Renewable Energy in Canada

by

Jan Carr

at the

JPAC Public Forum - North America's Energy Future: Powering a Low-carbon Economy for 2030 and Beyond

Toronto

April 18, 2012

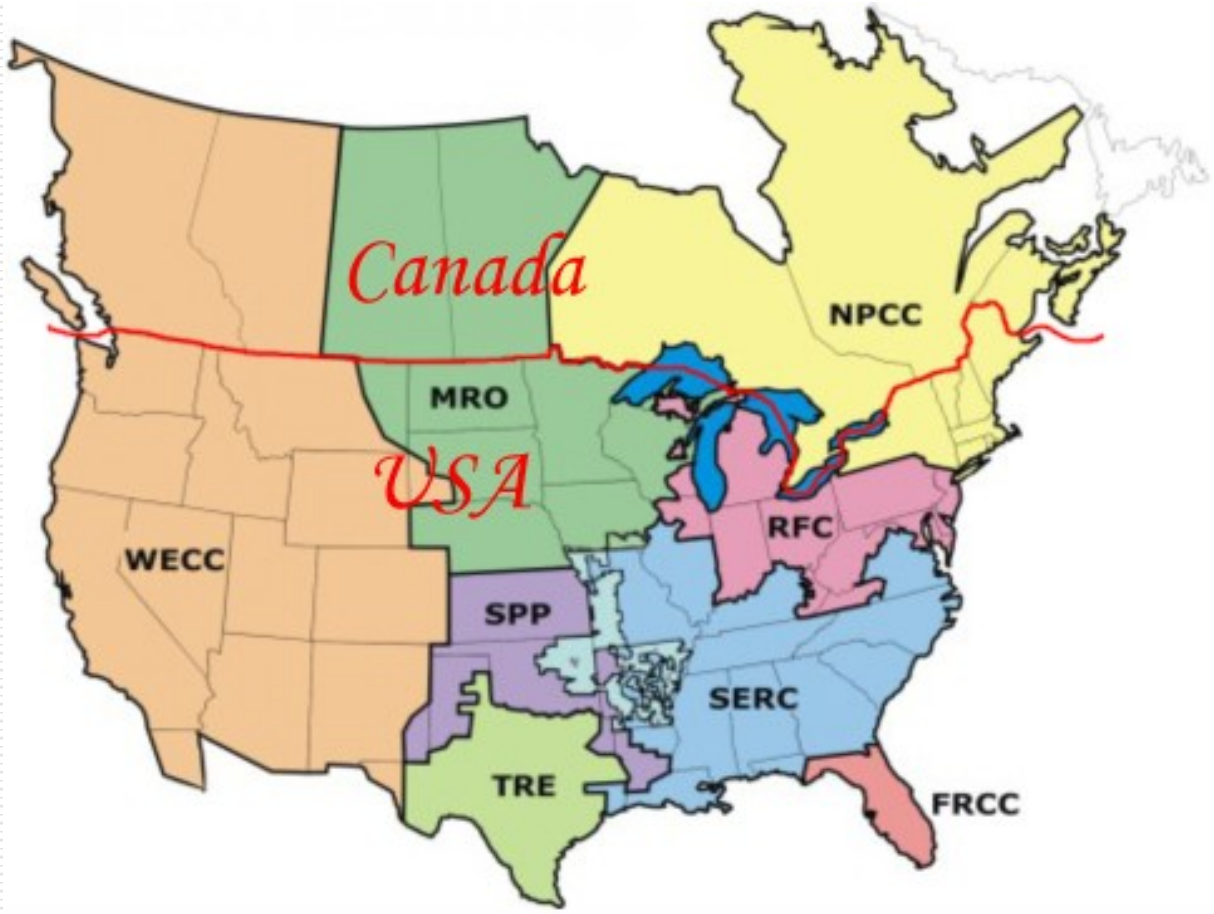
Outline

- Canada's electricity sector
- Feed in Tariffs
- policy sustainability

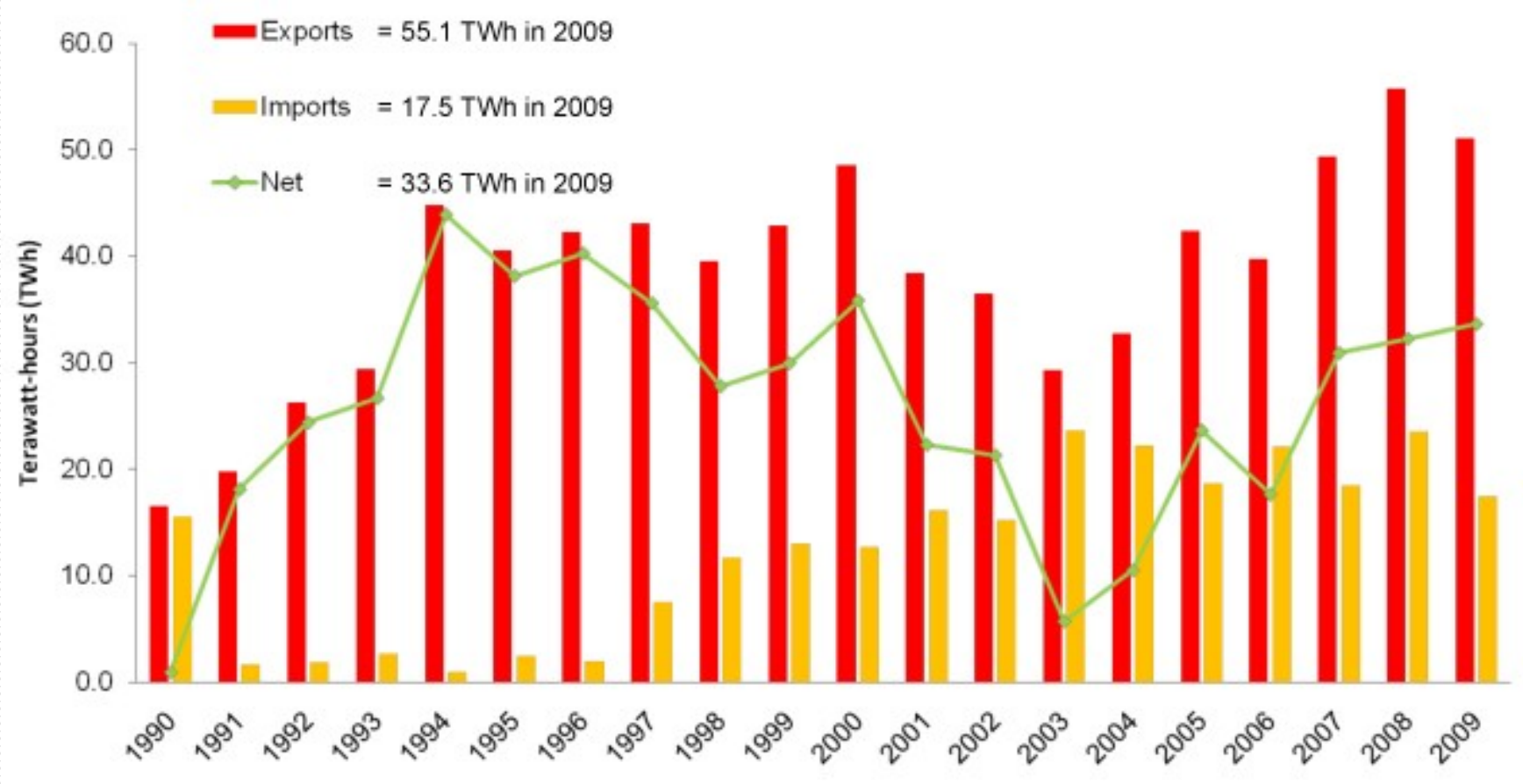
Jurisdiction over Energy in Canada

Jurisdictional Division of Responsibility	
Provincial/Territorial Governments	**Federal Government**
