

GRIDCo Presentation

April 19, 2011

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Welcome Address

Eldon Bennett

Renewables Past & Present

David Miller

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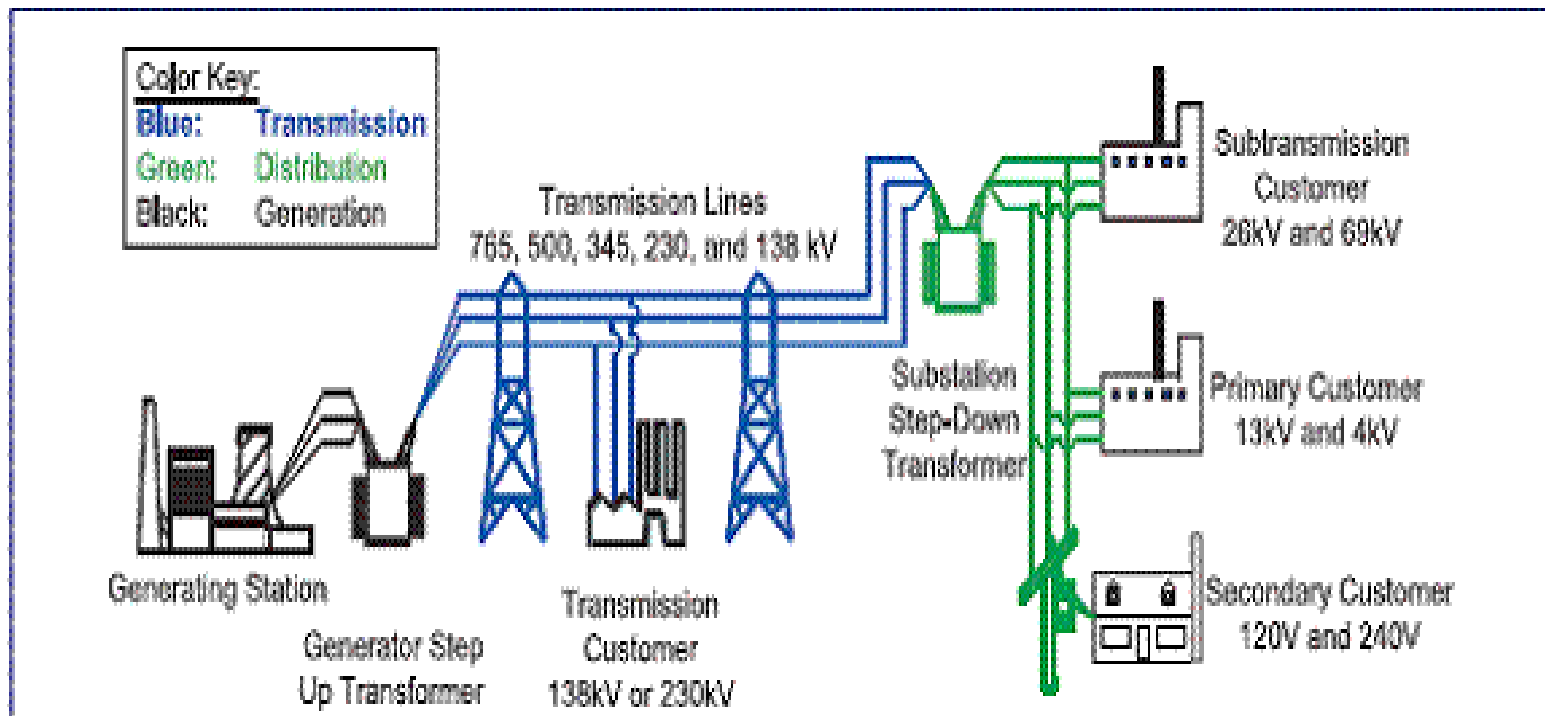
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Evolution of the Ontario Electricity Industry: 20 years of Change, Challenges and New Opportunities

Scott A. Stoll

1990:

- Ontario Hydro - a vertically integrated provincially owned utility



1990:

- Ontario Hydro - vertically integrated provincially owned utility (generation, transmission, distribution)
- 340 public utility commissions
- Ontario Energy Board - advisory role only
- Ontario Hydro Demand Supply plan
- Prediction for 2014 - 50% to 100% increase in demand
 - Nuclear 43%
 - Fossil 37% (coal, oil, natural gas)
 - Hydraulic 20%

1990:

- First use of independent power production (“Non-utility Generation” or “NUGs”)
- Ontario Hydro procured approximately 1800MWs of electricity through PPAs
 - natural gas, hydro, wood

