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Independent and Renewable Power in BC

Charles W. Bois

Miller Thomson Seminar:
CleanTech, Green Energy and Environmental Update
November 18, 2009

Overview

- Renewable and Clean Energy in BC
- Government Policy & Legislative Framework
- Opportunities for Clean and Renewable Energy in BC

The Goods on Renewable and Clean Energy

- Clean energy development is:
  - Driving growth in the low-carbon or green economy
  - Creating green collar jobs
  - Could contribute $9B to economic growth in BC
  - Multiplier effect results in $26.1B injected into BC's economy by 2020
  - Reducing green house gas emissions
  - Helping to fulfill the province's domestic energy needs

Renewable Power Production in British Columbia

- BC's climate and geography are ideal for a variety of renewable energy projects:
  - hydroelectric/run-of-river, wind, geothermal and biomass (wood waste).
  - solar, wave and tidal energy are also being researched and may be economic.

Who and What are Independent Power Producers?

- IPP can be private or public company; municipal or regional government; a First Nations community or co-op.
- BC Hydro currently has 54 EPA with IPPs for 8,800 GWh/yr of energy and 2,281 MW of installed capacity.
  - 70% are run-of-river/hydroelectric projects.
  - 46 are currently in operation and produce about 9% of BC's energy needs.
- IPPs assume the risks to develop, finance, construct and operate electricity-generating facilities and transmission lines.
- Virtually all electricity produced by IPPs in BC is sold to BC Hydro.

History of IPPs in BC

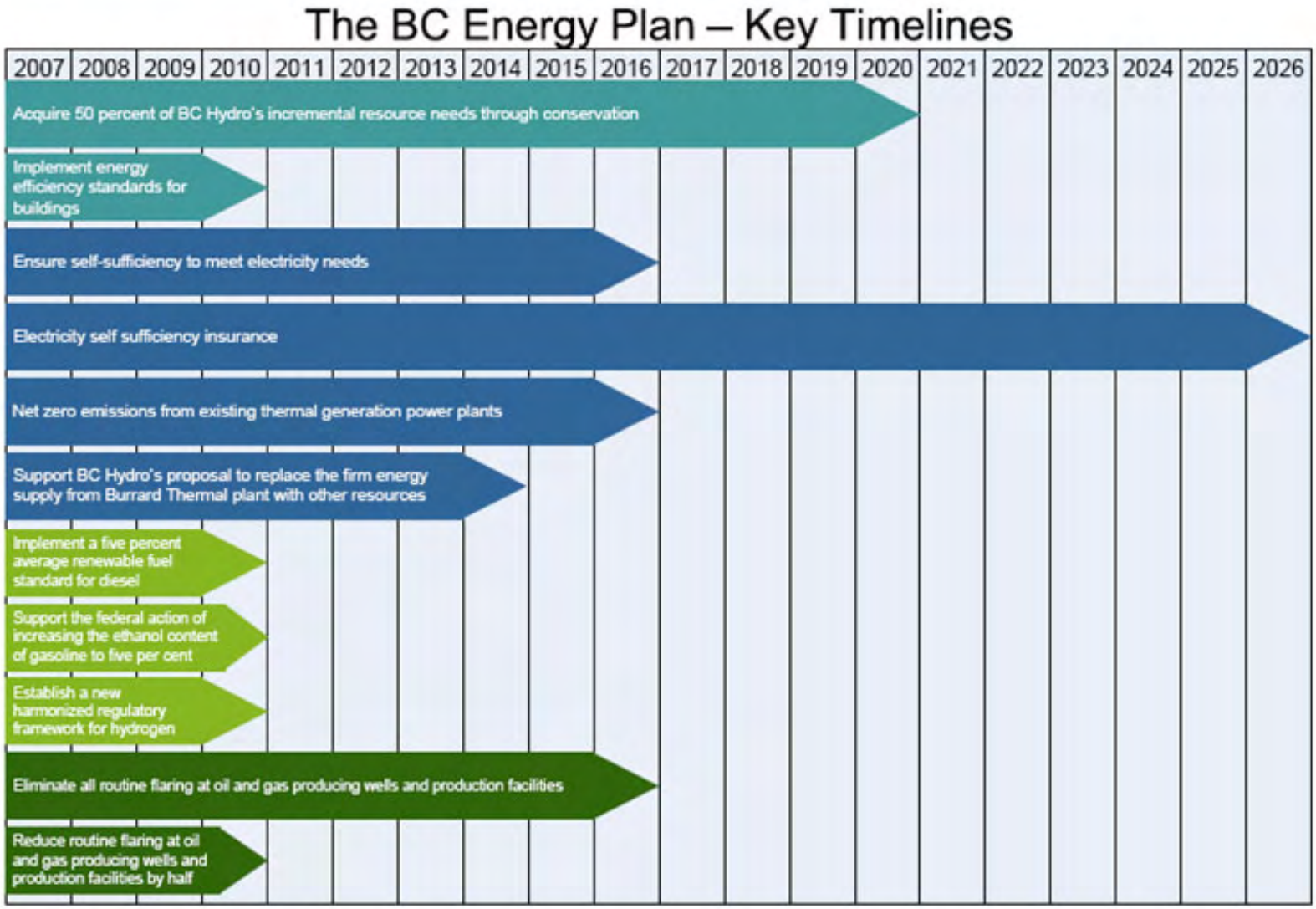
- Independent power production since late 1980s.
  - ~ Half of the IPP projects in operation in BC (as of late 2008) were built prior to 2001.
- BC's Energy Plan sets out policy and regulatory changes relating to:
  - clean/renewable electricity development;
  - climate change mitigation; and
  - security of energy supplies.