▫ resources management within provincial boundaries ▫ intra-provincial trade and commerce ▫ intra-provincial environmental impacts ▫ generation and transmission of electrical energy ▫ conservation and demand response policies	▫ resource management on frontier lands ▫ nuclear safety ▫ inter-provincial trade (except electricity) ▫ international trade ▫ trans-boundary environmental impacts ▫ environmental impacts where federal ▫ lands, investment or powers apply ▫ other policies of national interest

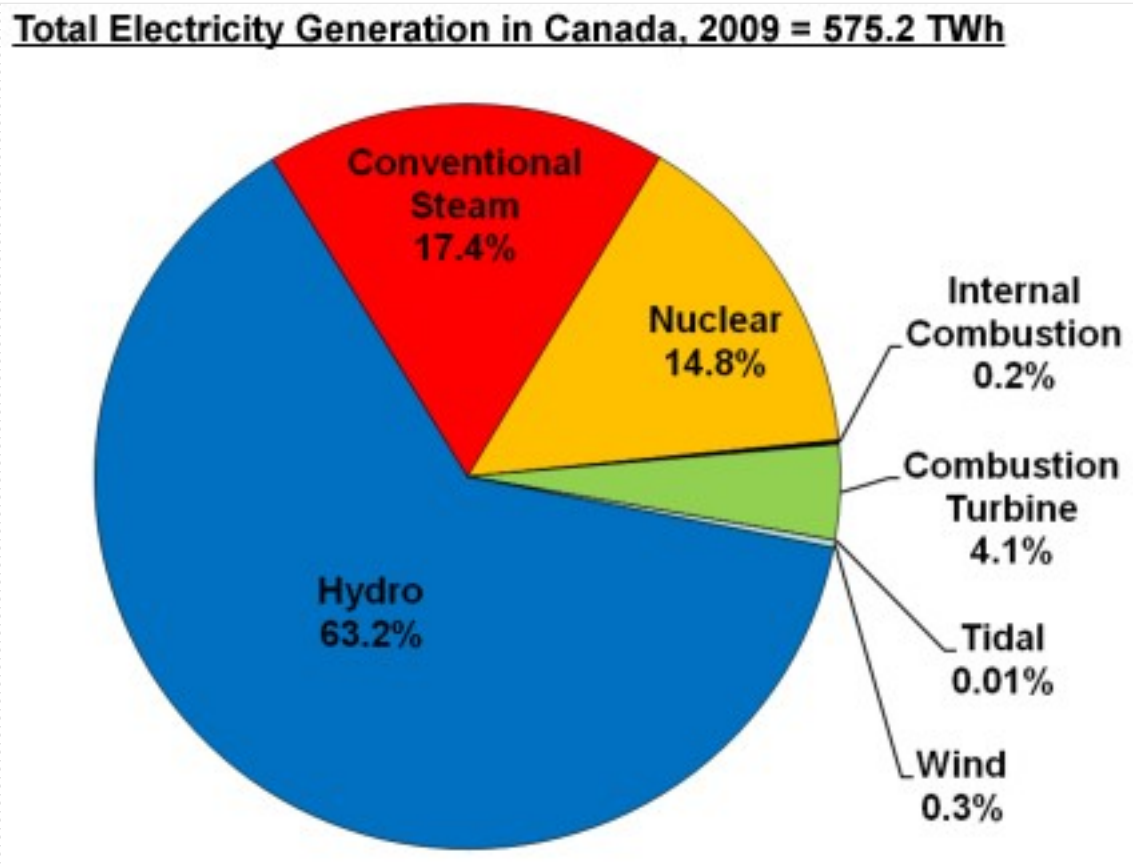
Planning and Operation of Electricity Systems



