



Status of Wind Energy in Canada

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Wind Electric Generation and Grid Integration

Asia Pacific Partnership

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Presentation Overview

- Canada's Electricity Sector
- Status of Wind Energy in Canada
- Presentation of Federal Incentives
- Presentation of Provincial Initiatives
- Getting Wind on the Grid



• East Point Wind Farm PEI





Canada's Electricity Sector

East Point Wind Farm PEI



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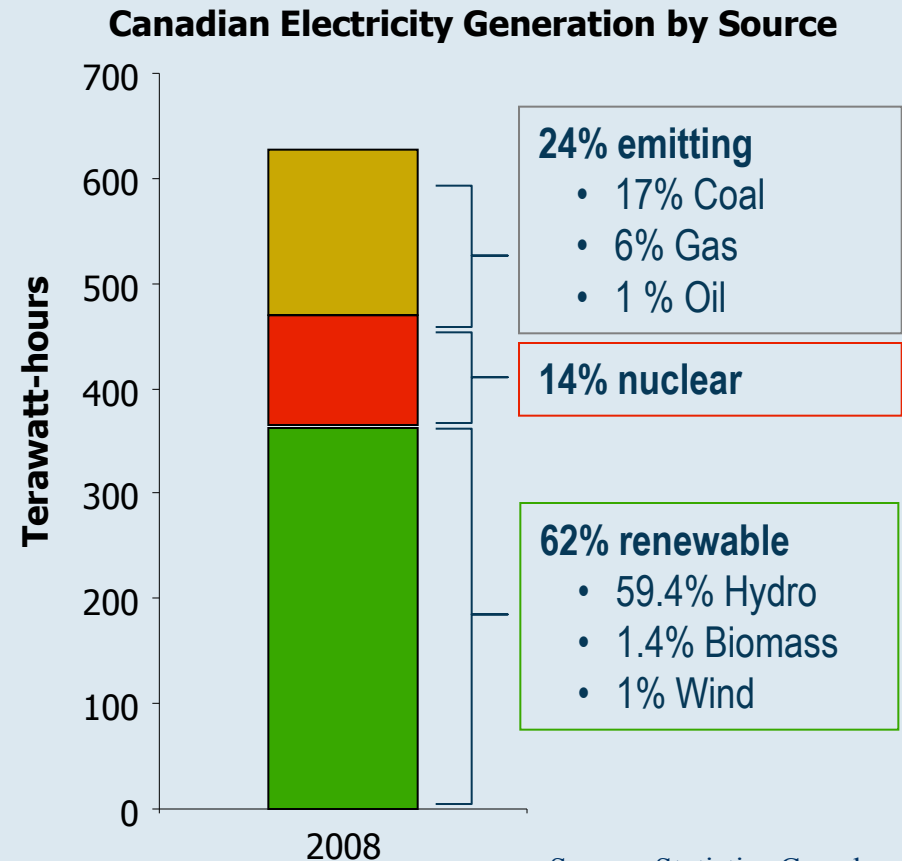
Canada is a large and diverse country

- Federal system, with 10 provinces and 3 territories
 - Covering 9,984,670 km² and 6 time zones
- Population: 34,000,000
 - Density: 3.4 people/km²
- 2009 GDP: \$1.34 trillion
 - GDP per capita: \$38,000



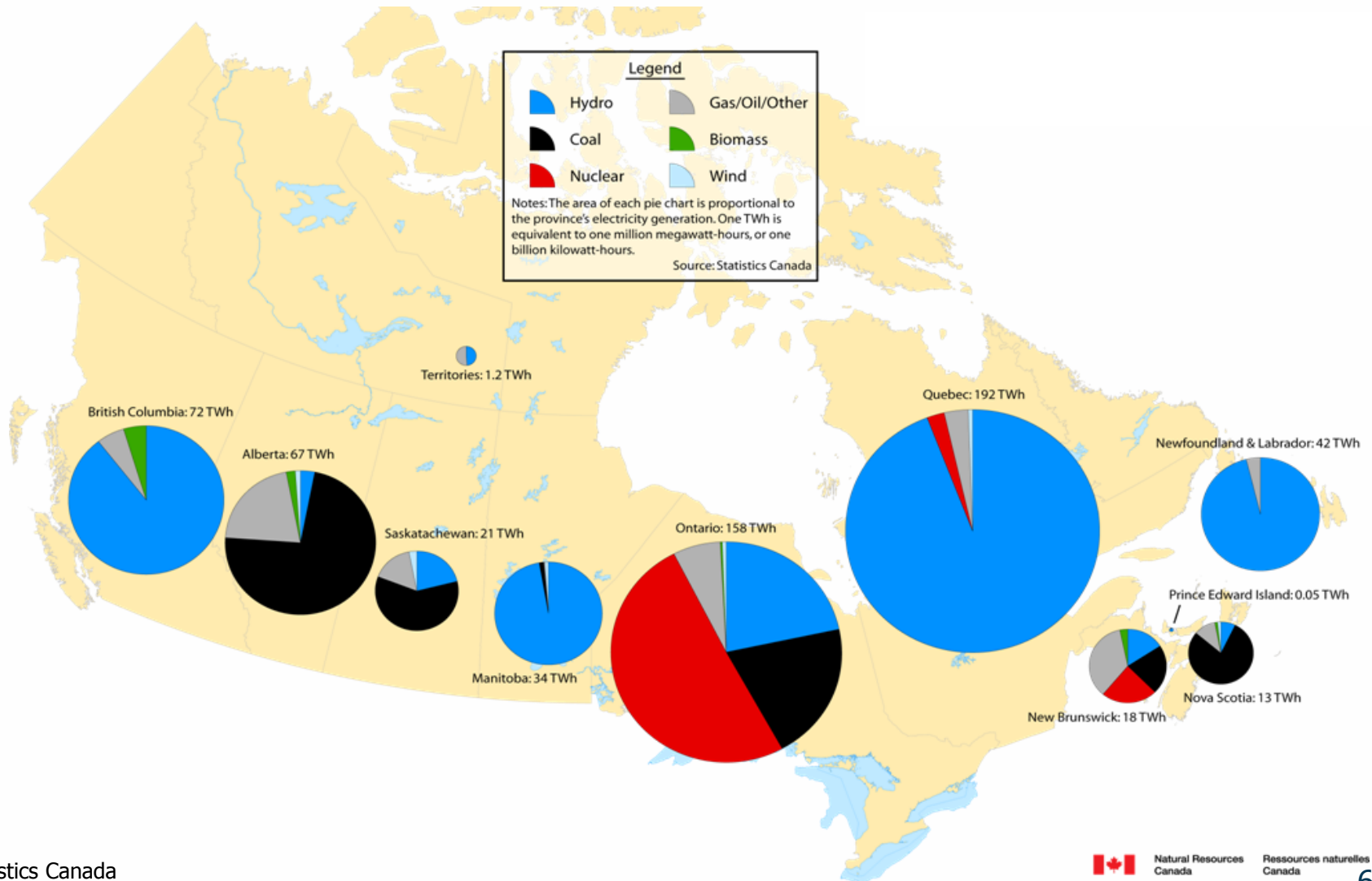
Canada's electricity mix is one of the cleanest in the world

- In 2008, 76% of electricity was from non-emitting generation
- Renewable electricity provided 62% of total generation
 - Canada is the 3rd world producer of hydroelectricity contributing about 59% of electricity in Canada
 - Wind contributed 1% of electricity demand



Source: Statistics Canada

Generation mix varies significantly by province ..



