

Ontario Power  
Generation, Canada

Coal to biomass journey furnace

<b>Year of implementation:</b>	2014 / 2015
<b>Location:</b>	Atitokan & Thunder Bay, Ontario, Canada
<b>Technology:</b>	Combustion
<b>Principle feedstocks:</b>	Pellets from residues/wastes in forestry.  All pellet manufacturers are required to source to UNFCC sustainably harvested biomass standards including third party chain of custody certification.
<b>Products/markets:</b>	Electricity
<b>Technology Readiness Level (TRL):</b>	TRL 9 – actual system proven in operational environment

**DESCRIPTION**

Ontario Power Generation was created in 1999 when Ontario Hydro (a provincially owned power utility) was broken up to create an open market. Ontario Hydro had an in-service capacity of nearly 26,000 MW and generated about 137 TWh of electricity at its peak.

In 2003 the provincial government announced its intent to eliminate coal for the generation of electricity in Ontario. This regulation required all OPG's coal assets to be converted or closed by December 31, 2014.

Since that time over 7,500 MW of coal fueled generating capacity has been eliminated, and is North America's single largest climate change initiative. This is the story of two of five coal fired generating stations that were repurposed to biomass fuels, eliminating coal while addressing climate change.

The **Atikokan Generating Station** (GS) stopped burning coal in September 2012 and resumed commercial operation on biomass (white wood pellets) in July 2014, after a 170 million CA\$ conversion. At 205 MWe, Atikokan is the largest 100% biomass fuelled power plant in North America and the #1 consumer of industrial wood pellets in Canada with a 90,000 MT (metric tons) annual consumption (at 8% capacity factor of the GS, producing 140 GWh/y).



*Two new silos were constructed at Atikokan during the conversion to biomass. Each is 44 meters tall, and holds approximately 5,000 tonnes of wood pellets.*

**Thunder Bay Generating Station** with 155 MWe uses advanced wood pellets/black pellets<sup>1</sup>, an emerging fuel source that can be stored outside, eliminating fuel storage capital requirements of white wood pellets. Due to these properties conversion costs for this GS were low (5 million CA\$). Thunder Bay GS burned the last coal in the province to produce electricity in April 2014 and restarted on advanced wood pellets in January 2015. Thunder Bay is the world's first 100% replacement of coal with advanced wood pellets at a commercial level.

Both conversions met the desired project goals, started up on time, budget and successfully repurposed existing generating assets owned by the provincial ratepayers. These conversions also enabled the off coal deadline of December 31, 2014 to be accomplished early.

As early adopters of coal conversion technology in North America, OPG was recognized with several industry awards, including groundbreaker of year from Biomass Magazine, and Canadian Electricity Association (CEA) sustainability commitment 2015 for their efforts in advancing this field in North America.

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<sup>1</sup> Advanced pellets or black pellets are produced through steam explosion of woody biomass followed by densification to produce a fuel pellet. Steam exploded pellets that have higher density and energy content (compared to conventional pellets) with enhanced storage and handling properties (water resistance, less dust, mechanically durable).