The Need for Green Power in BC

- The BC Government is encouraging the development of renewable power generation sources in the province for several reasons:
  - Eliminate GHG emissions.
  - Meet the province's growing energy needs in a sustainable manner.
  - Fill the energy gap and reduce reliance on imported, carbon-intensive, non-renewable energy.
  - Make BC is a global leader in clean technology and renewable energy.

IPPs: BC Policy and Legislation

- 2007 BC Energy Plan
- BC *Utilities Commission Act*
- *Greenhouse Gas Reduction Targets Act*
- Special Direction No. 10 to the BC Utilities Commission



Source: BC Energy Plan, Province of BC website

BC Energy Plan: A Vision for Clean Energy Leadership (2007)

- Goals:
  - No less than 90% of all our electricity will come from clean or renewable sources.
  - New electricity generating facilities constructed in BC required to achieve zero net greenhouse gas emissions (GHGs).
  - Existing thermal generating power plants achieve zero net GHGs by 2016.
  - BC will be self-sufficient in electricity supply by 2016.
  - BC will reduce GHGs by 33% by 2020 (similar to California).
  - 50% of BC's future electricity will be met through conservation.

Greenhouse Gas Reduction Targets Act, S.B.C. 2007, c.42

- S. 2(1) establish that:
  - by 2020, and for each subsequent calendar year, BC GHG emissions will be at least 33% less than 2007 levels;
  - by 2050 and for each subsequent calendar year, BC GHG emissions will be at least 80% less than 2007 levels.
  - Similar emissions reductions are planned in California

Utilities Commission Act, R.S.B.C. 1996, c.473

- IPPs are considered utilities under the *Utilities Commission Act*
  - BCUC regulates public utilities, including IPPs.
  - IPPs are exempted from regulation as long as sales are exclusively to BC Hydro.
  - But, BC Hydro must file EPAs with BCUC for approval.

Utilities Commission Act, R.S.B.C. 1996, c.473

- Section 64.01 provides that:
  - BC Hydro must achieve electricity self-sufficiency by 2016;
  - BC Hydro must maintain electricity self-sufficiency in each calendar year after achieving it.
  - Other public utilities must plan to meet these objectives as well.
- Section 64.02 provides that:
  - BC Hydro (+public utilities) must pursue actions to meet the prescribed targets relating to clean or renewable resources;
  - They must use the prescribed guidelines in planning for the construction or extension of generation facilities;
  - Their energy purchases must such that at least 90% of the electricity generated in BC is generated from clean or renewable resources.

Special Directives to the BCUC

- Have the force of legislation
- Two recent Directives
  - SD 10: When regulating BC Hydro, directs BCUC to use criterion that BC Hydro is to achieve energy and capacity self-sufficiency by becoming capable of:
    - meeting, by 2016 and each year thereafter, its electricity supply obligations; and
    - Exceeding as soon as practicable, but no later than 2026, its electricity supply obligations by at least 3000 GWh/yr and by the capacity required to integrate that energy in the most cost-effective manner, solely from the electricity generating facilities within the Province, assuming no more in each year than the firm energy capability from the assets that are hydroelectric facilities.