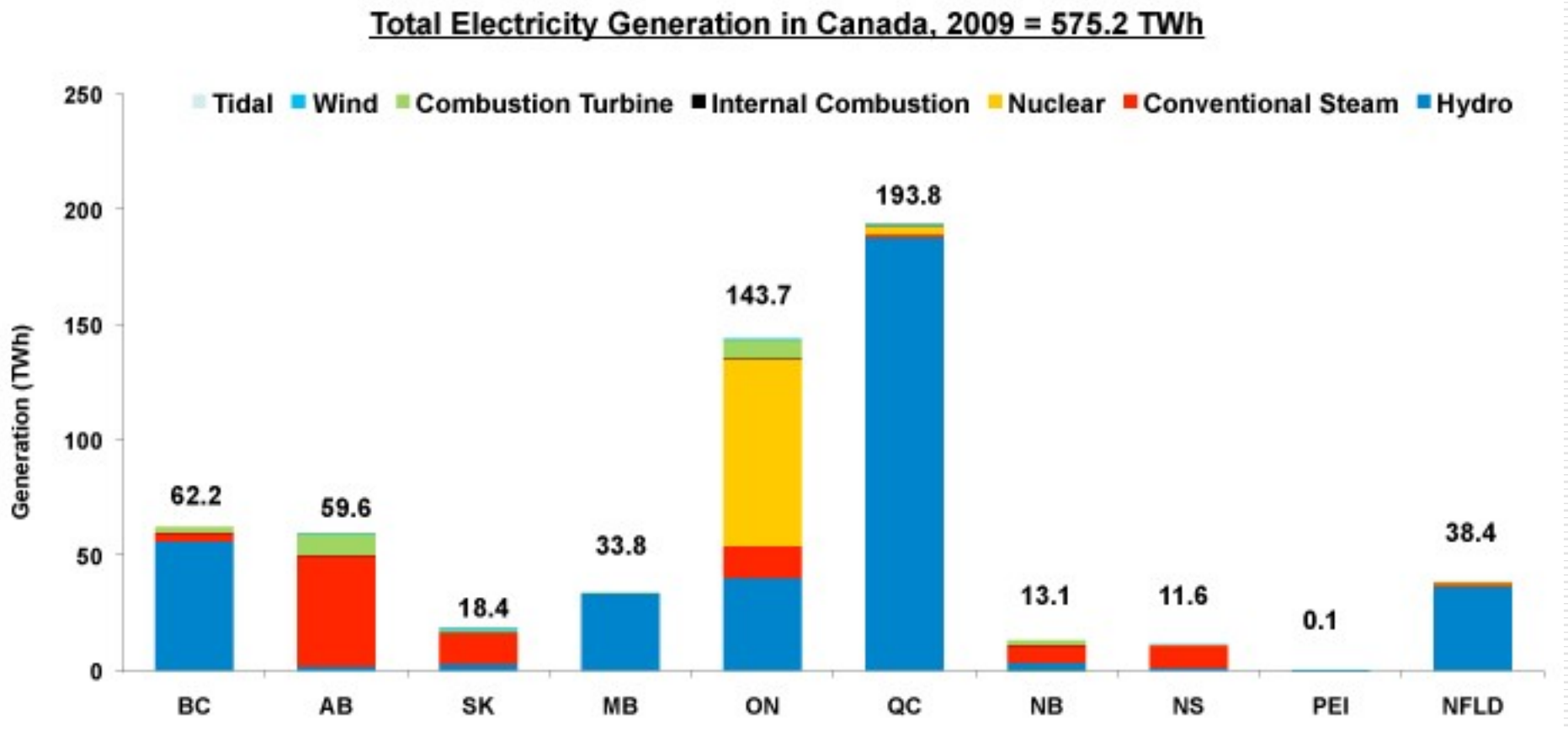
Canadian Electricity Trade with US



Electricity Supply Mix



Generation by Province



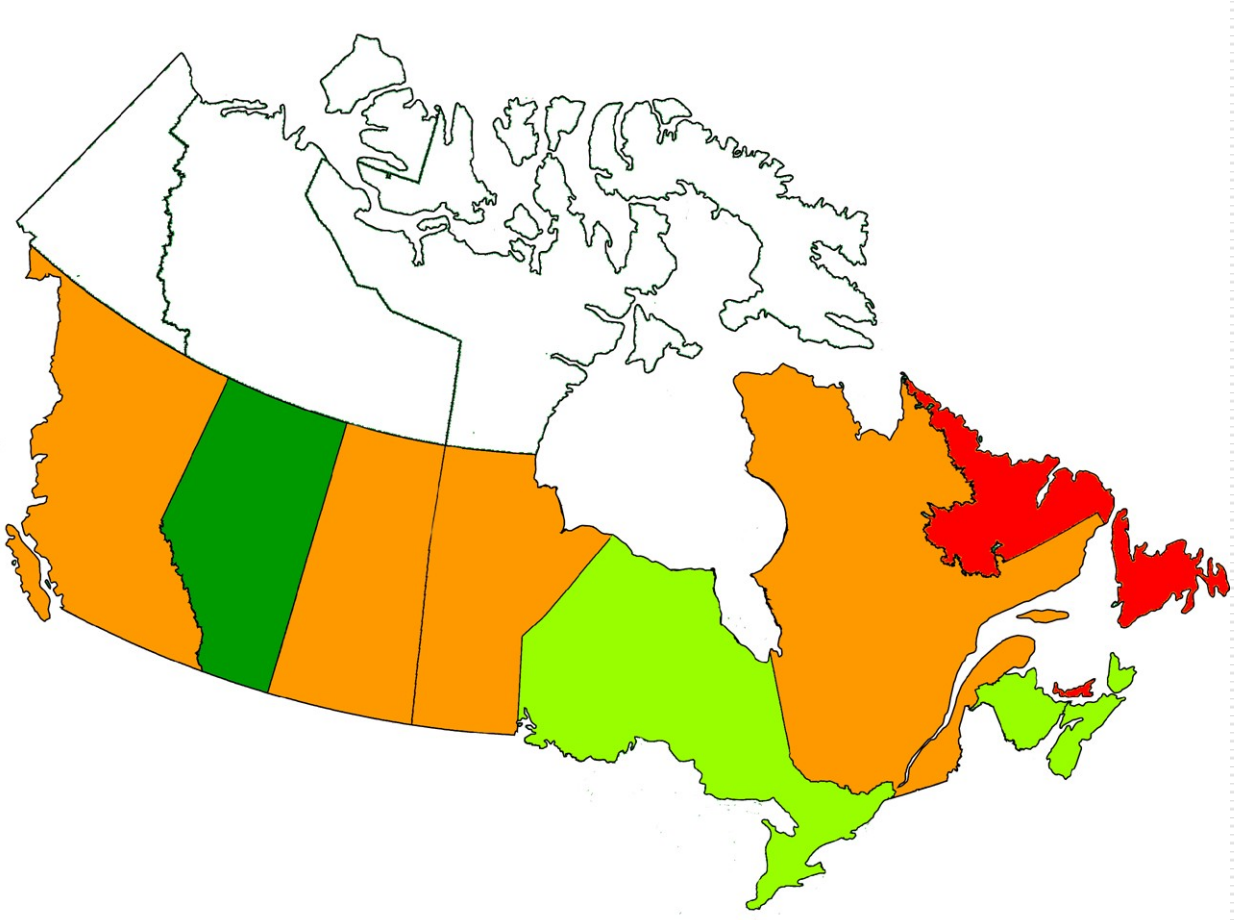
Business Structures

