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

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Project Size</th>
<th>Contract Price</th>
<th>Indexation</th>
<th>Contract Term</th>
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</thead>
<tbody>
<tr>
<td>Waterpower Projects</td>
<td>( \leq 10 \text{MW} )</td>
<td>13.1¢ / KWh</td>
<td>20% (CPI) indexation to contract milestone commercial operation date</td>
<td>40 years</td>
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<td>( &gt; 10 \text{MW} \leq 50 \text{MW} )</td>
<td>12.2¢ / KWh</td>
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<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Hours</th>
<th>Peak Incentive</th>
<th>Peak Disincentive</th>
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</thead>
<tbody>
<tr>
<td>Waterpower Projects</td>
<td>11 a.m. to 7 p.m. (business days)</td>
<td>35% increase in pricing (1.35)</td>
<td>10% decrease in pricing (0.9)</td>
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<td>After 7 p.m. to 10 a.m. (all weekend)</td>
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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