Special Directions to BCUC

- Direction No. 2 --- October 28, 2009
  - Directs BCUC to consider that Burrard Thermal will:
    - Have 900 MW of capacity;
    - 0 GWh/yr of energy for planning purposes.
  - Effectively means BT only for emergencies
  - No directions on Calls for Power
    - But, press release says 2008 CPC to be 5000GWh and Biomass Call 1000 GWh.

Burrard Thermal Plant

Source: Ian Lindsay, The Vancouver Sun

Opportunities for Renewable Energy Industry in BC

- BC Hydro Acquisition Programs
  - BC Hydro acquires electricity from IPPs through a competitive process
  - The amount of power purchased from IPPs and the associated contracts are subject to regulatory review by the BC Utilities Commission.
- Bioenergy Call For Power
  - Guided by the 2007 BC Energy Plan and the 2008 BC Bioenergy Strategy, BC Hydro is conducting a two-phase call for power using wood fibre and biomass fuel sources.
    - Phase 1 completed: 4 EPAs resulting in 579 GWh/yr of energy (wood fibre; waste-to-energy)
    - Phase 11 underway: Hydro to acquire 1000 GWh/yr of energy.

Opportunities for Renewable Energy Industry in BC

- BC Hydro Acquisition Programs
- 2008 Clean Call for Power
  - The Call is for “clean” energy, from projects using proven technologies.
  - BC Hydro to acquire 5,000 GWh/year of seasonal and hourly firm energy through a competitive process.
  - Accommodates larger projects with extended in-service dates of 2016 or earlier.
  - BC Hydro received bids for 68 additional projects (from 43 different proponents), representing 17,000 GWh/yr from 45 hydro projects, 19 wind projects, 2 waste heat projects, 1 biogas project and 1 biomass project.

Opportunities for Renewable Energy Industry in BC

- BC Hydro Acquisition Programs
- Standing Offer Program
  - BC Energy Plan directed BC Hydro to establish a Standing Offer Program with no quota to encourage small and clean electricity producers.
  - BC Hydro will purchase energy from eligible projects
  - Projects must be less than 10 MWs in size; be clean electricity or high efficiency electricity cogeneration.
  - The price offered in the standing offer contract is based on the prices paid in the most recent BC Hydro energy call and the region in which the project is located.
  - Price is escalated by CPI.
  - Green attributes go to BC Hydro for $3.10/MW (2008$) .

Opportunities for Renewable Energy Industry in BC

- Potential to generate virtually all of province's domestic energy needs from renewable and clean energy.
- Potential for exports of renewable power and clean technologies.
- Potential to help BC maintain its competitive advantage in a fully carbon priced economy.
- IPPs are well positioned to take on the financial, construction and operational risks of project development, thereby protecting BC ratepayers.
- IPPs have the expertise in efficiently and effectively developing smaller scale renewable electricity projects.
- BC Hydro has experience and expertise for large scale projects, such as Site C.

