used to generate this map is likely the best available approach at this stage in the interest in this resource.
 - Representation of groups with interests in tidal energy who participated in the mapping exercise appears to be limited.
 - The areas of interest are likely over-represented in some areas and time may show that some areas were actually left out.
 - The BC Marine Conservation Analysis (BCMCA) mapping will facilitate the opportunity for early ocean energy projects to consider avoiding areas of high use by existing industry and communities or intense biological sensitivity.
 - Mapping workshop comment: "With respect to the potential development of tidal energy resources, it is important to note that the siting of developments around Vancouver Island can be arranged as a series of sites to provide a continuous daily supply of power."
- Tidal potential comments:
 - Mean power potential tells nothing about the practicality of any energy capture devices being installed on these sites – second dimension (local) studies are needed before energy projects can be realized.
 - Back eddies occur at very localised scales are also very important to the harvestable energy production potential of sites. They are not captured by this tidal map.
 - Local flow structure is absolutely critical in design – it's all about the spatial spread in flow, both in vertical and horizontal dimensions.
 - Showing the units of measurement as Gigawatt hours per year would improve the usability; energy is a more useful unit of measurement than power for most audiences.

caveats of use

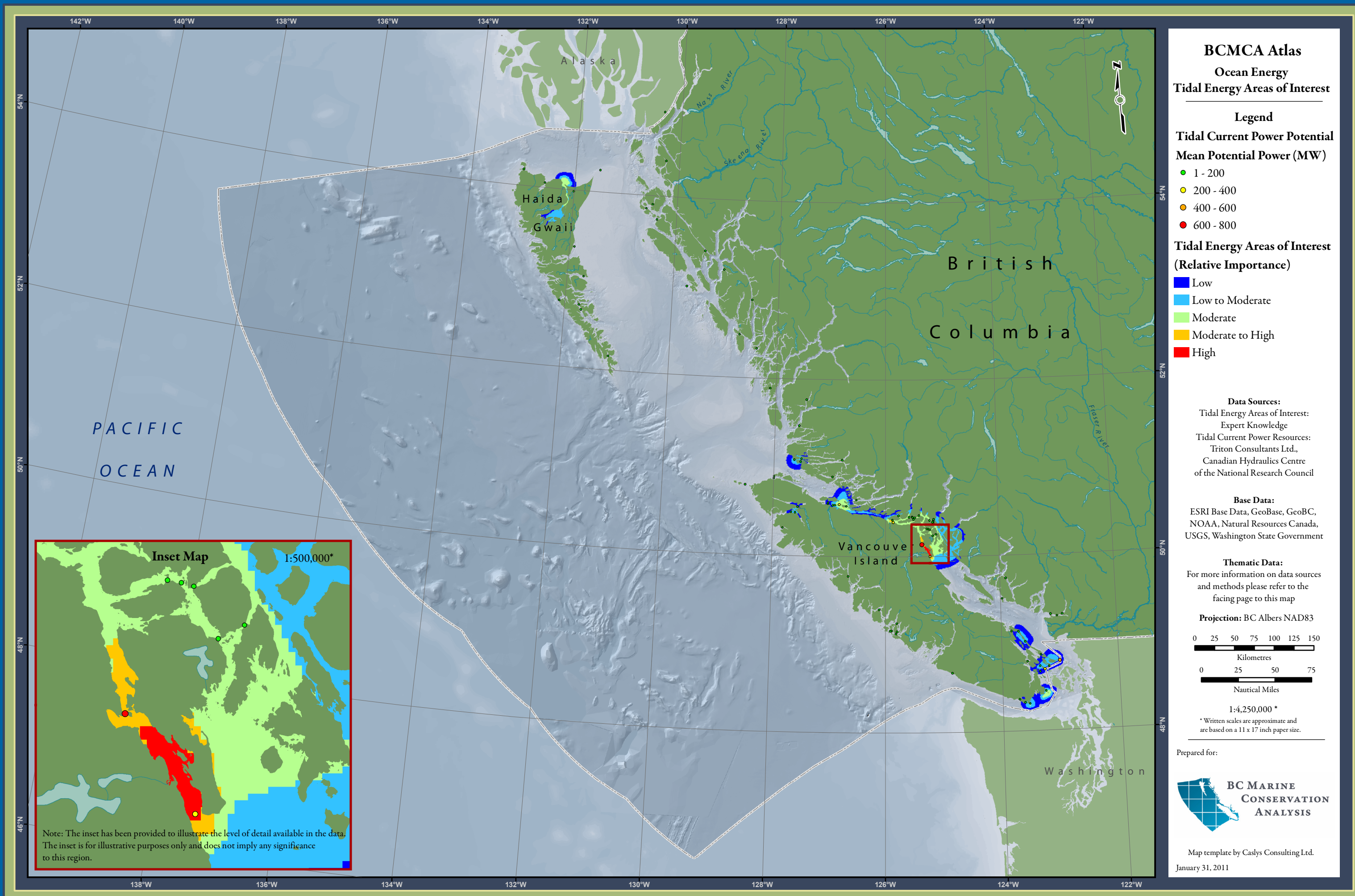
- These maps provide only a coarse (regional) indication of tidal energy resources, and as such, cannot be used for planning purposes to predict where energy development may or should happen. Finer scale, more detailed data are needed to inform where energy development may occur.
- The areas of interest assessments are preliminary and based on a limited understanding of BC's ocean energy resources. The knowledge of what sites may be appropriate is incomplete.
- Improved understanding of BC's ocean energy resources, technological advances, evolving population centres, global warming, and changing economic conditions are all likely to change future areas of interest for wave and tidal energy development.
- Participants in the mapping exercise may have considered criteria to identify and weight their areas of interest differently from each other.
- Tidal current power potential points are estimates, not economically realizable resources. No consideration has been given to environmental impacts, technological developments or limitations, climate change, site location verses power grid accessibility and demand, the effect of potential energy extraction schemes on existing flow conditions / wave regimes, and economic factors.
- Recommended date of expiry for use of these data in a marine planning context: 2013-2018, although information should be verified against up-to-date information available through the Ocean Renewable Energy Group.