full open access, customer choice

competitive with directed generation investment

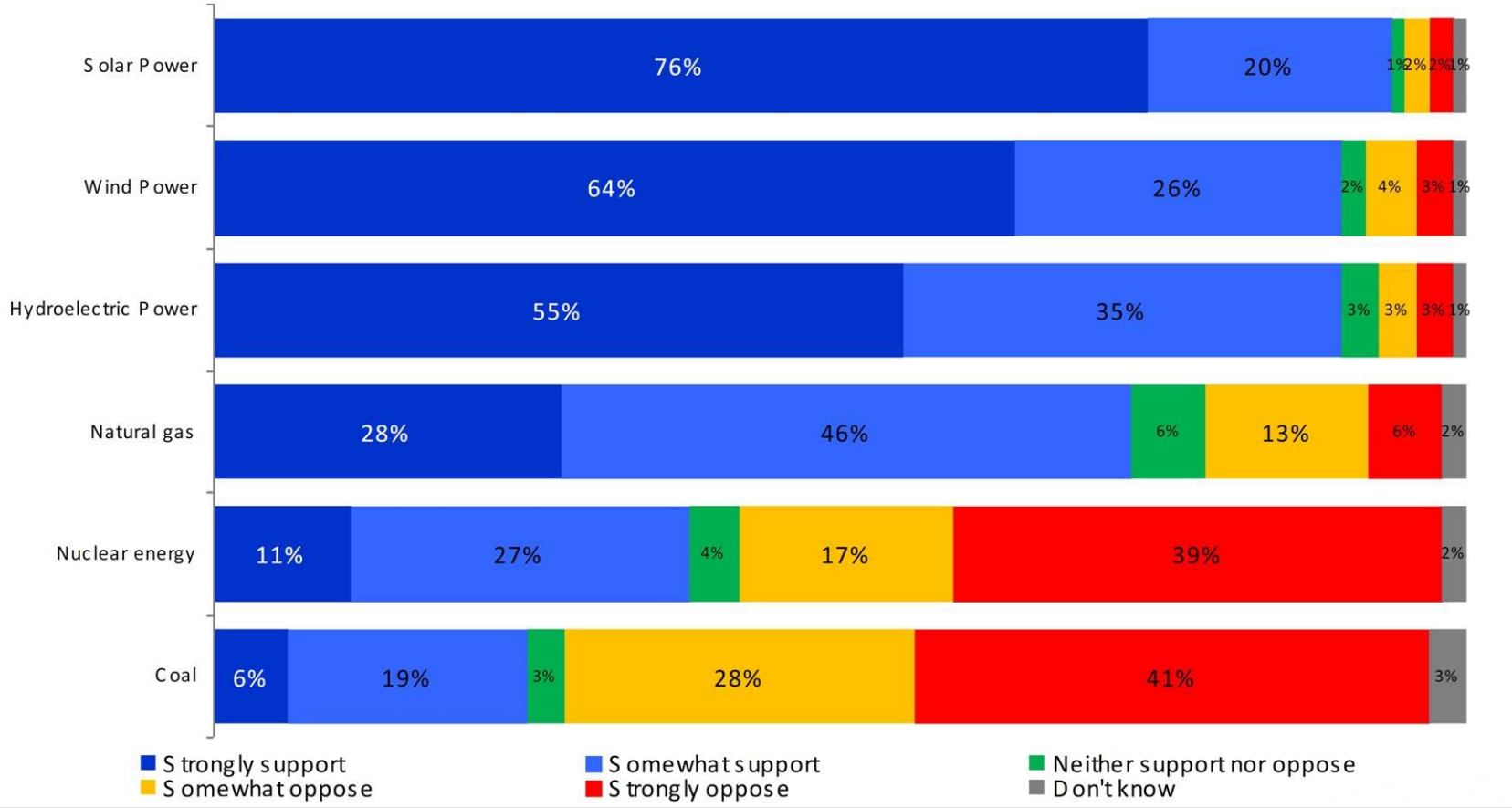
vertically integrated with open access transmission