Source: Statistics Canada



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General Regulatory Process

- In Canada's constitution, jurisdiction over energy is divided between the federal and provincial governments.
- Provincial governments have jurisdictional responsibility for resource management within their borders, which includes the production, transmission, and distribution of electricity.
- Federal jurisdiction over energy is primarily associated with the inter-provincial and international movements of energy. The federal government also leads in areas such as energy technology R&D.

Electricity systems are primarily under provincial jurisdiction

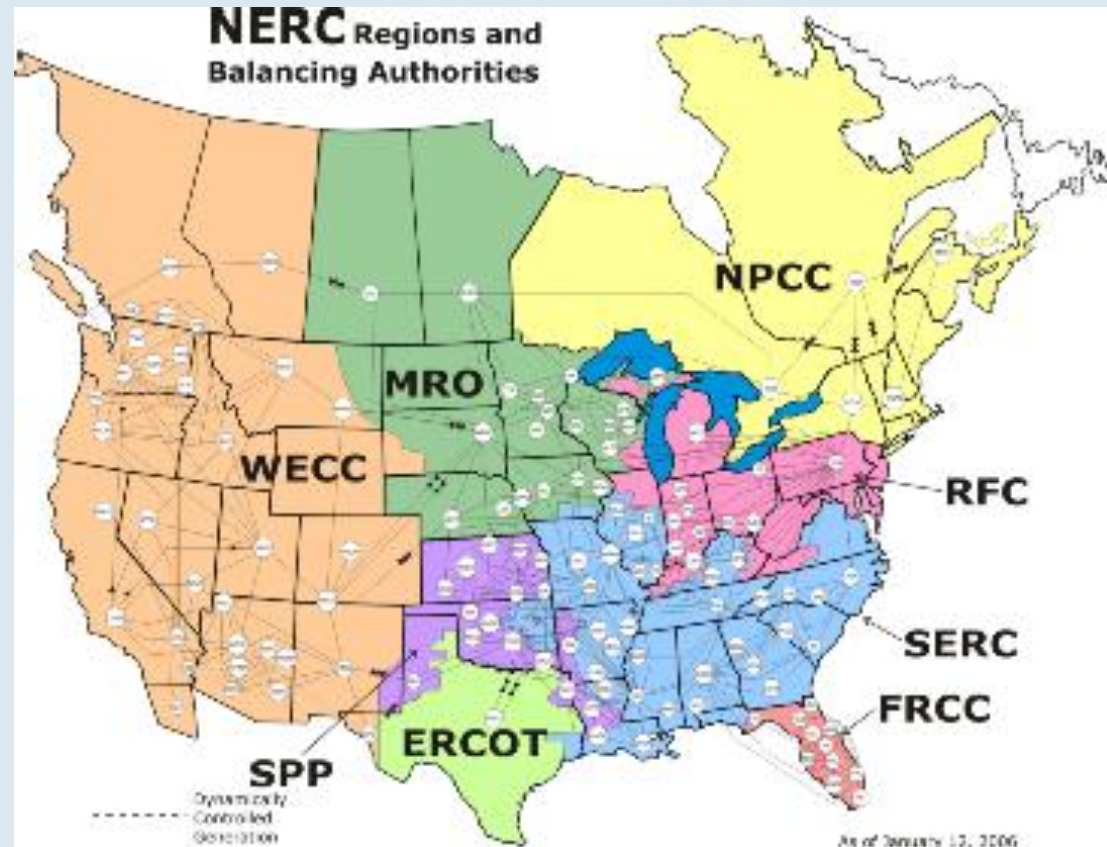
- Provincial governments have direct responsibility for the management and development of their electricity systems:
 - Prices
 - Market structure (including generation, transmission and distribution of electricity)
 - Project approvals (sitting and permitting)
 - Environmental regulations
- The federal government has a number of responsibilities that can have an impact on the structure and functioning of Canada's electricity system:
 - Nuclear
 - International and inter-provincial designated power lines
 - Environmental regulation in federal areas
 - Tax and investment climate
 - Science and technology
 - Managing federal and aboriginal lands

Production and use of electricity is provincially regulated

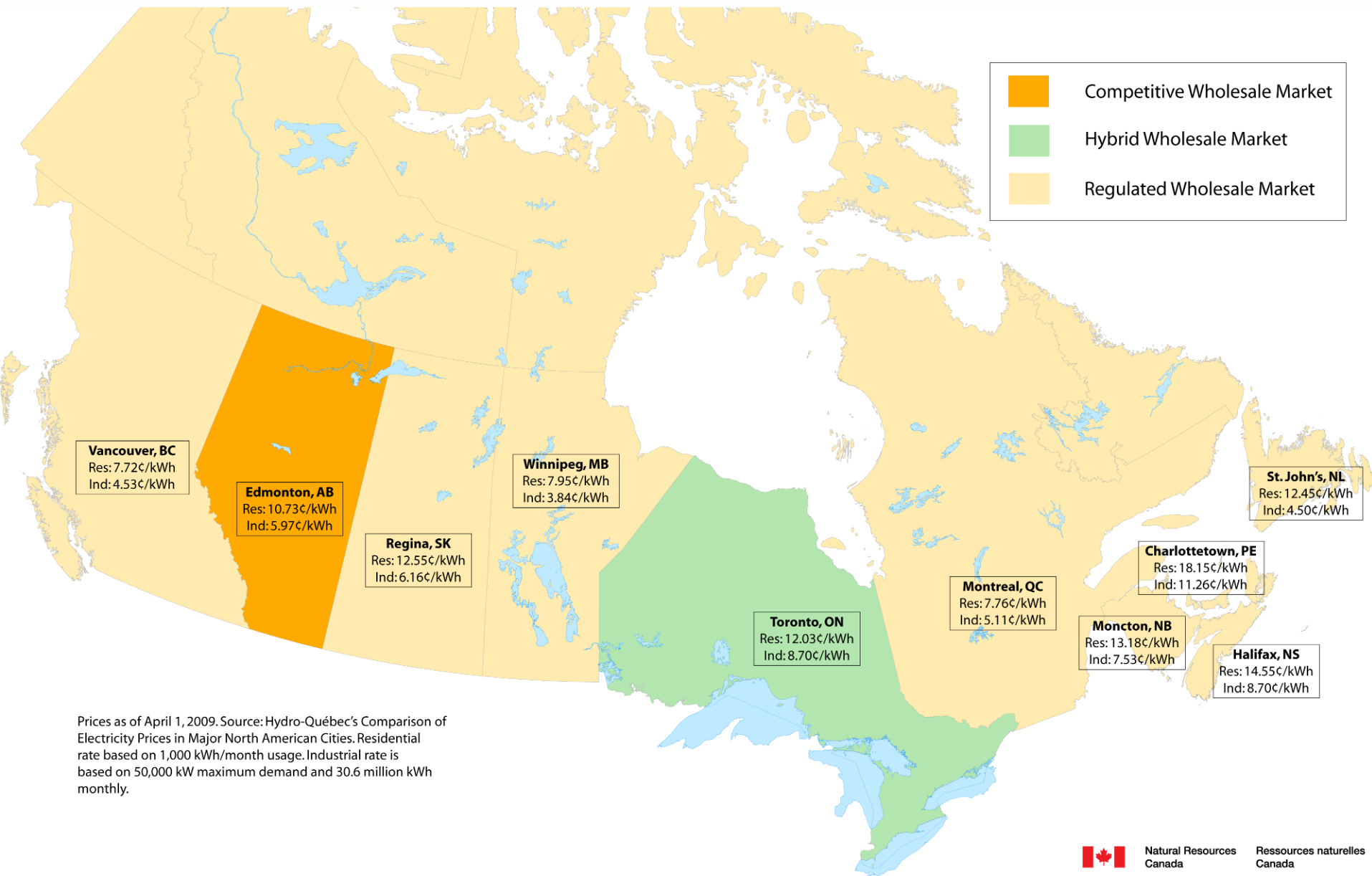
- In most provinces, electricity services are mainly provided by publicly owned utilities
- Two provinces have monopolistic investor-owned utilities that answer to regulatory boards on rates and investment
- Alberta is the only province with competitive wholesale and retail electricity markets
- Ontario has a hybrid market, with a large, regulated, publicly owned generation utility competing against other smaller investor owned companies

