

U of A – Houston Presentation

Renewable Energy

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Overview

- Canadian Energy Policy
- Factors that influence policy
- Types of renewable energy
- Use of renewable energy in the electricity sector
- Cost comparison

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Canadian Energy Policy

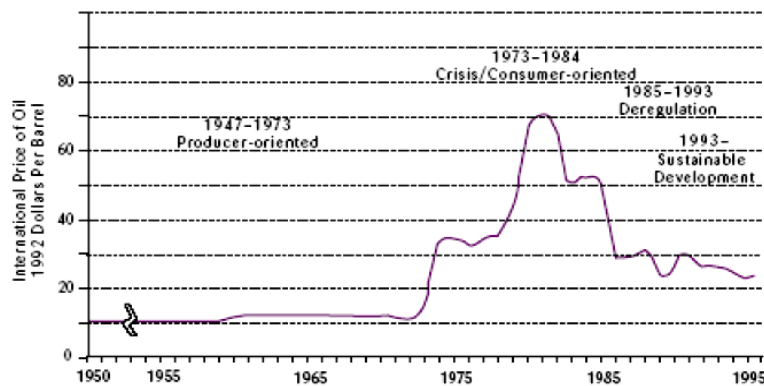
Canadian Energy Policy is market based and oriented towards sustainable development, the economic well being of Canadians and the environment.

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Evolution of Canadian Energy Policy

Evolution in Energy Policy Orientation



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Renewable Energy Policy Drivers

Energy Policy is shaped by both Canada's domestic and international commitments.

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International Drivers

1) Kyoto Protocol (1997)

Reduce green house gas emissions to 6% below 1990 levels

2) Canada – U.S. Clean Air Agreement

Govern the emissions of sulphur dioxide and nitrous oxides.

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Domestic Drivers

1) Western and the Atlantic Accords

Mainly influences and shapes
Canada's energy markets

2) Constitutional Division

In Canada's constitution, jurisdiction
over energy is divided between the
federal and provincial government

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Federal and Provincial Jurisdictions

Provincial and Territorial Governments

- resource management within provincial boundaries
- intra-provincial trade and commerce
- intra-provincial environmental impacts

Federal Government

- resource management on frontier lands
- uranium and/or nuclear power
- interprovincial and/or international trade and commerce
- trans-boundary environmental impacts
- policies of national interest:
 - economic development
 - energy security
 - federal energy science and technology

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Alberta Energy Policies

- Setup Climate Change Central as an agency to “promote the development of innovative responses to global climate change” (1999)
- Deregulation of energy (2001)
Committed to buying 45% of its energy to heat government owned facilities from green sources (2003)

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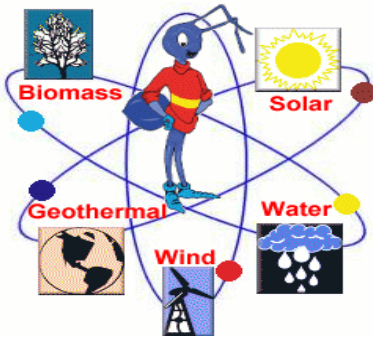
Alberta Energy Policies

- Solar Thermal Building Products program to help technology transfer from the lab into the marketplace (2005)
- Creation of the Energy Innovation Fund (2006)
- \$239M commitment to bioenergy through a nine-point bioenergy plan (2006)

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Sources of Renewable Energy

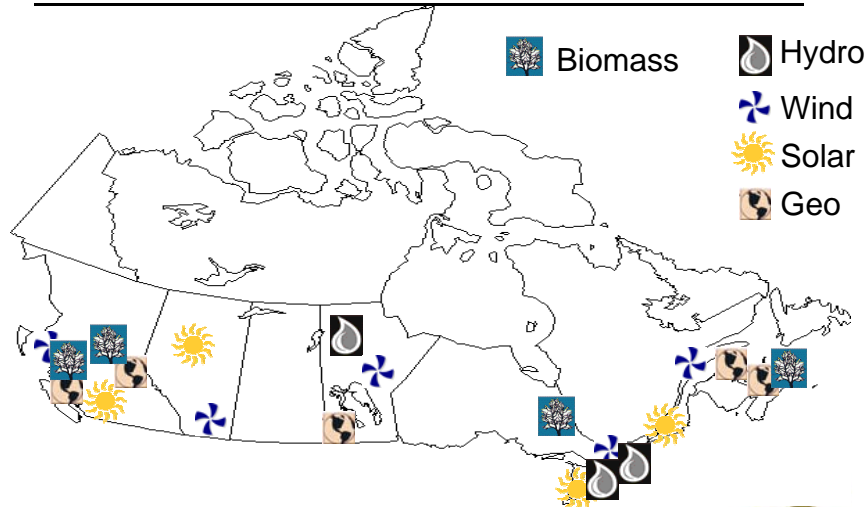


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Natural Resources in Canada



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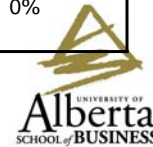
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Contributions

Source	Capacity (MW)	Supply (GWh/yr)	% of Total RET
Wind	316	970	8%
Water	1800	9460	78%
Solar	0.092	0.1	0%
Biomass	128	900	7%
Geothermal	0	0	0%

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Wind Power

Pros	Cons
No greenhouse gas emissions associated with electricity generation	Wind power facilities could be aesthetically unpleasing
Low operational and maintenance costs	Soil erosion problems in the wind farms
	Blades in wind farms have noise impacts
	Bird mortality is an issue

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Biomass

Pros	Cons
Uses fuel crops, agricultural wastes, sewage sludge, and waste to produce energy	Has some nitrogen oxides, a small amount of sulfur dioxide, and carbon dioxide emissions depending on technology used
Satisfies 5.9% of Canada's primary energy demand	Using water from lakes or rivers can result in negative impacts on the aquatic life.
Provides a benefit by freeing areas of land that might otherwise have been used for landfills or waste piles	Produce ash as a by-product

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Geothermal

Pros	Cons
Potential for long-term continuous use	Water usage
Minimal use of land	Could result in ground subsidence
No emissions	Could be expensive to locate areas of hot rock
Readily available around the world	

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Wind Power vs. Biomass

Wind Power	Biomass
Location dependent on weather patterns	Location dependent on feedstock availability
Can operate unattended and with low maintenance	Significant operation and maintenance costs
Operating availability is high (98%)	Operating availability dependent on maintenance
No emissions	Has emissions depending on the fuel and technology used

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Wind Power vs. Biomass

Technology	Wind Power	Biomass
Capacity (MW)	50	80
Heat Rate (BTU/ kWh)	10,280	8,911
Overnight Cost (2003 \$ / kW)	1,134	1,757
Variable O&M (2003 \$/mills / kW)	0	2.96
Fixed O&M (2003 \$ / kW)	26.81	47.18
Lead Time (years)	3	4

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Conclusions

- Great potential for renewable energy in Canada
- Need more incentives from the Provincial and Federal Governments
- Governments should promote renewable energy by using electricity generated by these sources

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