vertically integrated monopoly

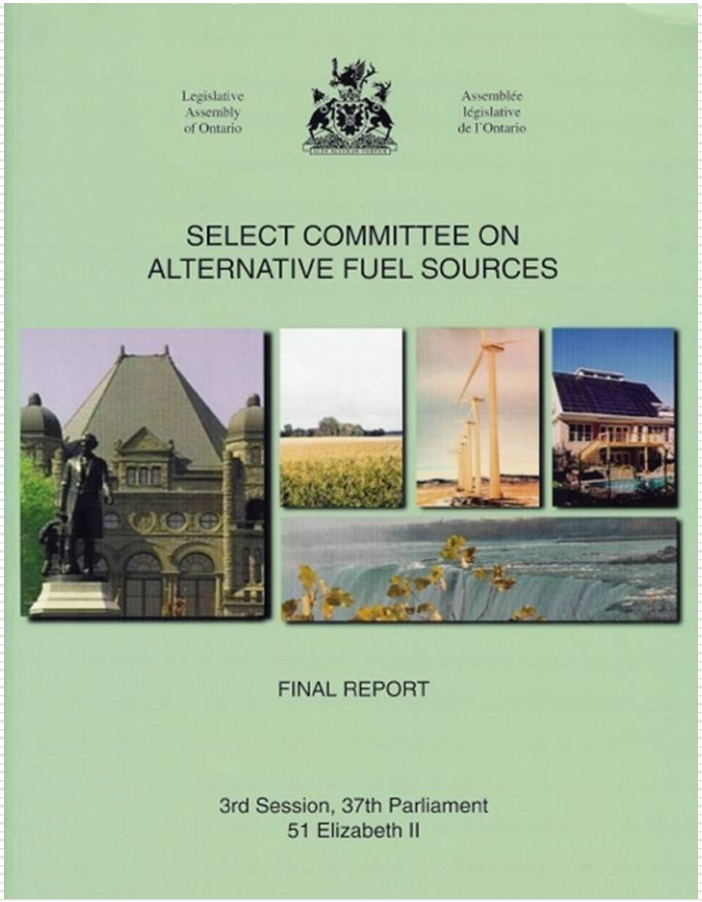


Public Preferences

I am now going to read you a list of several ways to produce electricity. Please tell me whether you strongly support, somewhat support, somewhat oppose, or strongly oppose each way of producing electricity.



Renewable Energy Beginnings



- All Party committee of the Ontario Legislature
- established June 2001 when electricity monopoly structure was dismantled
- "to investigate, report and recommend ways of supporting the development and application of environmentally sustainable alternatives to our existing fossil [carbon-based] fuel sources."

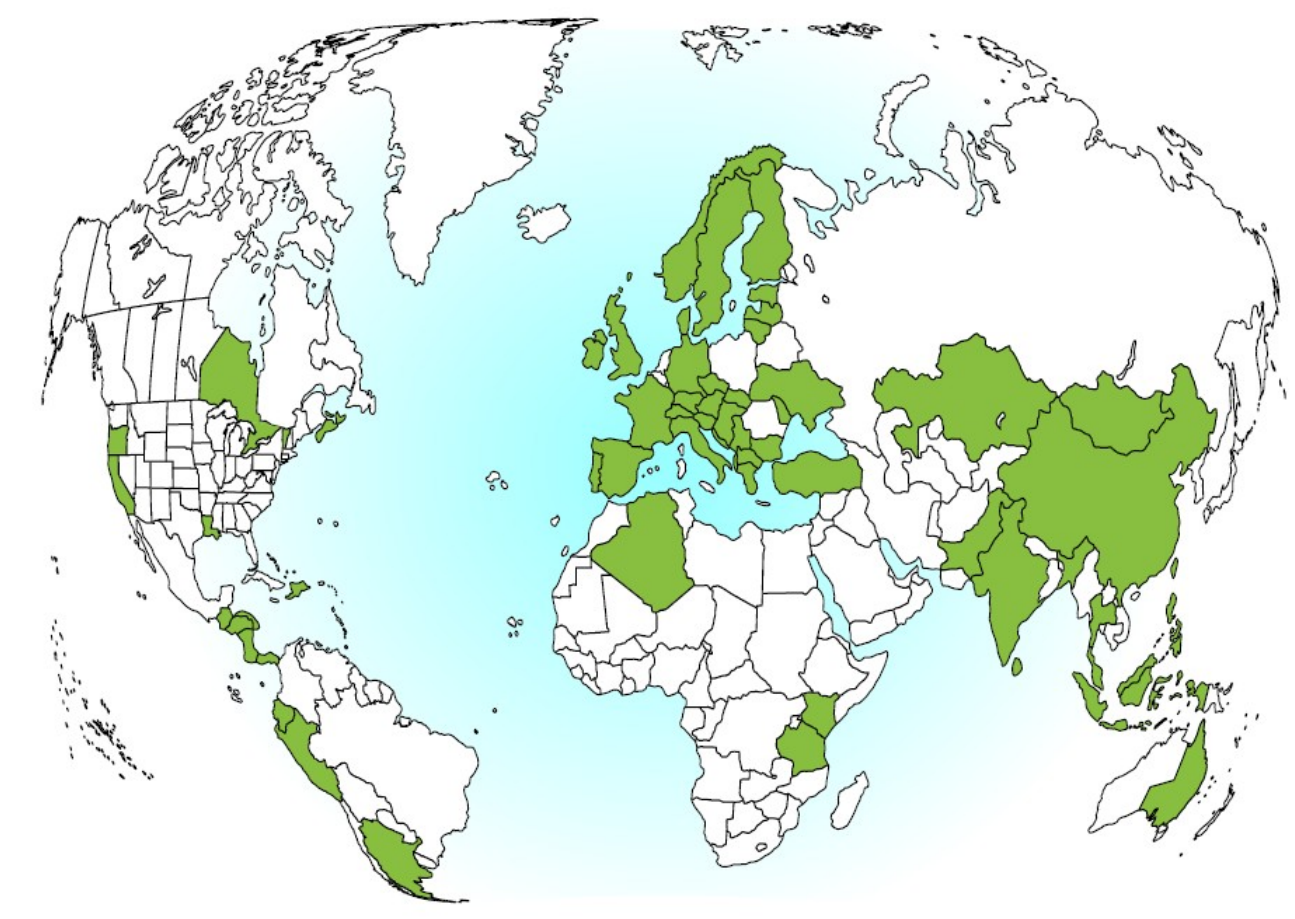
Alternative Fuels Committee Recommendations