Electricity Market Structures

- While electricity is a provincial jurisdiction, Canadian utilities operate within regional North American markets and are subject to or are influenced by the North American Electric Reliability Corporation's regulations regarding reliability standards.



Market structure and prices also vary by province



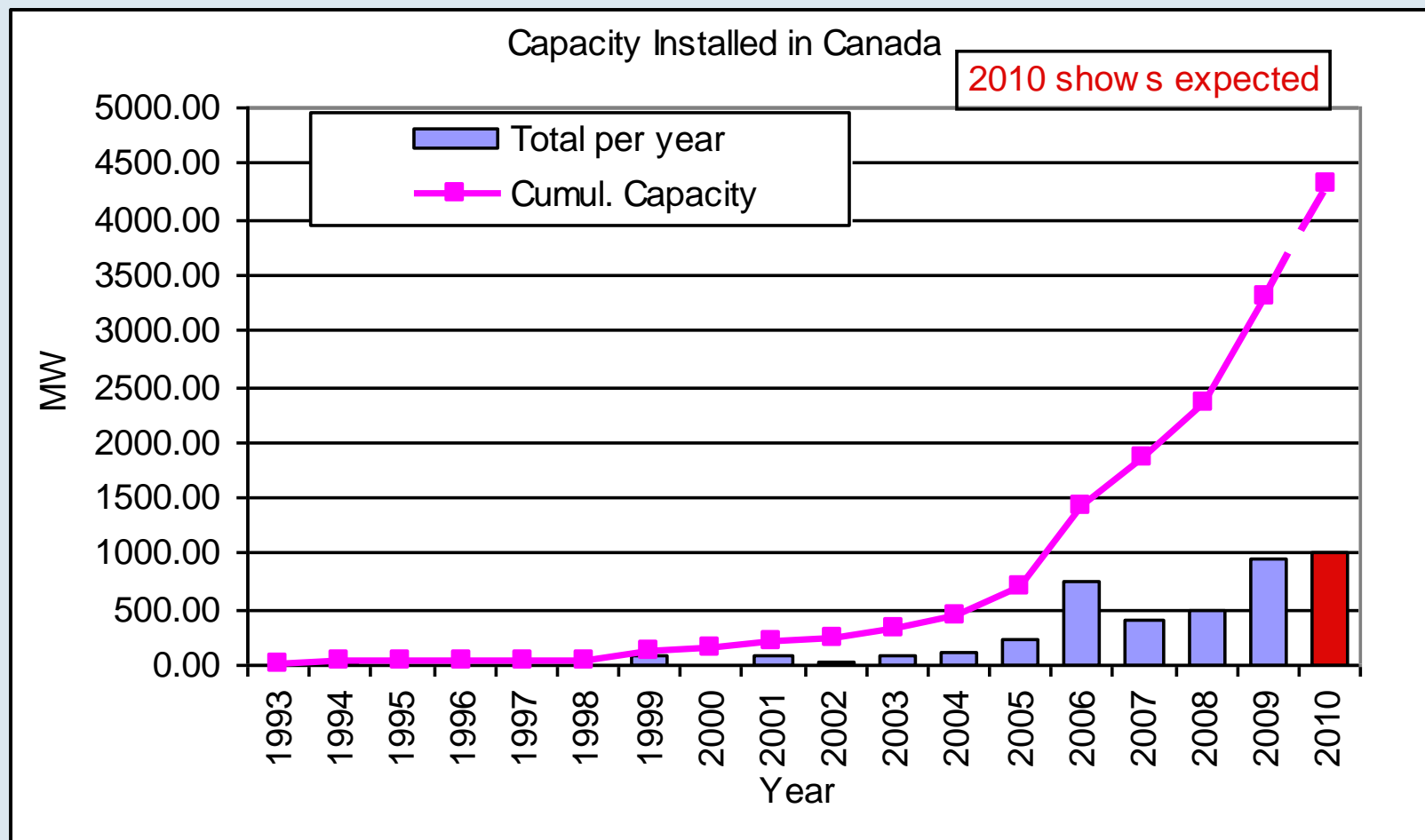


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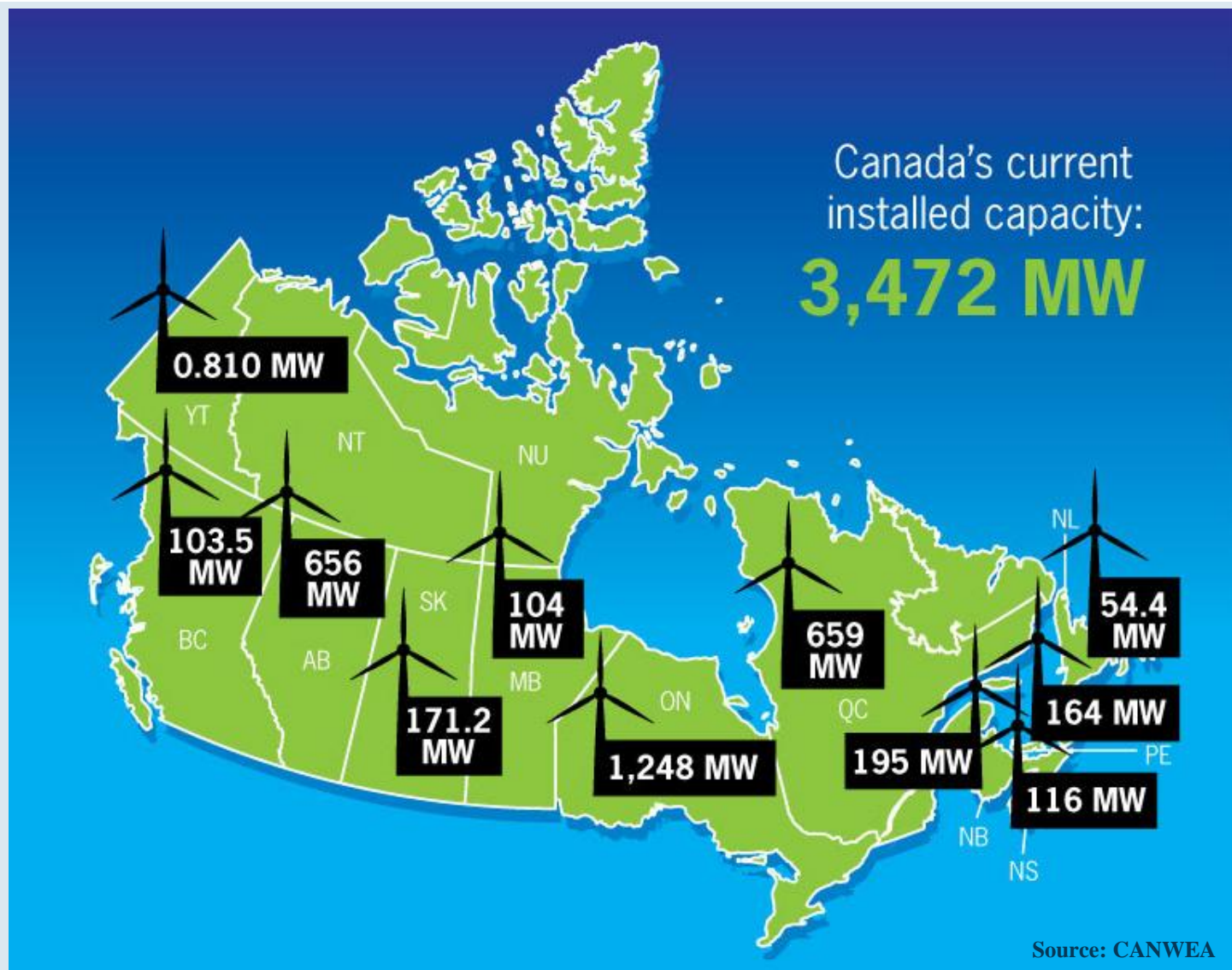
- Wind is the fastest growing source of electricity generation in Canada – average annual growth of 52% from 2004 to 2009
- By end of 2009, installed wind capacity totalled 3 290 MW, representing 1.3% of overall electricity production. Currently 3 472 MW installed
- Federal incentives with various provincial policies have contributed to growth

Yearly Growth of Canadian Wind Capacity



- By end of July 2010, Canada had 3 474 MW installed wind capacity

