Panel #3
OPTIONS FOR BUILD-OUT OF A SUSTAINABLE BIOENERGY INDUSTRY IN THE GREAT LAKES

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Context
- Electricity consumption
- OPG
- Requirements to reduce CO$_2$ emissions

Near Term Options
- Factors Influencing Decisions
- Maximizing Contribution of Biomass
Electricity Demand

Ontario Electricity Demand

- Peak Demand (millions of kilowatts)
  - Summer Peak (MW)
  - Winter Peak (MW)
  - Ontario Demand (TWh)

- Annual Consumption (billions of kilowatt hours)
2008 OPG Energy Production - 107.8 TWh

- Nuclear: 48.2 TWh (45%)
- Fossil: 23.2 TWh (21%)
- Hydroelectric: 36.4 TWh (34%)
OPG Fossil Generation Facilities

5 Fossil-Fueled Stations

2 Co-owned Gas-Fired Stations

OPG's Fossil generation portfolio as of December 31, 2008 had a total in-service capacity of 8,177 MW. OPG is also co-owner of the 580 MW Brighton Beach and 650 MW Portlands Energy Centre gas-fired generating stations.
Supplying Ontario Peak-Demand (Aug 1, 2006)
CO₂ Emissions from OPG Coal Plants

- Proposed WCI Cap & Trade – 2012
- Proposed Federal Cap & Trade – 2012

Target based on Shareholder Declaration and Resolution

Proposed hard cap based on Ontario Regulation O.Reg 496/07 Amendment

Use of coal ends under Ontario Regulation O. Reg 496/07
Biomass – European Experience

- Renewable energy standards
- Renewable energy premiums

- Avedore, Denmark – 70% wood + 30% gas/oil
- Amer, Netherlands – 20% wood + 80% coal
- Les Awirs #4, Belgium – 100% wood pellets
- Fiddlers Ferry, UK – 20% biomass + 80% coal
Renewable Energy Initiative: Biomass
The Dutch Experience

Annual renewable electricity production in the Netherlands and contributions per technology - 1989 until 2006.

Life cycle net GHG emissions: Reference and pellet pathways

- **Nanticoke GS**
  - Coal only: 1000 g CO₂ eq/kWh
  - 10% cofiring: 900 g CO₂ eq/kWh
  - 20% cofiring: 800 g CO₂ eq/kWh
  - 30% cofiring: 700 g CO₂ eq/kWh
  - 100% wood pellets: 600 g CO₂ eq/kWh

- **Atikokan GS**
  - Coal only: 1200 g CO₂ eq/kWh
  - 10% cofiring: 1100 g CO₂ eq/kWh
  - 20% cofiring: 1000 g CO₂ eq/kWh
  - 30% cofiring: 900 g CO₂ eq/kWh
  - 100% wood pellets: 800 g CO₂ eq/kWh

- **Natural gas pathways**
  - 10% cofiring: 400 g CO₂ eq/kWh
  - 20% cofiring: 300 g CO₂ eq/kWh
  - 30% cofiring: 200 g CO₂ eq/kWh
  - 100% wood pellets: 100 g CO₂ eq/kWh
  - Boiler: 50 g CO₂ eq/kWh
  - Combined cycle: 20 g CO₂ eq/kWh

Assumes carbon neutral level of harvest across forest resource.

Source: H. MacLean, Y. Zhang, J. McKechnie, University of Toronto, pending publication.
Near Term Options
- Biomass co-firing
- Fuel switching/Conversion of units to biomass

Factors Influencing Decisions
- Regulation to reduce CO\(_2\) emissions
  - existing regulation to cease coal use at the end of 2014.
  - anticipated cap & trade – 2012
- Existing electricity infrastructure & market
  - Makes use of existing assets – lower capital costs
  - Dispatchable renewable energy
- Synergy with forestry sector
- Net GHG reduction
- Public acceptance & perception
- Costs
Maximizing Contribution of Biomass

- Value along the entire fuel supply chain
  - Fuel contracts consistent is scope and scale with the electricity industry

- Investment in transportation infrastructure to fully exploit the benefits the Great Lakes provide

- Regional recognition of sustainable practices.

- Emerging technologies
  - torrefaction