- 141 recommendations covering transportation fuels and electricity generation under headings which included
  - financial assistance for alternative fuels
  - renewable portfolio standard
  - roles of agencies and utilities
  - net metering
  - grid connections
  - emissions trading and renewables “set aside”
  - phase out of coal and oil fired generation
  - energy conservation and efficiency
  - consumer awareness and education

Alternative Fuels Report - Principles

- focus is on what to do rather than what to achieve
- no attention to costs, no measures for success
- economic support through:
  - subsidies to consumers who adopt alternative fuels – i.e. market pull
  - tax advantages to developers
  - funding for research and development

Jurisdictions with Feed in Tariffs



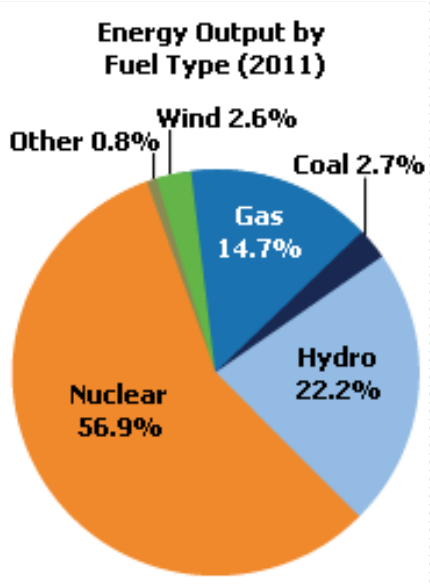
Ontario Feed in Tariff Program

Fuel	Project Size Tranche	Original FIT Price (c/kwh)	New FIT Price (c/kwh)	% Change from Original FIT Price
Solar Rooftop	≤10 kW	80.2	54.9	-31.5%
	> 10 ≤ 100 kW*	71.3 <250kw	54.8	-23.1%
	> 100 ≤ 500 kW*	63.5 >250 ≤ 500kw	53.9	-15.1%
	>500 kW	53.9	48.7	-9.6%
Solar Groundmount	≤ 10 kW	64.2	44.5	-30.7%
	> 10 kW ≤ 500kW*	44.3	38.8	-12.4%
	> 500 kW ≤ 5 MW *	44.3	35.0	-21.0%
	> 5 MW		34.7	-21.7%
Wind	All sizes	13.5	11.5	-14.8%
Water	≤ 10 MW	13.1	13.1	0.0%
	> 10 MW ≤ 50 MW	12.2	12.2	0.0%
Biomass	≤ 10 MW	13.8	13.8	0.0%
	> 10 MW	13	13	0.0%
Biogas On Farm	≤ 100 kW	19.5	19.5	0.0%
	100 kW ≤ 250 kW	18.5	18.5	0.0%
Biogas	≤ 500 kW	16	16	0.0%
	> 500 kW ≤ 10MW	14.7	14.7	0.0%
	> 10 MW	10.4	10.4	0.0%
Landfill Gas	≤ 10MW	11.1	11.1	0.0%
	> 10 MW	10.3	10.3	0.0%

- new pricing effective Sept 1, 2011
- pricing to be reviewed annually
- prices set by Government
- adders available for:
  - community cooperatives
  - indigenous peoples enterprises
- minimum domestic content requirements
- priority given to projects with local support
- no limit on maximum project size except for 10 MW solar, 50 MW waterpower

Ontario Feed in Tariff Program

- 2,442 contracts - 4,750 MW capacity
  - 3,165 MW wind - 1,331 MW solar
- plus 2,500 MW sole source contract with Samsung
  - 2,000 MW wind - 500 MW solar
- target is 10,700 MW by 2015
- in 2011 wind and solar exceeded coal in electricity production



Cost of Ontario FIT Program

	Average Feed-in Tariff Rate (cents/kWh)	Total Capacity Likely to be Built (MW)	Expected Actual Production (TWh)	Annual Payment to FIT Projects ($ million)	FIT Premium Relative to Natural Gas ($ million)
Wind	13.5	4,324	11.4	1,534	284
Solar	48.5	3,309	3.2	1,514	1,163
Hydro	13.0	320	1.7	218	34
Other	13.0	123	0.9	112	17
Total	**19.8**	**8,075**	**17.2**	**3,378**	**1,498**

- status May 13, 2011
- reduced prices announced for solar and wind effective September 1, 2011