<p><b>Stakeholders involved:</b></p>	<p>Stakeholders include local community advocates who not only lobbied for the construction of the Atikokan power plant in the 1980's and continue to seek ongoing support for the ongoing operation of the facility on biomass. Local first nations are engaged through new business opportunities provided in harvesting, logistics and pellet manufacturing.</p> <p>Prior to the full conversion of Atikokan, a research consortium was funded to assess biomass availability, sustainable harvest criteria and socio-economic impacts of bioenergy on the region. This work has been extended with the lifecycle and socioeconomic benefits of advanced wood pellets on the Thunder Bay generating station and broader bioenergy community.</p> <p>Beneficiaries of these projects include host communities, first nation partnerships, and enhanced business opportunities for the forest sector.</p> <p>Outreach beyond provincial boundaries has assisted utilities worldwide in better understanding white and advanced wood pellet conversion pathways. Benchmarks with peer reviewed research, NGO engagement and extensive collaboration with policy makers, bioenergy interest groups (pro and con) supported the goal of increasing public confidence in biomass to energy projects.</p> <p><a href="http://www.opg.com/about/environment/Documents/OPGBiomassConversion.pdf">http://www.opg.com/about/environment/Documents/OPGBiomassConversion.pdf</a></p>
<p><b>Contribution to Sustainable Development Goals:</b></p>	<p>SDG 13 (climate change): Closing coal fueled generating capacity, and partly replacing by biomass has had a large impact in terms of climate change.</p> <p>SDG 15 (sustainably managed forests): OPG's biomass fuel specification includes the requirement that biomass suppliers provide OPG with third-party chain-of-custody certification. This provides OPG assurance that the biomass fuel was sourced legally and from well-managed forests. Importantly for their ISO 14001 registration, PwC verifies that OPG stays on-top of these criteria.</p> <p>Prior to biomass conversion, OPG set about ensuring the biomass fuel procured would be sourced from sustainably managed forests; that there would be environmental and socio-economic benefits for biomass fuel use; and that the decisions made on these matters would be validated by third-party assessments. Positive contributions to local economies, and First Nation community benefits were considered in sourcing decisions.</p>
<p><b>Employment:</b></p>	<p>The Atikokan GS employs 90 people and the Thunder Bay GS around 70. Next to that there are construction jobs, forestry and fuel processing jobs.</p>
<p><b>Replicability and scale-up potential:</b></p>	<p>These reference conversions require sufficient plant scale. Replicability depends on existing coal power capacity, which varies by country/region.</p>
<p><b>Success factors:</b></p>	<p>Without government's desire to eliminate coal from electricity generation mix these projects would not have succeeded. To this end, many questions needed to be answered thoroughly requiring the expertise and engagement of academia, fuel suppliers, forest industry, provincial governments, NGOs and public.</p>

<b>Constraints:</b>	<p>Both conversions were challenged by low power market demands, while balancing the need for grid stability and future growth potential.</p> <p>Challenges encountered in both conversions centered around achieving</p> <ol style="list-style-type: none"> <li>1. Successful power purchase contracts with the procurement authority</li> <li>2. Mitigating project risks through construction contracting strategies</li> <li>3. Sourcing sustainable fuel contracts in immature markets</li> <li>4. Safety systems at class leading technologies</li> <li>5. Collaboration with environmental regulators on modernizing approvals.</li> </ol>
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*Thunder Bay, Ontario Power Generation*

<b>Info provided by:</b>	Brent Boyko, Ontario Power Generation
<b>More information:</b>	<p><a href="http://www.opg.com/generating-power/thermal/Pages/thermal.aspx">http://www.opg.com/generating-power/thermal/Pages/thermal.aspx</a></p> <p><a href="https://www.opg.com/about/environment/Documents/OPGBiomassConversion.pdf">https://www.opg.com/about/environment/Documents/OPGBiomassConversion.pdf</a></p> <p><a href="http://oce-ontario.org/meet-our-companies/success-story/2012/01/09/atikokan-bio-energy-research-centre-(abrc)">http://oce-ontario.org/meet-our-companies/success-story/2012/01/09/atikokan-bio-energy-research-centre-(abrc)</a></p> <p><a href="http://www.power-eng.com/articles/2013/09/sneak-peek-inside-the-atikokan-biomass-plant-conversion.html">http://www.power-eng.com/articles/2013/09/sneak-peek-inside-the-atikokan-biomass-plant-conversion.html</a></p> <p><a href="http://www.canadianbiomassmagazine.ca/news/opg-atikokan-wins-groundbreaker-of-the-year-award-at-ibce-5171">http://www.canadianbiomassmagazine.ca/news/opg-atikokan-wins-groundbreaker-of-the-year-award-at-ibce-5171</a></p> <p><a href="https://www.canadianbiomassmagazine.ca/pellets/advanced-energy-5410">https://www.canadianbiomassmagazine.ca/pellets/advanced-energy-5410</a></p> <p><a href="http://www.noma.on.ca/upload/documents/atikokan-biomass.pdf">http://www.noma.on.ca/upload/documents/atikokan-biomass.pdf</a></p>