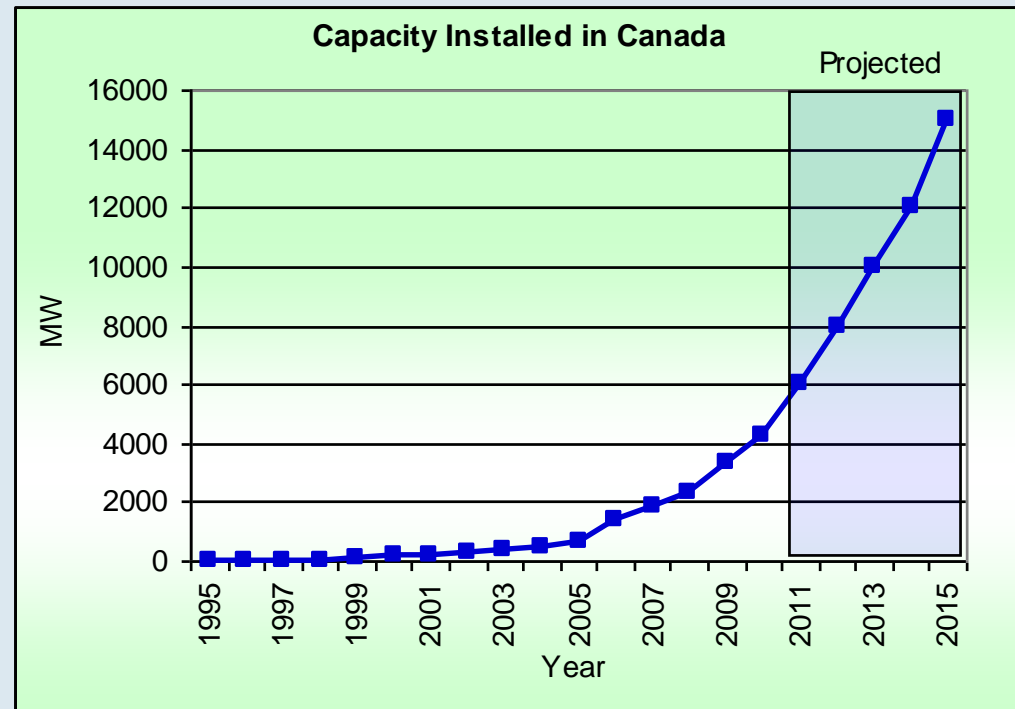
- Canadian Wind Farms



Future of Wind Energy in Canada

- Total installed wind capacity is expected to increase by 4 times by 2015
- Wind farms are becoming larger and more prevalent
- Wind is becoming a greater proportion of supply mix (currently at 1.3 %)
- Wind is making the transition from an “emerging” source of electricity to mainstream

Total Installed Wind Capacity



Federal Incentive Programs



Federal initiatives have contributed to the growth in renewables power generation

- Current Programs

- ecoENERGY for Renewable Power (ecoERP): Direct Production Incentive
- Clean Energy Fund: Request for Proposal Process
- Green Infrastructure Fund: Letter of Interest Process

- Tax Policy

- Class 43.1/43.2: Accelerated depreciation of capital assets to improve project's rate of return
- Canadian Renewable and Conservation Expenses (CRCE): full deduction of intangible costs related to project development