Nova Scotia Feed in Tariff Program

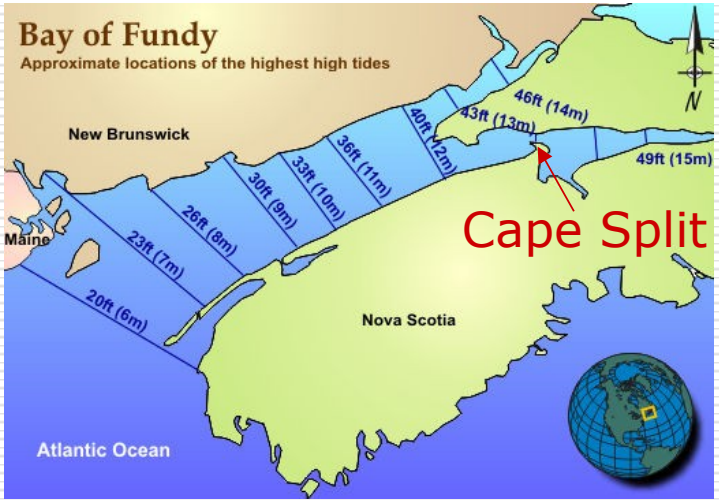
	¢/kWh
wind ≤50 kW	49.9
wind >50 kW	13.1
run-of-the-river hydro	14
in-stream tidal	65.2
CHP biomass	17.5

- net metering available for customer based renewable generation

- ≈100 MW aggregate (excluding tidal)
- rates set by independent regulatory board
- eligibility requires majority ownership by municipalities, cooperatives, non-profit or indigenous peoples enterprise
- initiated Sept 1, 2011
- 95 applications received, 20 projects approved
  - 2.5 MW tidal
  - 40.5 MW wind
  - 3.3 MW biomass

World's Highest Tides

- at Cape Split:
  - 8 knots (4m/s) = maximum current
  - 5 km = channel width
  - 4 km^3/h = flow rate
    = combined flow of all rivers on Earth
  - 14 km^3 = 14 billion tonnes water moves in an out twice daily



Targets and Subsidies vs Markets

Alberta Generating Capacity (MW)

installed and operating			under construction and fully permitted			announced and in connection queue		
total	wind	**% wind**	total	wind	**% wind**	total	wind	**% wind**
13012	777	**6.0**	3833	1374	**36**	8711	4169	**48**

- **Alberta** does not centrally plan generation or have supply mix targets
  - generation projects are self-initiated and receive only market priced payments for electricity and renewable energy credits sold to US buyers
  - no subsidies or legislatively guaranteed contracts
  - 2011 average market price 7.6 ¢/kWh

Ontario Generating Capacity (MW)

installed and operating			under development		
total	wind	**% wind**	total	wind	**% wind**
34079	1645	**4.8**	8435	4076	**48**

- **Ontario** generation investment is centrally planned and controlled to achieve supply mix targets
  - subsidized legislatively guaranteed long term contracts are provided
  - 2011 average electricity price 7.09 ¢/kWh (hourly price plus Global Adjustment)

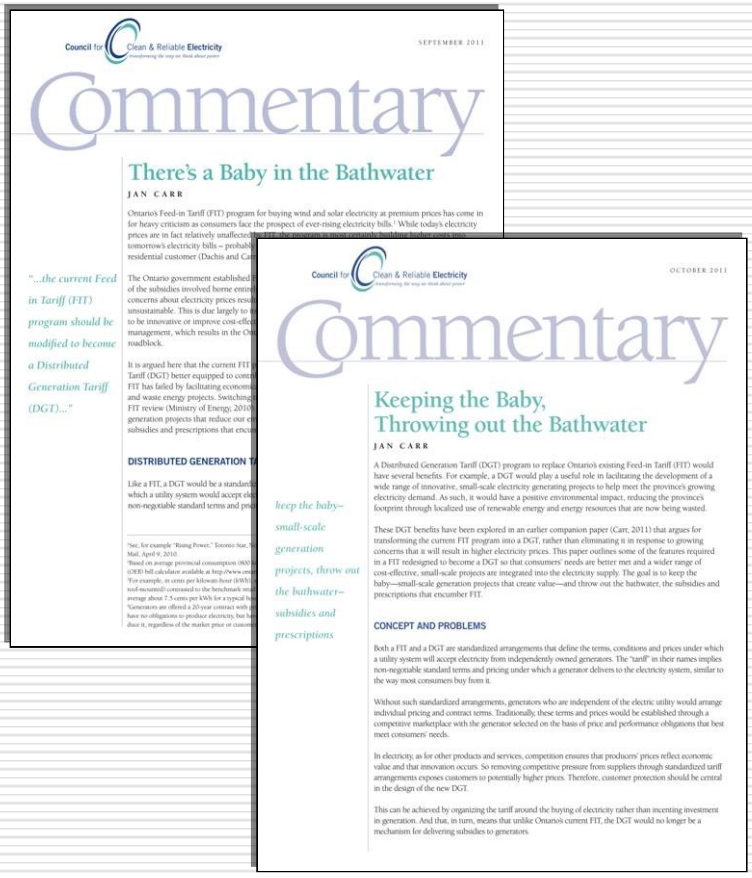
Future of FIT - Ontario

- public support for FIT is at the breaking point
  - just below the surface politically
    - Opposition party calls to scrap program during election campaign and in Legislature
  - winding down of programs in Germany and Spain
    - "austerity" is a common cause
    - cited as prototypes for Ontario
- linkage between FIT and renewables reinforces the negatives of each
  - Auditor General 2011 Report
    - enumerates $billions overspending on renewables due to lack of Government due diligence in setting prices and following procurement procedures
    - electricity prices are a growing public concern – residential, commercial, industrial
  - deeply unpopular in rural areas
    - linkage with wind and loss of local control of land use
- FIT is worth preserving
  - small-scale distributed generation
    - building total energy systems
    - energy from waste
  - complex projects requiring innovation
    - district energy systems
    - storage and electrification of transport