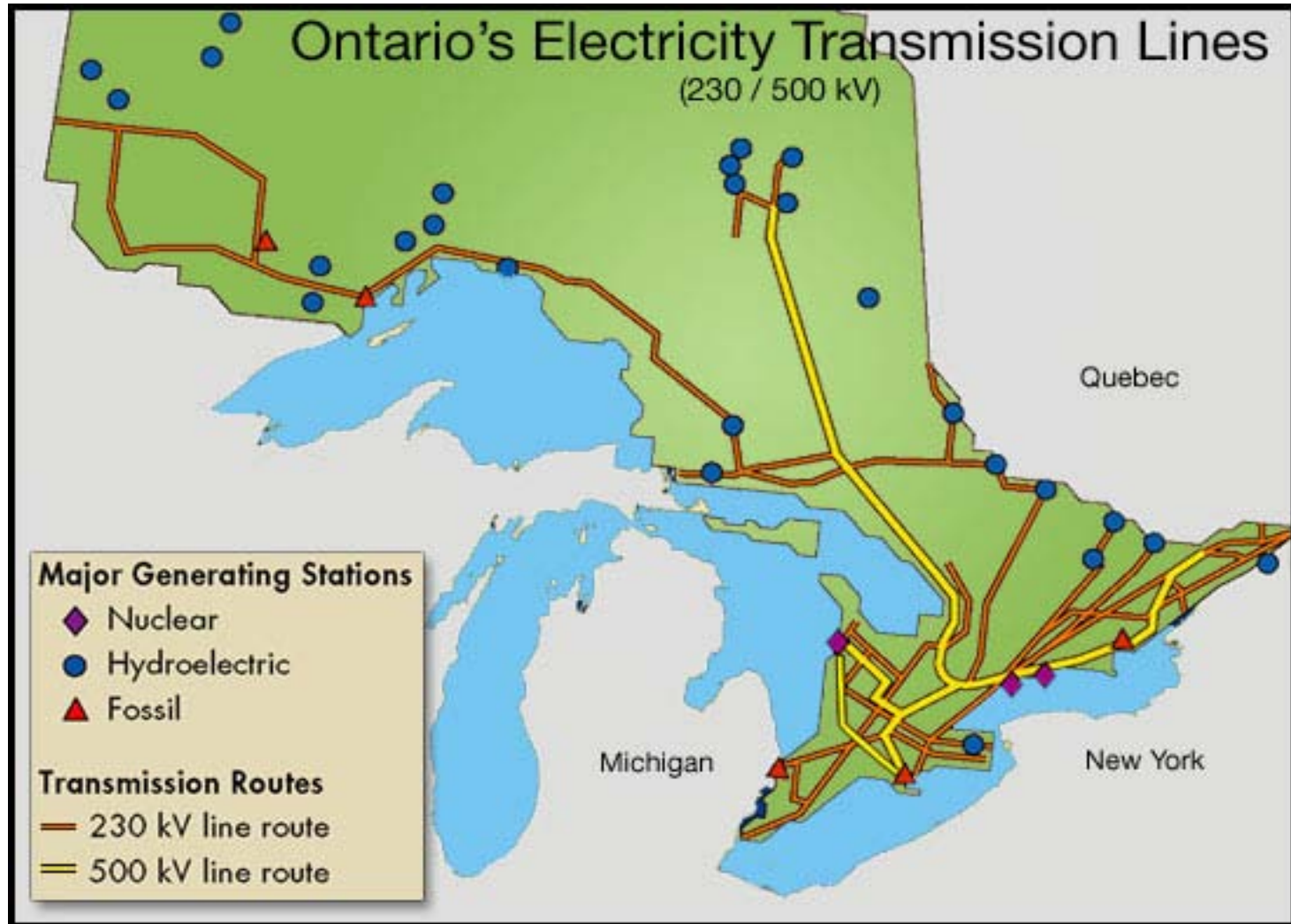
2010:

- Hydro One broken into 5 entities
- 80 local distribution companies (from 340)
- Regulated by the Ontario Energy Board
- Annual demand is flat (160TWh)
- Seasonal peaking changes
- Peak generating capacity (37,000MWh)
- Daily peaking and surplus baseload
- Economy has shifted with loss of heavy industrial load (auto, forestry)

2010:

- Nuclear about 35% Demand and 50% energy
- Off-coal - natural gas becomes more significant market price setter
- Over 500 Generating facilities + micro-generating facilities
- Competitive Transmission

Transmission System:



POLICIES, ISSUES & TRENDS

Policies:

- Off-coal policy adopted by provincial government
- Climate change (future use, fuel impact, water levels and timing, demand patterns)
- Market elements:
 - Market to sell power or centralized buyer (the OPA)
 - Changing capital market requirements

Issues:

- Grid Connection/Expansion
 - Who pays and how (tariff, capital contributions, societal benefits, asset use)
 - Monopoly or competitive
- Inter-jurisdictional
 - Trading
 - *Import Offer Guarantee*
 - Enforceable standards
 - *How enforce across multiple jurisdictions*
- Renewable/Distributed Generation
 - Matching dispatch, technologies and demand

Issues: cont'd

- Market integrity
 - independent market review
 - physical constraints in system and potential for exploitation
- Other market issues
 - Capacity v. energy payment
 - Ancillary services (e.g. blackstart, VAR support)
 - Achieving other social policies for ratepayers

Trends:

- Technology (smart grid, generation, demand management)
- Distributed generation (renewable, higher efficiency)
- Competition is different
 - Project proponent relationships
- Continued politicization of ABCs and the increase in regulatory risk
 - Annual statutory amendment and policy shift

Small renewable energy projects created many challenges for the distributors and transmitters :

- Reverse flow
- Stability from long feeders
- Significant added complexity to analysis of additions to the system
- Significant additional work that needed to be resourced



5kW Solar panel installed by local distribution company

- First GE project of its kind in North America
- Takes traditional co-generation (heat and electricity) and utilizes carbon dioxide emissions for fertilization of greenhouse crop
- Greenhouse is a carbon sink and significantly reduces air emissions while enhancing crop production
- Ability to add absorption chillers
- Good partner for intermittent generators like wind



Ontario's Feed-in-Tariff (FIT) Program - Summary and Transmission Challenges

Randy Williamson

Ontario's Feed-in Tariff (FIT) Program

- *Green Energy and Green Economy Act, 2009* created the FIT Program, operated by the Ontario Power Authority (OPA) - in effect since September 2009
- OPA is the power purchaser from generators under standardized 20/40 year agreements - a creditworthy customer upon which to finance and develop projects
- FIT Program can help Ontario achieve its announced Long Term Energy Plan (LTEP), expecting \$87 billion in public and private sector investment to achieve
- LTEP anticipates that non-hydro renewables represent 10-15% of the supply mix by 2018, at 10,700 MW of nameplate capacity, given peak generating ability

State of FIT Program

- Since its launch, it's been extremely popular!
- ~1,300 FIT projects in development/operation, with 3,400+MW of capacity - 2,125MW Wind, 1,087MW Solar PV (rooftop and groundmount), 188MW Hydro and 55MW Bioenergy
- If all contracted projects are built, it represents about \$10 billion in total capital invested
- Currently - 3,000 active applications (92% Solar PV), representing > 10,000MW additional capacity (64% Wind)
- To reach the LTEP 10,700MW goal, 7,300MW additional would eventually be contracted/built, requiring an additional \$20-25 billion in capital invested
- And this doesn't include >25,000 microFIT (<10kW) offers and contracts (99% Solar PV), for 220 MW, requiring \$1-\$1.5 billion to build

Some FIT Challenges to 'Grid' Operators

- FIT program's "right to connect" has led to a large number of independent generators – many are unsophisticated on connection/transmission issues
- Short lead times for renewable energy generation development, and attrition of generation projects, means priority areas for transmission/distribution developments could change
- Intermittent Wind/Solar PV electricity generation adds complexity to generation forecasting and grid balancing
- Concentration of FIT and microFIT projects places pressure on distributors which connect them – analytical, reliability and financial
 - "ability to connect" eligibility criteria added, notices of no connection
- Pressure from generation developers to make connection choices that are quicker or cheaper, perhaps at the expense of consistency/reliability
- Grid operators must also consider the effects on planning of a looming election campaign and the winning party's promises regarding renewable electricity generation or transmission

Hydro One and Its Wires Mandate

Les Horswill

Historical Context and Wires Business

“The past is never dead. It’s not even past.” (William Faulkner)

- From 1906 to April 1, 1999, Hydro One was the spine of Ontario Hydro, the largest publicly owned electricity monopoly in North America. All the wires owned by Ontario Hydro are now the responsibility of Hydro One.
- Hydro One owns and operates Ontario’s public electrical transmission system, transmitting electricity through a 28,600 kilometre high-voltage transmission network. In addition, Hydro One owns and operates 26 interconnection facilities that link Ontario to neighbouring provinces and the U.S.
- Hydro One is the largest electricity distributor in Ontario, serving approximately 1.3 million residential, agricultural, commercial and industrial customers through a 124,700-kilometre low-voltage distribution system, primarily in rural areas. Hydro One Brampton Networks Inc. is Hydro One’s urban distribution company, serving approximately 120,000 customers in the Greater Toronto Area.
- Hydro One Remote Communities Inc. operates 18 small, regulated generation and distribution systems in 19 remote communities across northern Ontario that are not connected to Ontario’s electricity grid.
- Hydro One’s transmission network is estimated to be worth \$9.1 billion; its distribution system is estimated to be worth \$6.5 billion. Its annual net income is usually just below \$500 million. It is wholly owned by the province of Ontario.