Small Hydro Power

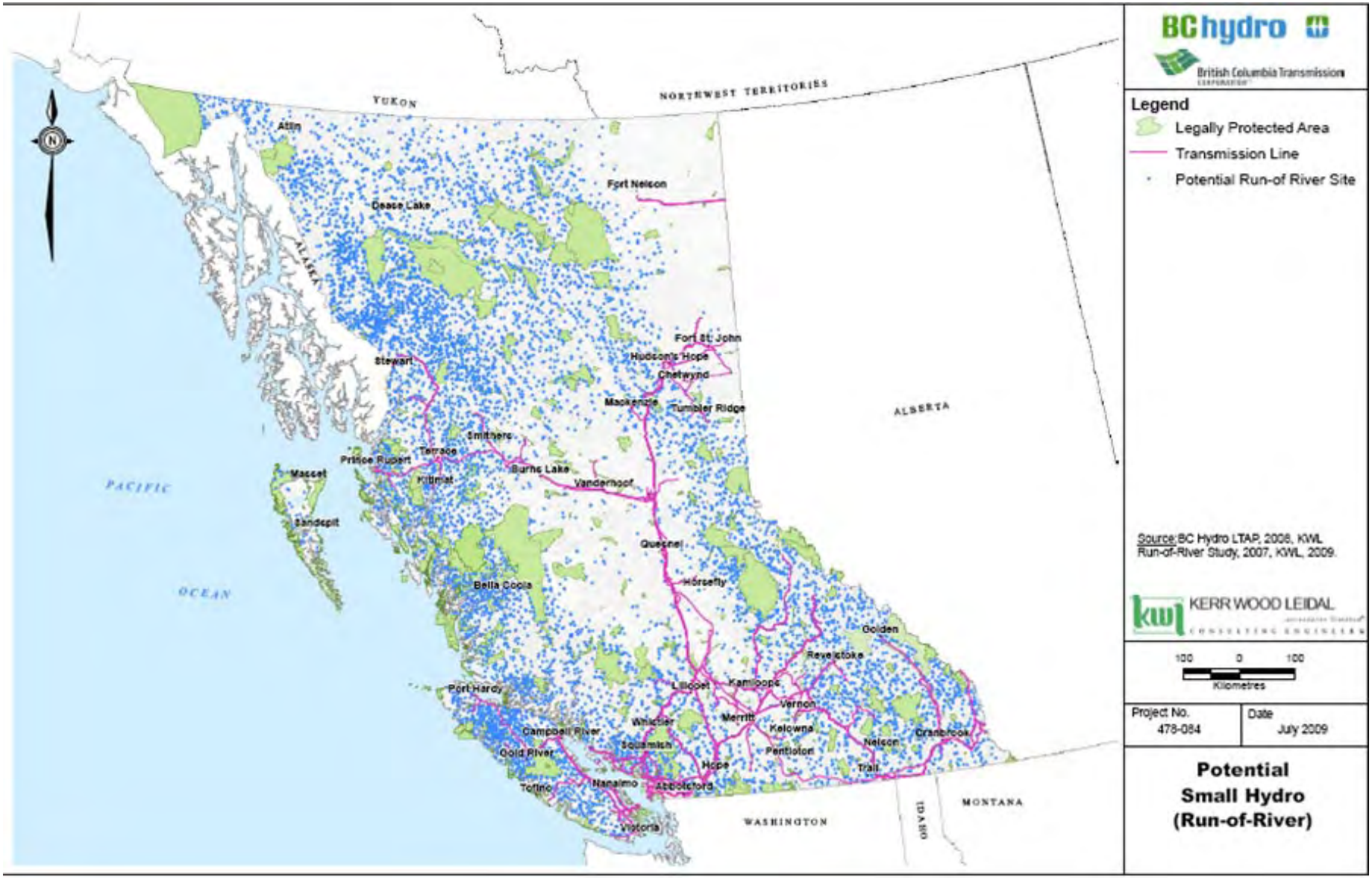
- BC's mountainous topography and climate along with its extensive waterways presents numerous opportunities for run-of-river hydro.
- run-of-river hydro projects divert a portion of the water from a fast-moving river into a penstock or pipe that channels it to a turbine, then back to the river, while ensuring that enough water remains in the to maintain and protect environmental requirements.

Hystad 2MW

Source: IPP BC website

Run-of-river Project on the Sunshine Coast – weir and headpond

Source: IPP BC website



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Small Hydro Power

- A typical 26 MW run-of-river power plant producing 80 GWh/yr of green energy displaces about 47,000 tonnes of $C0_2$.

- That's the equivalent of taking 9000 cars off the road.

Wind Power

- Wind energy is a clean, reliable, renewable, cost competitive source of renewable energy that has been used for decades.
- Wind turbines have variable capacity up to 3MW or more.
- Wind energy projects are operating in over 70 countries around the world as well as several other provinces in Canada.
- BC has one of the best wind resource climates in Canada – particularly on northern Vancouver Island, the North Coast, the Peace region and the southern and eastern Interior/Okanagan where wind energy prefeasibility studies are under way.
- Wind energy projects also face environmental hurdles relating to noise levels, bat and bird strikes, large tracts of land required, as well as impacts from construction.