- Environmental Policy

- Federal Regulatory framework for industrial GHG emissions

ecoENERGY for Renewable Power

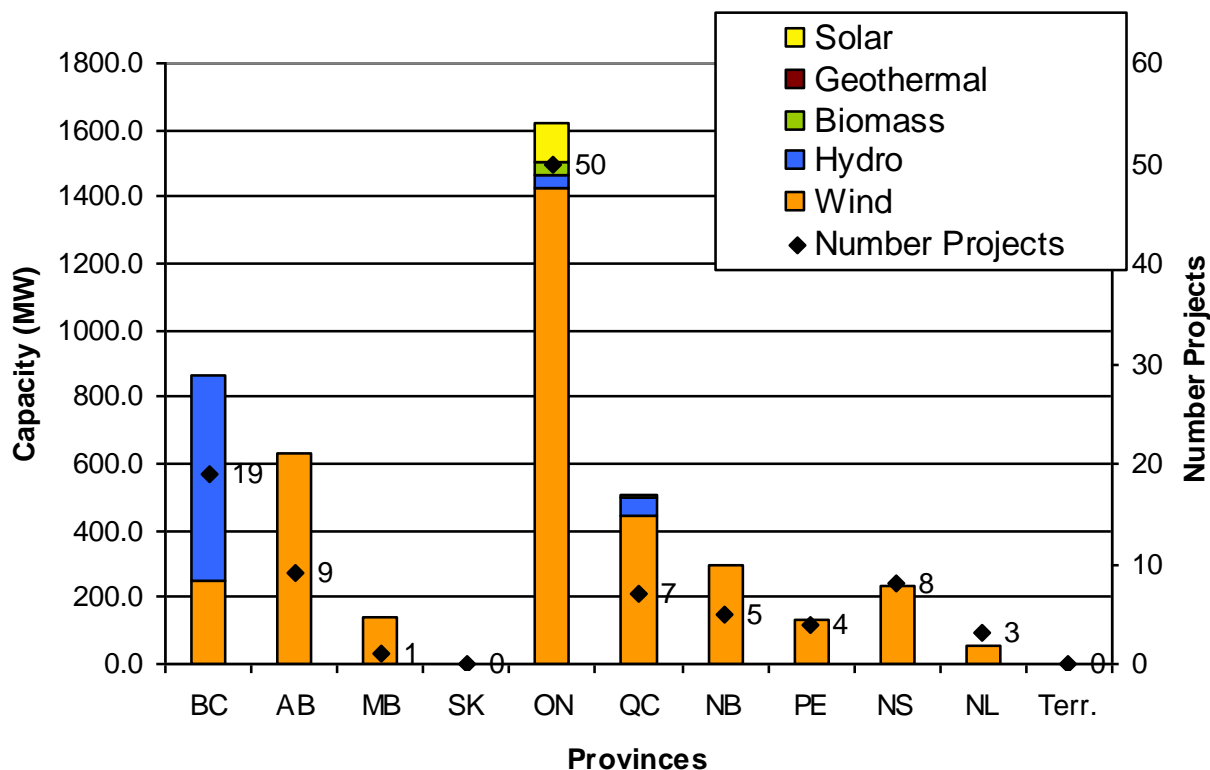
- Announced in January 2007 as part of ecoENERGY Initiatives
 - Building on success of Wind Power Production Incentive program (2002-2007)
- Support for 4000 MW of low-impact renewable power projects
 - About \$1.5 billion investment in low-impact renewable power sources, such as wind, biomass, hydro, tidal, solar, etc.
- Provide 1¢ per kilowatt-hour incentive over 10 years for projects commissioned between April 1, 2007 and March 31, 2011
 - Represents 14.3 GWh of annual production (estimated 6.5 Mt/yr GHG emission reductions)

Results to Date

- 332 projects were registered for about 18 000 MW of renewable power capacity
 - About 85 percent were wind projects
- 109 projects with contribution agreements representing more than 4 500 MW of capacity and funding of \$1.4 billion over 10 years
 - 68 projects from wind representing a total capacity of 3 605 MW and \$1 billion in incentive

EcoERP Projects with Contribution Agreements

ecoERP CA Signed Capacity per Province and Tech.



Wind benefited the most from the ecoERP program:

- 75% of funding
- 80% of total capacity

As of August 2010

- Request for Proposal approach
 - \$146 millions investments over 5 years to support the demonstration of renewable and clean energy across the country
 - 19 projects selected out of 178 proposed
 - Projects include integrated community energy solutions, smart grid technology, and renewable applications with solar, wind, tidal and geothermal energy

- Letter of Interest process
 - \$1 billion over 5 years
 - Funds allocated on merit to support green infrastructure projects on a cost-shared basis.
 - Project must focus on green priorities such as green energy generation and transmission infrastructure, building and upgrading wastewater treatment systems, and improving solid waste management.
 - 20 projects selected to date

- Class 43.1/43.2 Tax Measures
 - 50% accelerated capital cost allowance for investment in renewable energy technologies
 - 2008 Budget expanded eligibility to ground source heat pumps, biogas production equipment and waste-to-energy applications
 - 2010 Budget further expanded eligibility to heat recovery and distribution equipment used in district energy systems.
- Canadian Renewable and Conservation Expenses (CRCE)
 - Cost of acquisition and installation of test wind turbines is 100 percent deductible and can be financed through flow-through shares
 - Intangible costs, such as studies, road construction etc, can qualify for tax deductions for all renewable generation