Distributed Generation Tariff
proposal to return FIT to original purpose

- limit size of projects to 10 MW
- remove restrictions on generation technology
  - deliver technology-specific subsidies through tax or similar mechanisms
  - all generators get same price for electricity
- structure as a regulated buying tariff instead of a purchasing contract
  - independent regulator sets price periodically
  - perpetual contract term
  - available at any time – no procurement cycle or deadlines
- these changes would remove need for centralized direct management
  - administration could be undertaken by electricity distribution utility
  - one-stop approval of contract and grid connection

Distributed Generation Tariff



Council for Clean & Reliable Electricity

SEPTEMBER 2011

Commentary

There's a Baby in the Bathwater

JAN CARR

"...the current Feed in Tariff (FIT) program should be modified to become a Distributed Generation Tariff (DGT)..."

Council for Clean & Reliable Electricity

OCTOBER 2011

Commentary

Keeping the Baby, Throwing out the Bathwater

JAN CARR

keep the baby– small-scale generation projects, throw out the bathwater– subsidies and prescriptions

A Distributed Generation Tariff (DGT) program to replace Ontario's existing Feed-in Tariff (FIT) would have several benefits. For example, a DGT would play a useful role in facilitating the development of a wide range of innovative, small-scale electricity generating projects to help meet the province's growing electricity demand. As such, it would have a positive environmental impact, reducing the province's footprint through localized use of renewable energy and energy resources that are now being wasted.

These DGT benefits have been explored in an earlier companion paper (Carr, 2011) that argues for transforming the current FIT program into a DGT, rather than eliminating it in response to growing concerns that it will result in higher electricity prices. This paper outlines some of the features required in a FIT redesigned to become a DGT so that consumers' needs are better met and a wider range of cost-effective, small-scale projects are integrated into the electricity supply. The goal is to keep the baby—small-scale generation projects that create value—and throw out the bathwater, the subsidies and prescriptions that encumber FIT.

CONCEPT AND PROBLEMS

Both a FIT and a DGT are standardized arrangements that define the terms, conditions and prices under which a utility system will accept electricity from independently owned generators. The "tariff" in their names implies non-negotiable standard terms and pricing under which a generator delivers to the electricity system, similar to the way most consumers buy from it.

Without such standardized arrangements, generators who are independent of the electric utility would arrange individual pricing and contract terms. Traditionally, these terms and prices would be established through a competitive marketplace with the generator selected on the basis of price and performance obligations that best meet consumers' needs.

In electricity, as for other products and services, competition ensures that producers' prices reflect economic value and that innovation occurs. So removing competitive pressure from suppliers through standardized tariff arrangements exposes customers to potentially higher prices. Therefore, customer protection should be central in the design of the new DGT.

This can be achieved by organizing the tariff around the buying of electricity rather than incenting investment in generation. And that, in turn, means that unlike Ontario's current FIT, the DGT would no longer be a mechanism for delivering subsidies to generators.

www.thinkingpower.ca

Conclusions

- renewable energy will play a significant role in tomorrow's energy supply
  - public support is high
  - momentum has been established
- commercial feasibility of renewable energy does not require a FIT
  - transparent open markets attract investors
  - de-linking renewables and FIT will facilitate both
- FIT programs have a useful role in distributed generation

Information Sources

slide 3-7 electricity system data

- Canada's Electricity Industry: Background and Challenges, Canadian Electricity Association http://www.electricity.ca/media/pdfs/Electricity%20101/Electricity%20101%20Slide%20Deck_December%202010[1].pdf

slide 9 public opinions

- Innovative Research Group for Canadian Nuclear Association, June 2011

slide 10-12 renewable energy report

- Select Committee on Alternative Fuel Sources, Final Report, Legislative Assembly of Ontario, June 2002 http://www.owa.ca/assets/files/publications/Alt_Fuels_Report.pd

slide 13-14 Ontario FIT

- "Ontario's Feed-in Tariff Program Building Ontario's Clean Energy Future: Two-Year Review Report", March 19, 2012, Queen's Printer for Ontario, 2012 http://www.energy.gov.on.ca/docs/en/FIT-Review-Report-en.pdf

slide 15 Ontario FIT statistics

- A Progress Report on Electricity Supply – 3rd Quarter 2011, Ontario Power Authority
- Supply Overview, Independent Electricity System Operator http://www.ieso.ca/imoweb/media/md_supply.asp

Information Sources

slide 16 cost of Ontario FIT

- Benjamin Dachis and Jan Carr, "Zapped: The High Cost Of Ontario's Renewable Electricity Subsidies", May 31, 2011, C.D. Howe Institute e-Brief, http://cdhowe.org/pdf/ebrief_117.pdf

slide 17 Nova Scotia FIT

- Community Feed-in Tariff Program, Nova Scotia Department of Energy, http://nsrenewables.ca/feed-tariffs

slide 18 Bay of Fundy tidal power

- http://www.wolfville.ca/
- http://www.srh.noaa.gov/jetstream/ocean/fundy_max.htm
- http://www.nspower.ca/en/home/environment/renewableenergy/tidal/projectoverview.aspx

slide 19 wind generation levels

- 2011 Market Statistics, Alberta Electric System Operator
- Long Term Adequacy Metrics - February 2012, Alberta Electric System Operator
- A Progress Report on Electricity Supply – 3rd Quarter 2011, Ontario Power Authority
- Supply Overview, Independent Electricity System Operator http://www.ieso.ca/imoweb/media/md_supply.asp