Source: Province of BC website

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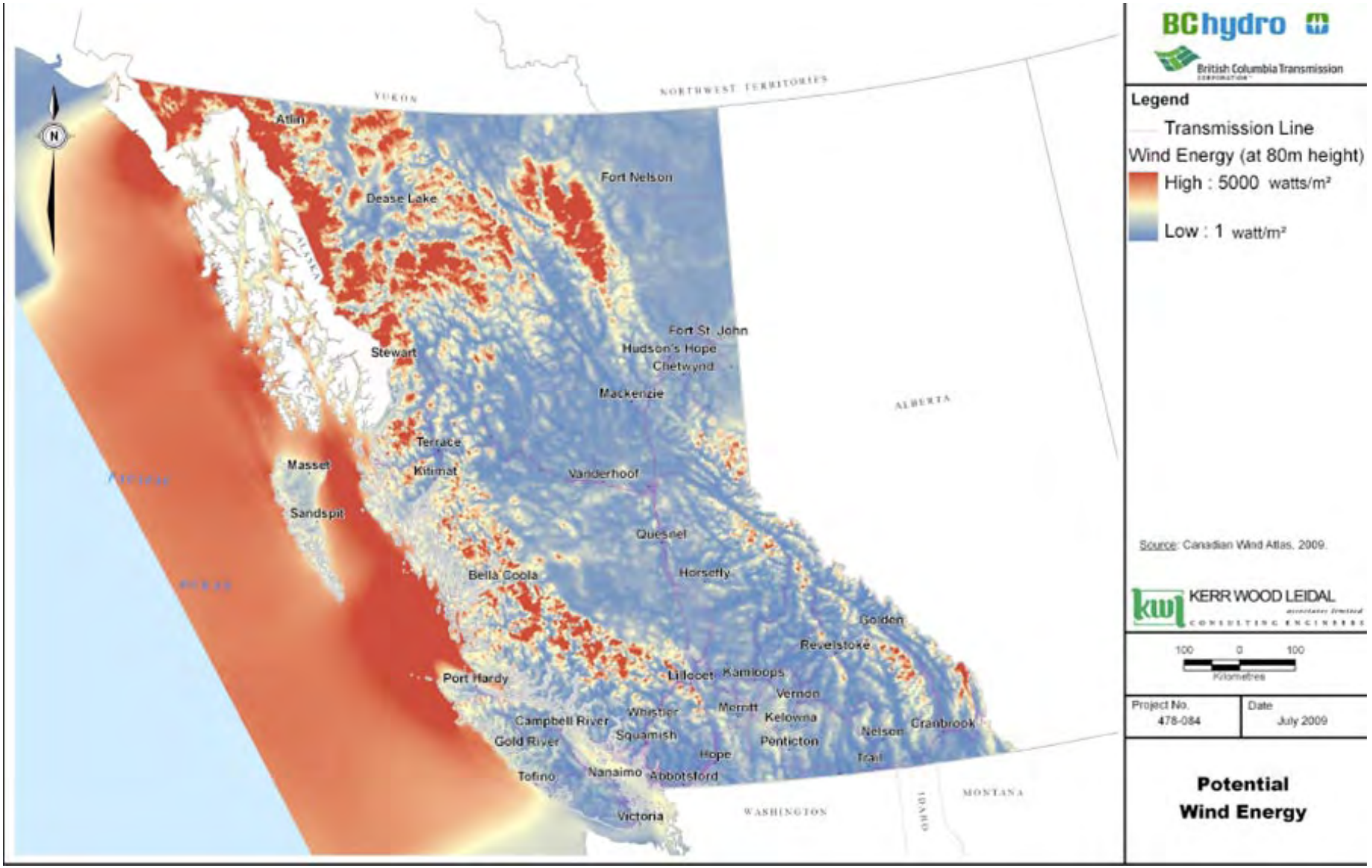

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Wind Power

- Wind turbines sit atop towers so that the blades of the turbine are free of obstacles and take advantage of higher and more constant wind speeds.
- Turbines are built to adapt to all kinds of wind conditions. Blades will turn when the wind reaches 13 km/h and shut down when the wind is too strong – 90km/h and above.
- Tower heights can be between 50 and 85 meters; and rotor diameters can reach 80 meters.
- Most economical and environmentally responsible to develop wind projects is to use multiple wind turbines that can tie-in to one transmission line right-of-way thereby providing the most power with a smaller environmental footprint.

Geothermal Energy Power

- Geothermal power is a form of renewable energy utilizing subsurface hot water or steam created by the heat beneath the earth's surface.
- Geothermal energy projects involve drilling deep into the ground to access hot water or steam.
- Geothermal power facilities require production and injection wells, a gathering and injection system, a power generation plant and a transmission line.

