

BIOMASS



Biomass Program at Ontario Power Generation

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March 2009

ONTARIOPOWER
GENERATION

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Ontario Power Generation Profile

- ⦿ Owned by the Province of Ontario
- ⦿ Generated 107.8 TWh in 2008
- ⦿ Produces 70% of Ontario's electricity
- ⦿ 12,000 employees
- ⦿ Capacity: 21,700 MW
- ⦿ Gross Revenue: \$6 billion



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Lambton 1,920 MW



Nanticoke 3,640 MW



Atikokan 211 MW

Thunder Bay 306 MW



Lennox 2,100 MW



Portlands Energy Centre* 550 MW



Brighton Beach* 580 MW

Current Capacity

Coal	6,077 MW
Lennox	2,100 MW

*Co-owned gas 1,130 MW

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Why Biomass at Coal Plants ?



Thunder Bay GS



Atikokan GS

- ⦿ Renewable energy
- ⦿ On demand when you need it
- ⦿ No net greenhouse gases
- ⦿ Contributes to the transition to lower carbon future
- ⦿ Synergy with agriculture and forestry – made in Ontario industry
- ⦿ Makes use of existing plants – lower capital costs

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OPG's Expectations

- ⦿ Not all 15 coal units will be converted
- ⦿ We will be fuel limited to a few Twh/year
 - ⦿ 600,000 t of wood pellets generate 1 Twh
- ⦿ We will need a renewable energy premium
- ⦿ Supply infrastructure will take time



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OPG Biomass Test Program

- ⦿ All OPG coal plants involved
- ⦿ Tests encouraging but we are still learning about
 - Fuel types
 - Fuel handling
 - Combustion
- ⦿ Environmental approvals for testing in place



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Atikokan GS Biomass Experience

- ◉ Lignite boiler design is favourable to 100% biomass fuel
- ◉ Focused on fuelling with wood pellets
- ◉ Test burns achieved 100% biomass fuel input and 3 million kilowatt hours
- ◉ Host to the provincial Atikokan Bio-Energy Research Centre



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Nanticoke Biomass Experience

- ⦿ First no-coal wood pellets test complete
- ⦿ Continued with seasonal wheat-shorts tests
- ⦿ 2008 test production of 4 million kilowatt hours
 - More than 300 homes for a year
 - Displaced 4,700 tonnes of carbon dioxide



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Thunder Bay and Lambton Experience

Thunder Bay

- ⦿ Similar design to Atikokan
- ⦿ Successful co-fire of grain screenings
- ⦿ Moving towards wood pellet test



Lambton

- ⦿ Completed first co-fire test with wheat shorts in December 2008



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Challenges

- ⦿ Fuel cost – more expensive than coal
- ⦿ Fuel supply infrastructure does not exist
- ⦿ Requires supply and safe handling huge volumes of fuel – low energy density
- ⦿ Covered shipping and storage is required. Safe fuel handling.
- ⦿ Potential boiler issues – slagging, fouling, corrosion
- ⦿ Ash re-use considerations
- ⦿ Avoid competition for resources



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OPG & Responsible Fuel Sourcing

- ⦿ Will not use food crops
- ⦿ Wood fuel must be from sustainable harvest practices
- ⦿ Keep watch on new developments like algae
- ⦿ Biomass obtained with minimal impact on consumers and existing resource users



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Request for Expressions of Interest – Fuel and Transportation

OPG needs to build understanding of:

- Biomass industry
- Production capability
- Physical characteristics
- Commercial conditions
- Open to wood or agricultural based material
- Aggregation of smaller producers desired
- RFEI closed February 26 – strong response



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Basic Requirements

- ⦿ Solid biomass fuel – pellets, pucks, etc
- ⦿ Ontario sourced and processed
- ⦿ Wood or agricultural products with the following qualifications:
 - ⦿ Meets the UN Framework Convention on Climate Change definition of renewable
 - ⦿ Biomass fuel must not be defined as a waste under Ontario regulation