The Electricity Market Context

Hydro One's wires link Ontario-wide demand and electricity supply in an evolving market.

- Demand varies widely on an hourly, daily and seasonal basis. For instance, demand in 2007 ranged from approx. 12,000 MW up to approx. 25,737 MW.
- Electricity demand has historically tracked GDP; however, the ratio of the growth in electricity demand to the growth in GDP has been reduced in the last decade.
- Since 1990, residential energy demand has remained relatively static. In comparison, commercial and institutional demand has grown by roughly 30%, and demand by industrial users has declined by roughly 9%. Today, all three sectors have similar total electricity consumption.
- Ontario's generation capacity (approximate):

	Total capacity (MW)	Number of Stations
Nuclear	11,426	5
Hydroelectric	7,788	68
Coal	6,434	4
Oil/Gas	5,103	22
Biomass/Landfill Gas	75	5
Wind	2,600 (end 2011)	12
Total	33,426	

Source: IESO 18-Month Outlook

- The Ontario Power Authority has estimated that, because of demand growth and aging facilities, Ontario will need to add or replace some 30,000 MW of supply by 2027. Much of the new supply will require new transmission facilities.

Policy Legacy and Future Responsibilities

- Legacy tasks: economic development and province-wide electrification
 - “Power at cost”
 - Equitable transmission rates
 - Equitable rural rates
 - Service to remote communities

- New commercial mandate
 - The Energy Competition Act (1999) placed all Ontario Hydro’s wires assets in Hydro One. As a corporation mandated to facilitate wholesale and retail competition, its former regulatory, system planning and wholesale dispatch responsibilities were assigned to the Independent Electricity System Operator (IESO.)

- Future uncertainties
 - Facilitating renewable generation; expanding North American regional markets; containing transmission rates and rising costs; responding to technology innovations and new ideas in governance.

Procurement for Generation Resources by the Ontario Power Authority

Ron Clark

Past and Future OPA Procurements (in MW)

Technology	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
Renewable Energy	11	396	113	341	1,448	1,020	1,173	956	595	131	438	6,622
Clean Energy		1,095		1,036	2,113	868	15	673		900		6,700
Nuclear	1,500						1,500					3,000
TOTAL	1,511	1,491	113	1,377	3,561	1,888	2,688	1,629	595	1,031	438	16,322
Cumulative Totals (MW)	1,511	3,002	3,115	4,492	8,053	9,941	12,629	14,258	14,853	15,884	16,322	

Clean Energy Procurement (Gas)

- I. 2,500 MW RFP - successful
- II. Early Movers - successful
- III. Bilateral Contracts (gas and nuclear) - successful
- IV. Combined Heat and Power - mixed success
- V. Peaking Generation - on track
- VI. GTA West - successful
- VII. Southwest GTA - unsuccessful

Clean Energy Supply Contract - Structure

- 20-year term following Commercial Operation Date (COD)

- Payment:
 - Generator is deemed to produce electricity when contract price is higher than spot price
 - Deemed revenues from market are subtracted from monthly payment by OPA

- Restrictions on assignment and change of control (stricter prior to COD)

- Provisions allowing step-in rights for secured lenders

Clean Energy Supply Contract - Structure ...cont'd

- Completion and performance security
 - Higher amounts prior to COD
 - Lower amounts following COD
- OPA pays generator its monthly revenue requirement
 - Environmental attributes assigned to OPA
- Re-openers for:
 - Changes in market rules that adversely affect “supplier’s economics”
 - Discriminatory action

Renewable Energy Procurement

- Renewable Energy Supply I, II and III (competitive RFPs)
- Renewable Energy Supply Standard Offer Program (10 MW and under)
- Feed-In Tariff Program (standard offer for both large and small renewable projects)
- MicroFIT (residential scale solar)
- Commercial MicroFIT (aggregator-scale residential)

Renewable Energy Supply Contract Structure

- 20-year term following Commercial Operation Date
- PPA-style: payment for electricity produced
- Restrictions on assignment and change of control (stricter prior to COD)
- Provisions allowing step-in rights for secured lenders