Provincial Initiatives

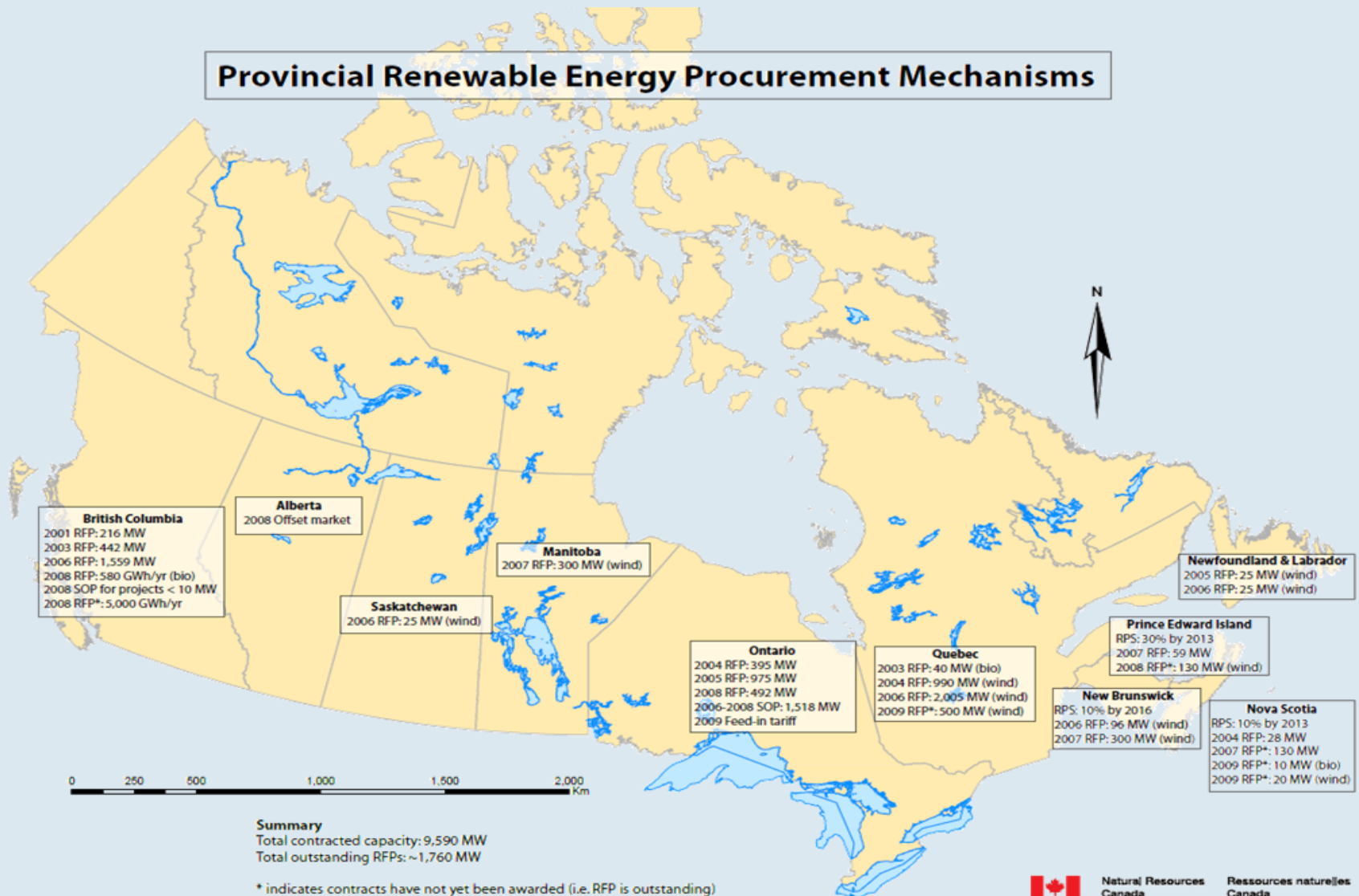


Provincial initiatives (General)

- Requests for proposals/Calls for Tenders
 - Competitive processes to offer higher price for renewable energy
 - British Columbia
- Renewable Portfolio Standards
 - Establishes targets for renewable energy supply
 - Legislated in Nova Scotia, New Brunswick and Prince Edward Island, others exploring voluntary targets
- Feed-in-Tariffs and Standard Offer Programs
 - Provides a standard pricing regime and simplified eligibility and contracting rules
 - Ontario, BC
- Government Procurement
 - Requirement for a % of electricity purchases from renewable resources
 - Alberta, Ontario, Government of Canada
- Direct support
 - Program based incentives (Saskatchewan, New Brunswick, BC)

Most provinces now have renewable power policies and programs

Provincial Renewable Energy Procurement Mechanisms



Provincial Initiatives...

| Province | Development Initiatives |
|-------------------------|---|
| British Columbia | Government aims to achieve energy self-sufficiency by 2016. 50% of new generation to come from clean energy sources (no specific wind energy target). Clean Energy Act just passed in June 2010 |
| Alberta | No provincial target. Note that Alberta operates Canada's only fully deregulated electricity market. |
| Saskatchewan | Provincial energy strategy seeks to have 300 MW of wind energy in Saskatchewan by 2011. |
| Manitoba | Manitoba Government seeking 1000 MW of wind energy by 2016. |
| Ontario | In 2009, Ontario's Green Energy Act came into force with a feed-in-tariff and new transmission investments. The government has not provided a wind-specific target but The Ontario Power Authority's Integrated Power System Plan has called for 4,600 MW of wind energy by 2020. |

...Provincial Initiatives

| Province | Development Initiatives |
|--------------|---|
| Quebec | Quebec Energy Strategy set target for 4,000 MW of wind energy by 2015, with an addition of 100 MW of wind for every 1,000 MW of new hydro. |
| N. Brunswick | The New Brunswick government's commitment is to increase the amount of electricity from new renewable sources in New Brunswick to 10% of total use by 2016 (roughly 500 MW, 400 MW of which will be wind) |
| Nova Scotia | The Renewable Energy Standard (RES) put in place by the Government of Nova Scotia requires that 25% of the total Nova Scotia electricity requirement be supplied by new (post 2001) renewable energy sources by 2015. |
| PEI | Government target of installing 500 MW of wind power by 2013. |
| Newf. & Lab. | Target of 80 MW of wind energy on the island of Newfoundland and exploring wind development potential in Labrador. |