map, feature data and metadata access

- Visit www.bcmca.ca/data for more information.

references

- BCMCA. *Renewable Ocean Energy Mapping Workshop report*. November 2008. www.bcmca.ca/document-library
- Cornett, A. "Inventory of Canada's Marine Renewable Energy Resources." *Canadian Hydraulics Centre, National Research Council*. CHC-TR-041. 2006. www.oreg.ca/web_documents/chc-tr-041.pdf
- Maser, Michael. *Tidal Energy – a primer*. Report prepared by Blue Energy Canada Inc. 2009. <http://bluenergy.com/Uploads/TidalEnergy/TidalEnergyPrimer-09.pdf>
- Ocean Renewable Energy Group www.oreg.ca
- Triton Consultants Ltd. *Green Energy Study for British Columbia Phase 2: Mainland – Tidal Current Energy*. Report prepared for BC Hydro Engineering. 2002. <http://web.me.com/michaeltarbotton1/Triton/download/environment3928.pdf>



BCMCA Atlas
Ocean Energy
Tidal Energy Areas of Interest

Legend

Tidal Current Power Potential
Mean Potential Power (MW)

- 1 - 200
- 200 - 400
- 400 - 600
- 600 - 800

Tidal Energy Areas of Interest
(Relative Importance)

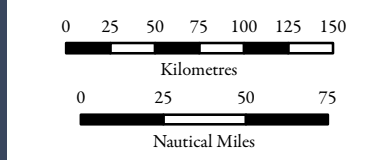
- Low
- Low to Moderate
- Moderate
- Moderate to High
- High

Data Sources:
Tidal Energy Areas of Interest:
Expert Knowledge
Tidal Current Power Resources:
Triton Consultants Ltd.,
Canadian Hydraulics Centre
of the National Research Council

Base Data:
ESRI Base Data, GeoBase, GeoBC,
NOAA, Natural Resources Canada,
USGS, Washington State Government

Thematic Data:
For more information on data sources
and methods please refer to the
facing page to this map

Projection: BC Albers NAD83

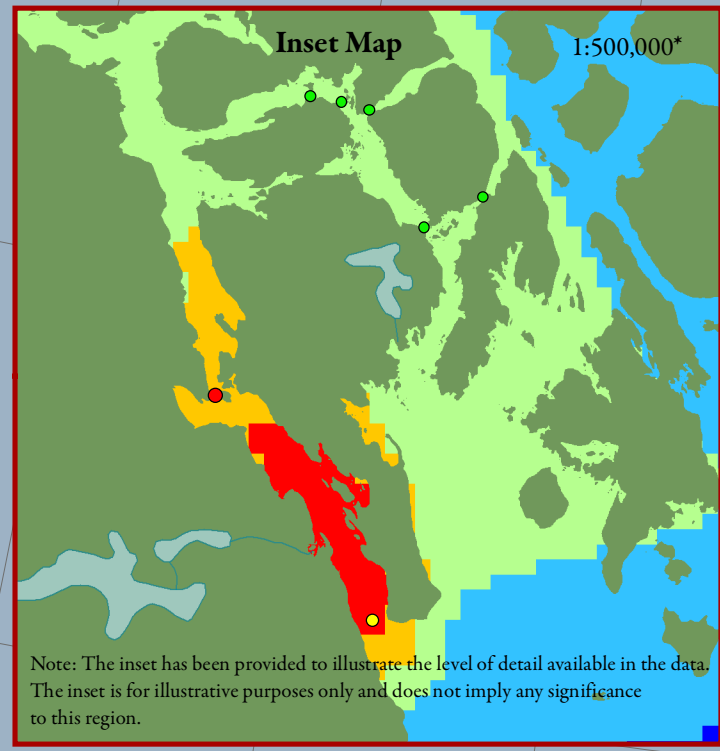


1:4,250,000 *
* Written scales are approximate and
are based on a 11 x 17 inch paper size.

Prepared for:



Map template by Caslys Consulting Ltd.
January 31, 2011



Note: The inset has been provided to illustrate the level of detail available in the data.
The inset is for illustrative purposes only and does not imply any significance
to this region.