

Small Hydro in Ontario, Canada

# In the beginning.....

- Hydro-electric Power Commission -> Ontario Hydro
- Vertically integrated utility (generation, transmission and distribution)
- Also dozens of small municipal and industrial generators
- All of Ontario's electricity came from waterpower (1951)

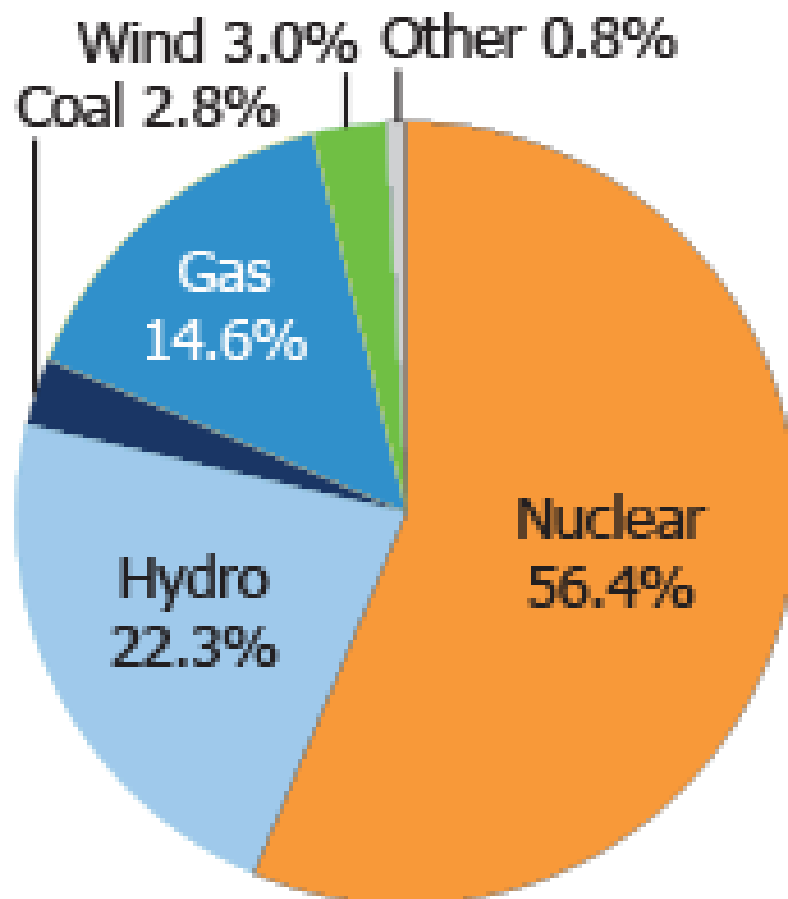


# The era of large centralization

- 1946 - 515 hydro facilities in operation
- 1984 - 175 hydro facilities in operation
- Installed hydroelectric capacity grows from 2GW to 7.5GW
- Average installed hydroelectric plant capacity grows from 4MW to 40MW
- Total 35.8 GW including nuclear, gas, coal and wind

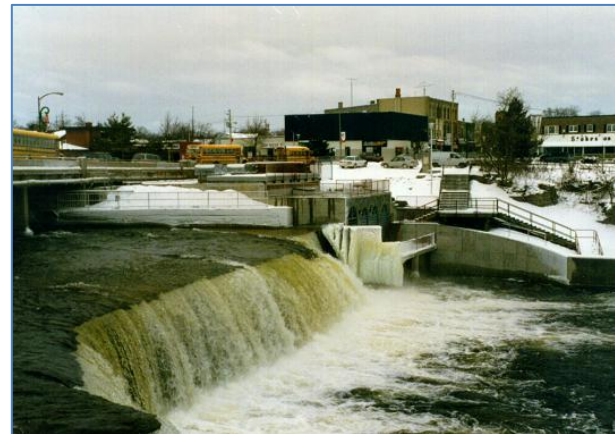


# Ontario's 35.8 GW of Installed Capacity by Fuel Type (Nov. 2012, IESO)



# The first modern small hydro renaissance...

- 1980's-1990's – Ontario Hydro “Demand Supply Plan”
- Target of 1,000 MW of “Non-Utility Generation” from small hydro
- Long-term contracts (20-50 years)
- Formal “Small Hydro Program” across government
- 52 new/refurbished facilities – 142MW
- Economic downturn (1990's) ended program



# Market Commercialization

- In May 2002 Ontario opened both wholesale and retail electricity markets to competition (merchant generation)
- The vertically integrated utility (Ontario Hydro) was broken up into separate companies, with market dominance in generation and transmission
- Some large utility generation assets (hydro, nuclear) were sold
- Demand often exceeded supply and the “Invisible Hand” of market forces
- Wholesale electricity prices volatile (i.e. market worked)
- Political decision to freeze retail prices – investment confidence lost

# Government – backed procurement

- Requests for proposals for all renewables with annual targets
  - Competition based on price
  - Disproportionate administrative burden for small projects
- Renewables Standard Offer Program
  - Fixed price for small projects (<10MW)
  - Price differential by technology
  - Limited to low voltage connections
- Feed in Tariff Program
  - Fixed prices for all sizes of projects
  - First come-first served – competition for capacity
  - Waterpower takes longer to build than other renewables

# FIT for Waterpower

Fuel Type	Project Size	Contract Price	Indexation	Contract Term
Waterpower Projects	≤10MW	13.1¢ / KWh	20% (CPI) indexation to contract milestone commercial operation date	40 years
	> 10MW ≤ 50MW	12.2¢ / KWh		
Fuel Type	Hours	Peak Incentive	Peak Disincentive	
Waterpower Projects	11 a.m. to 7 p.m. (business days)	35% increase in pricing (1.35)		
	After 7 p.m. to 10 a.m. (all weekend)		10% decrease in pricing (0.9)	



# Unintended consequences

- Procurement of new sources (renewables/gas/hydro)
- Closing of coal-fired generation (was 25% of supply)
- Take or pay contracts
- Economic downturn (2008) and drop in demand  
==> Surplus baseload generation
- Significant periods of “negative” prices (wholesale market still functions)
- Existing hydro facilities subject to “spot price”
- Results in requirement for contracts for existing operating stations

# Key lessons learned

- What to avoid.....
  - One size models - do not fit all
  - Boom and bust cycles - do not work for long term investments
  - Race to connect – hydro won't win
- What to advocate....
  - Long term targets implemented through measured annual procurements
  - Differential recognition of electricity attributes
  - Value to the ratepayer