Source CANWEA

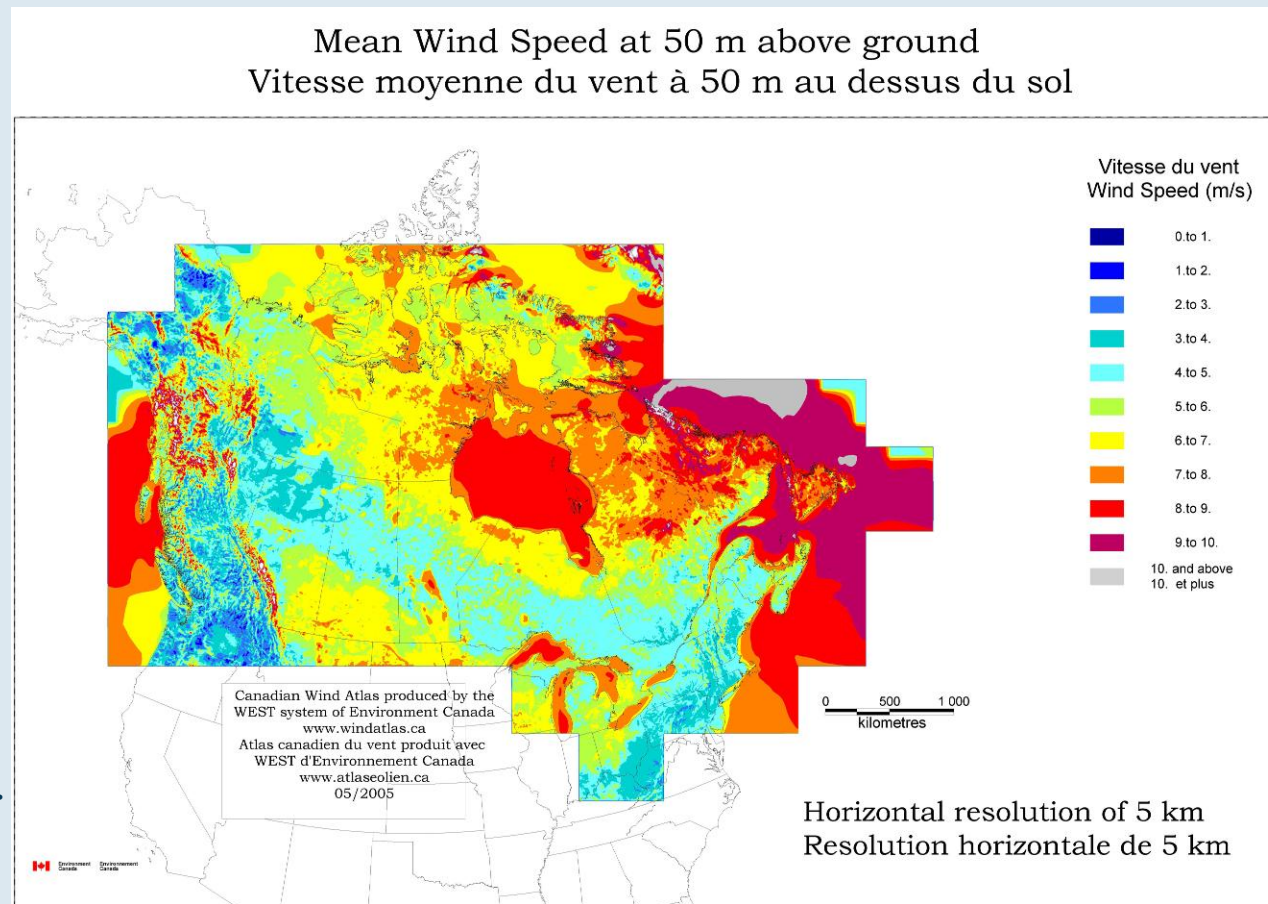
Wind on the Grid

As a variable, non-dispatchable source of power, wind development is limited by the grid's infrastructure and the grid's ability to connect and integrate wind operations



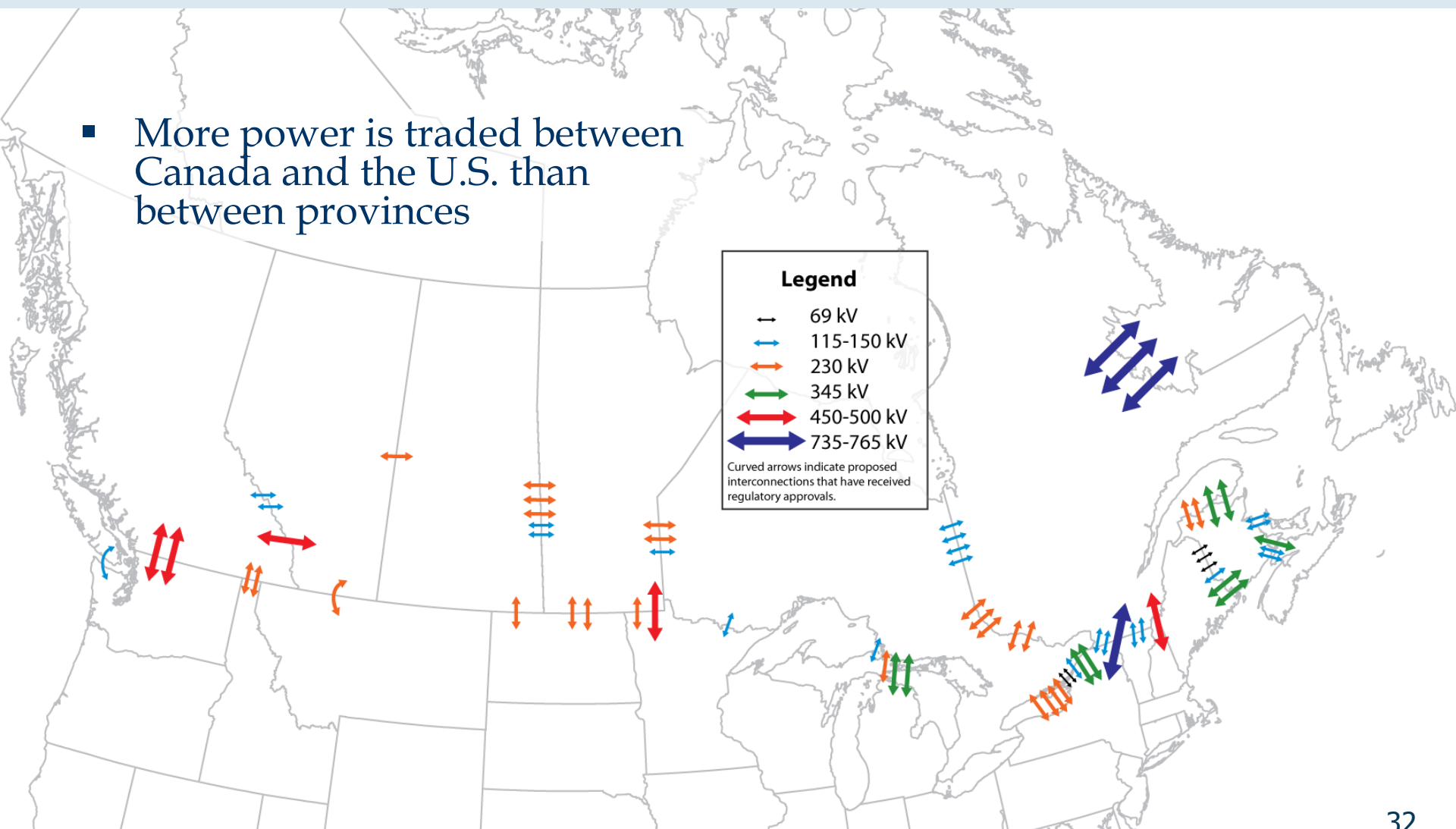
Why Wind Energy in Canada

- High Wind Availability
 - Between 30 to 40 % yearly average capacity factor depending on location
- Large Land Area
- Extensive Transmission Infrastructure
- Hydro-Base Grid
 - Ideal for balancing wind energy fluctuations and increase energy storage capacity and redelivery.