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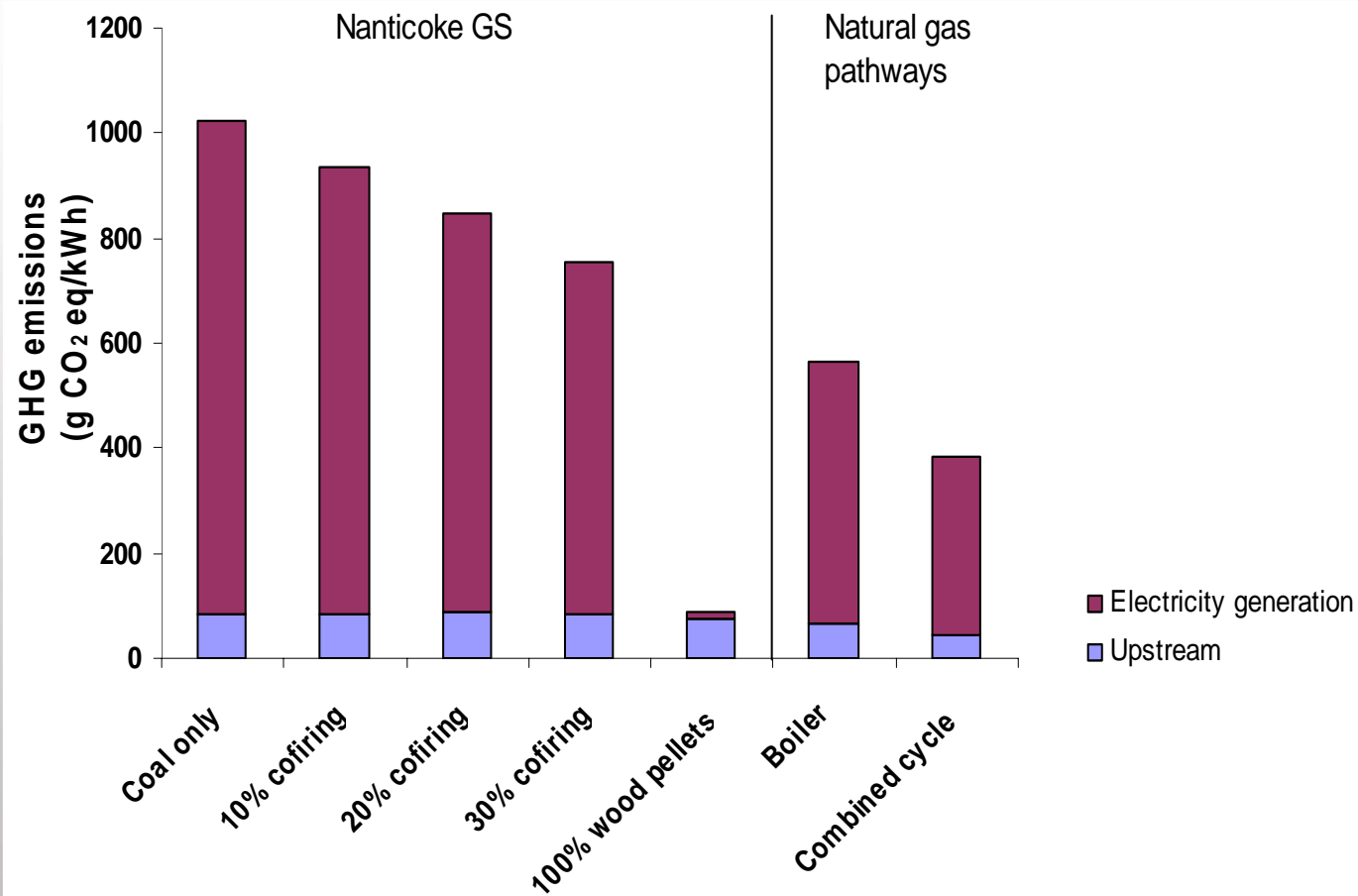
Fuel Heat Values

Coal	(BTU/lb)	Biomass	(BTU/lb)
Sub-bituminous PRB	8,880	Wheat Shorts	7,200
Bituminous USLS	12,500	Distillers' Grain	8,700
Lignite	6,850	Grain Screening	7,200
		Soy Hulls	6,660
		Oat Hulls	7,140
		Wood Pellets	7,900

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Wood Biomass – Life Cycle GHG



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Going Forward

- Technical studies complete and contracts for plant modifications (fuel storage and handling, combustion modifications) let within two years
- Generation supply contracts in place within two years
- First fuel contracts let within two years – next step this year - fuel and transportation industries geared up within three years
- Atikokan first - likely 2012



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Biomass Program at Ontario Power Generation

<http://www.opg.com/power/fossil/biomass.asp>

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OPG Production Mix 2008