Source: www.bcenergyblog.com

Geothermal Energy Power

- Geothermal power plants have the distinction of being “baseload” power sources. They operate continuously at up to 98% capacity because they have a constant source of “fuel” and require little downtime for maintenance.
- Geothermal plants are not affected by changing weather conditions.
- BC Hydro has identified 16 prospective geothermal sites in the province, with the six most likely prospects having an estimated geothermal potential of over 1000 MWs collectively.

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Other Sources of Green Energy

- Solar Energy
  - A clean, reliable form of renewable energy generated by converting energy from the sun into electricity.
  - Traditionally pursued at small scale for self supply; but now large scale generation sites are being developed.
- Tidal Energy
  - Energy generated from power found in ocean tidal currents.
- Wave Energy
  - Energy generated from wave motion using offshore buoys or coastal based generating stations.

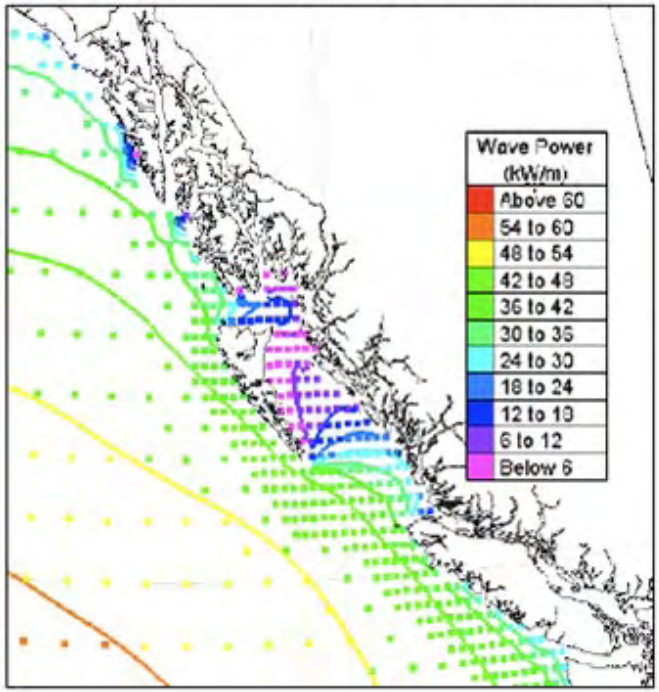
Solar Energy

Source: http://en.wikipedia.org/wiki/File:Nellis_AFB_Solar_panels.jpg

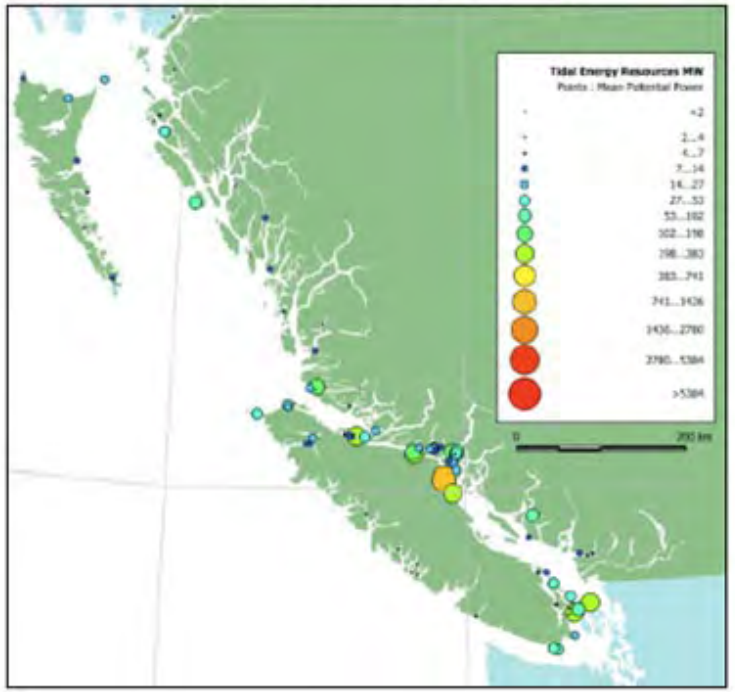
Source: The Georgia Straight

Wave and Tidal Energy Potential

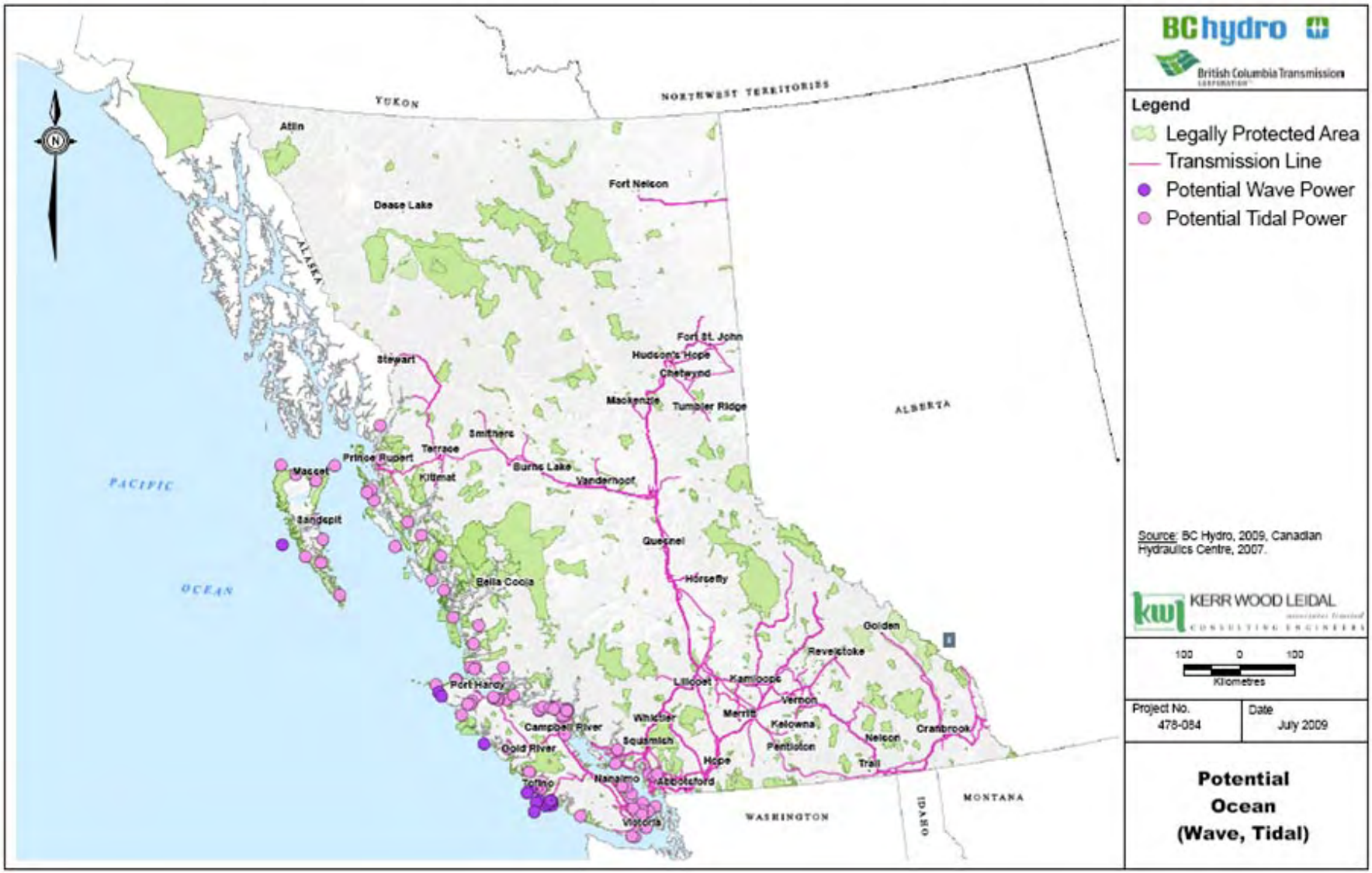
Available Wave Energy



Available Tidal Energy



Source: Canadian Hydraulics Centre



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Summary

- The BC government is committed to developing a sustainable renewable energy industry in BC and making BC a global leader in clean technologies.
- The success and sustainability of such an industry in BC will depend on:
  - Technologies implemented;
  - Resolving environmental and public concerns about IPPs;
  - Increasing demand for electricity and ensuring firm access to additional markets.
  - Exporting technology and expertise around the globe.

Thank You

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