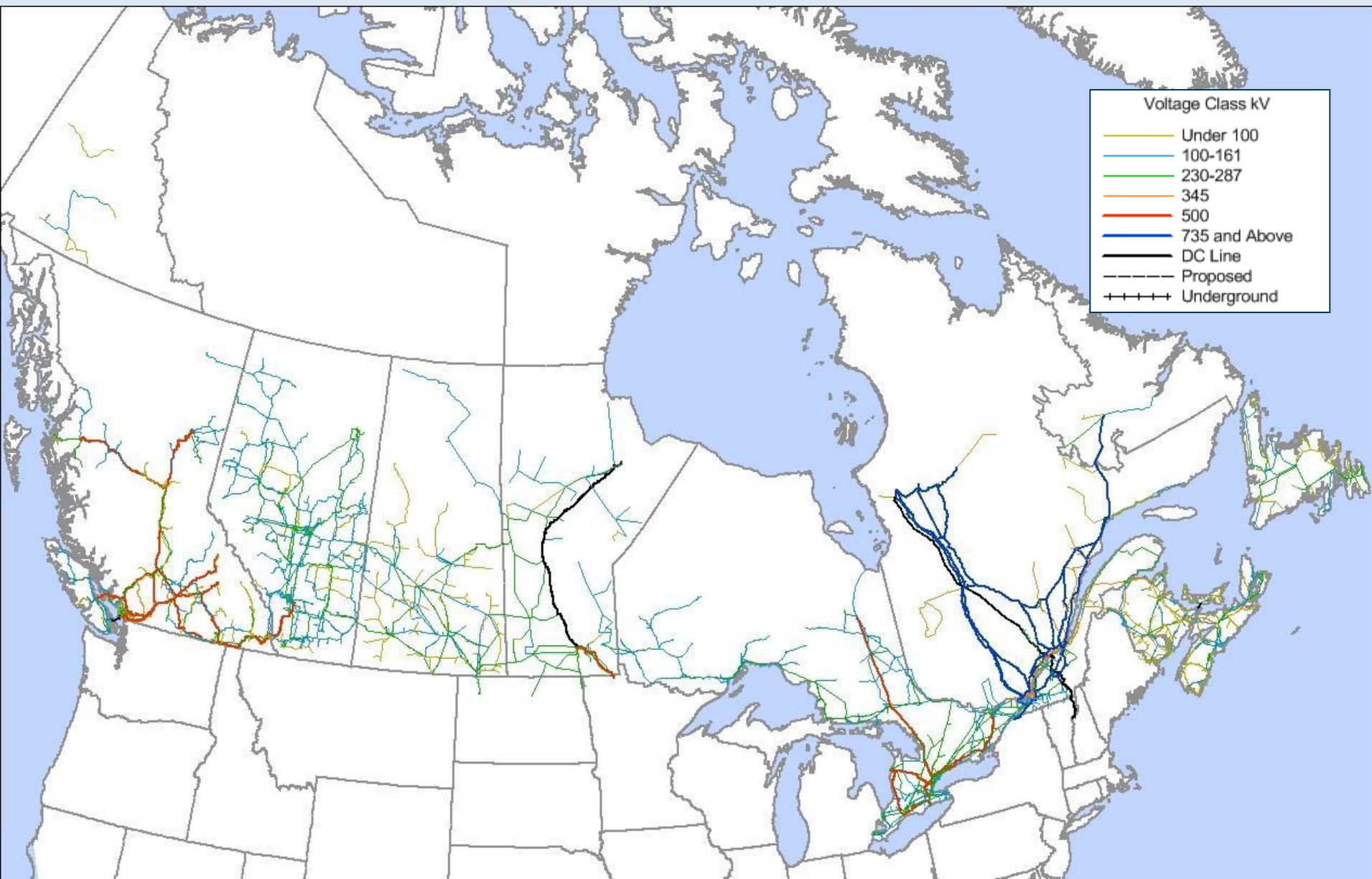


Strong interconnections with the U.S. enables significant north-south trade

- More power is traded between Canada and the U.S. than between provinces



Provincial transmission networks connect remote hydro with load centres



Wind Energy on the Grid

Issues

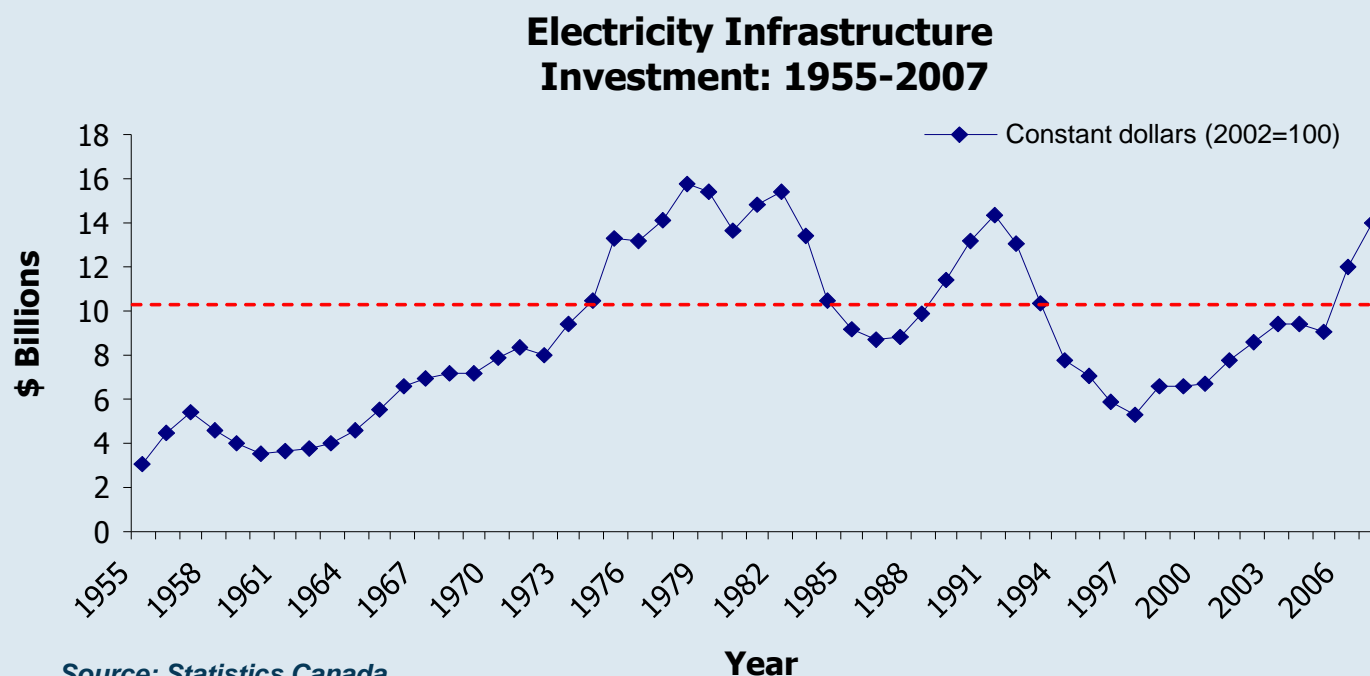
- Interconnection: relates to maintaining the quality of the power delivered to the grid – the technology is available, but comes with incremental costs
- Integration: grid must be in balance at all times – variability of wind provides a challenge in integrating wind power as wind energy increases its penetration on the grid
- Transmission: issues include transmission access and planning, and lengthy regulatory approvals

Potential Actions

- Support development of clear interconnection standards
- Expand collaborative analysis on wind integration strategies
- Support collaboration on transmission planning to improve access to grid

Investment in the electricity sector on an upward trend

- Significant new investment in generation, transmission, and distribution will be required to replace aging infrastructure and meeting growing demand
- The International Energy Agency estimates \$238 billion in new investment required between now and 2030



Source: Statistics Canada

In Conclusion

- Wind energy is clean and renewable
- Wind resource in Canada is high, capacity factor ranges between 30 to 40 percent and well distributed.
- Federal government and provinces have introduced measures to increase the use of wind energy in Canada by addressing barriers and providing financial support.
- There is a need to address interconnection/ integration/ transmission issues now.

For more information



- Visit our websites at:
 - <http://nrcan.gc.ca/eneene/renren/index-eng.php>
 - <http://ecoaction.gc.ca/ecoRP>
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