Renewable Energy Supply Contract Structure ...cont'd

- Completion and Performance Security
 - Higher amounts prior to COD
 - Lower amounts following COD

- OPA pays generator its monthly revenue requirement
 - Environmental attributes assigned to OPA

- Re-openers for:
 - Changes in Market Rules that adversely affect “Supplier’s Economics”
 - Discriminatory action

Case Study - 2500 MW RFP

1. Government-led project to procure new clean generation
2. Intent of the RFP was to contribute to the provincial government's objective of phasing out coal-fired generation, address future supply challenges, and to mitigate near-term reliability concerns in priority areas of the province
3. Procurement activities were initiated in June 25, 2004 with the call for Request for Information/Request for Qualifications ("RFQ") to prospective proponents
4. RFP was then issued on September 13, 2004 by the Ministry of Energy
5. RFP process was overseen by an independent fairness commissioner
6. Once selected, proponents were legally required to enter into Clean Energy Supply Contracts (Demand Response also procured)

Evaluation of Proposals - Three-stage process:

Stage 1 - Evaluation for Completeness

Stage 2 - Technical and Financial Evaluation

Stage 3 - Economic Evaluation

Stage 1 - Evaluation for Completeness

Requirements:

- a) Responses to the Technical and Financial Questionnaires and Supporting Documents
- b) Confidentiality Statement
- c) Economic Bid Statement
- d) Proposal Security

Stage 2 - Technical and Financial Evaluation

<p>Minimum Specifications</p>	<ul style="list-style-type: none"> •“Clean” (effectively, gas-fired) • min. ramp rate over a single 5 minute interval • minimum contract capacity of 5 MW • transmission or distribution connected or embedded • not an upgrade of existing facility
<p>Description of Proposed Facility Site</p>	<ul style="list-style-type: none"> •map showing the location •plan of survey
<p>Ownership/Interest in Land</p>	<p>(i) registered title to the lands of the proposed site; (ii) lease or licence; (iii) a written agreement to purchase the land; or (iv) option to purchase the land. (v), a written agreement entitling the proponent to lease, license or use the land for the site.</p>
<p>Environmental Assessment</p>	<p>which category of environmental assessment (“A”, “B”, or “C”) would apply to the project.</p>
<p>Connection Related Assessments</p>	<ul style="list-style-type: none"> •System Operator •Transmitter •Distributor
<p>Notice to Municipal/ Planning Authority</p>	<ul style="list-style-type: none"> •Notification to the local municipality and planning authority •Consideration of Planning Act
<p>Schedule of Major Project Milestones</p>	<ul style="list-style-type: none"> •obtaining project and site approvals; •permitting; •equipment orders and deliveries; •commencement and completion of construction; and •commercial operation date no later than June 1, 2009.
<p>Qualification of Proponent Team</p>	<p>sufficient prior experience in each of the areas of planning, development, construction, and operation with at least one generating facility (other than the proposed facility). The RFP described how this requirement could be met; for instance, with respect to planning experience, at least one member of the proponent team must have been in a managerial capacity for at least two years in the function of project organization, site acquisition, and technical design.</p>
<p>Minimum Mandatory Financial Requirements</p>	<ul style="list-style-type: none"> • Equity providers: <ul style="list-style-type: none"> - Tangible Net Worth of \$500,000/MW - Investment Grade Credit rating •Debt providers: <ul style="list-style-type: none"> - Lender Commitment Letters

Stage 3 - Economic Evaluation

Proposals that were complete and which met the minimum mandatory technical and financial requirements were then subject to being assessed on the proposal's financial merits.

Lowest Net Revenue Requirement proposals which cumulatively delivered the aggregate capacity approximating the RFP target capacity of 2,500 MW selected

2,500 MW RFP – Winning Proposals

Five CES Contracts award:

- Greenfield Energy Centre (1005 MW) - Sarnia
- St. Clair Energy Centre (577 MW) - Sarnia
- GTAA Cogeneration Plant (90 MW) - Mississauga
- Greenfield South Power Plant (280 MW) - Mississauga

OPA Challenges

- a) Electricity policy remains highly political, OPA implements government policy (even if controversial)
- b) Price increases always perceived as bad (even if still lower than other jurisdictions, even if incents conservation)
- c) What to do with environment attributes
- d) Connection issues
- e) NIMBYism
- f) Perception of bureaucracy
- g) Perception of inflexibility (all negotiations have impact for all similar contracts)

Questions & Answers

Thank You

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