

**Heating the Midwest
Conference & Expo
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Applied Research



Outline

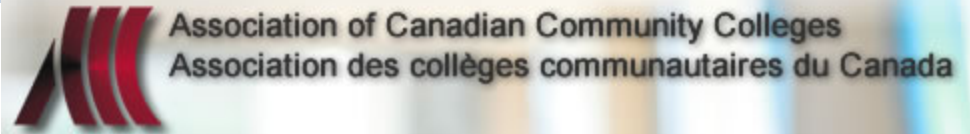
- ✓ Confederation College Overview
- ✓ Larger Biomass Project - Drivers & Background
- ✓ Project History
- ✓ BioEnergy Learning and Research Centre (BLRC) Overview
- ✓ BLRC as a Catalyst for Community Development

About Confederation College

- 3,200 full time & 8,000-9,000 part-time learners
- 56% of Ontario's landmass
- 9 campuses (1,000 km east to west)
- Broad range of programming
 - trades & technology
 - business, hospitality, media
 - health
 - aviation
 - natural resources



Biomass Project Drivers



- **\$ (Energy Savings) + GHG Reductions**
- Other Post-Secondary Institutions focused on wind & solar – we decided on Biomass
- With the closure of several pulp mills our forest industry needed a new commodity market

Some Statistics

- 380,000² ft. main campus building
- Biomass will provide roughly 80% of the total heat load
- Replaces perimeter electric heat and some natural gas hot water heat capacity
- Biggest single cost item is piping retrofit

Some Statistics

Major Cost Categories (Rounded \$CDN)

2 – 500 kw Boilers Including

Installation/Commissioning \$ 1,200,000

Boiler House: \$ 1,800,000

New Piping and Retrofit Work

Related Controls / Engineering \$ 2,200,000

BLRC \$ 1,250,000

Total: \$ 6,450,000



Biomass Project History

- 2008 - Confederation College makes decision to proceed with biomass as source of energy for major heating retrofit
- Vendor chosen to supply heating unit (1mW Unit)
- 2010 - Environmental Compliance Approval (ECA) Application submitted to Ministry of Environment (MOE) for 1mW boiler
- 2011 - Draft ECA received
- Draft ECA issued using 1990 Wood Combustor Guidelines as standard conditions
 - Vendor unit could not demonstrate compliance with temperature and residence time
 - Vendor made business decision to back out of project

BLRC History (cont.)

- Project Contractor assessed 2 additional vendors for supply of boiler
 - Only one could guarantee compliance with 1990 Wood Combustor Guidelines (Froling)
- College proceeded with amending Draft ECA to reflect 1 mW Froling unit
- Based on funding opportunities and strategic direction of College, Learning and Research Component added
 - Addition of 150 kW 'research' boiler
 - Approached MOE for permitting advice, as this unit would not comply with 1990 Wood Combustor temperature requirements
- In 2012 Pilot ECA Application Submitted for 150 kW unit

BLRC History (cont.)

- ECA for 1 mW Froling unit received December 2012
- December 2012 Froling attempts to get CSA/ASME Certification for 1 mW unit
 - ASME suggests modification to controls and water wall thickness as condition of certification
 - Froling rejects this request as that would require full re-tooling and engineering of production line
- Froling presents 2 x 500kW option to College
- College re-submits amendment to ECA in May 2013
- Approved ECA's for two 500kW and one 150kW units received March 19, 2014

Challenges

MOE Environmental Compliance Approval

- 1) Application of 1990 Combustor Guidelines are not designed for small factory built equipment (temperature is major issue)
- 2) Monitoring/Measuring conditions are significant financial constraint (>\$150 000 for CEM's, emission testing/reporting)
- 3) Application processing times can be upwards of 12 - 18 months and \$30k

Challenges

Equipment and Suppliers

1. Domestic supply of equipment that can meet both CSA and environmental performance requirements
2. Engineering/Design expertise for small scale fuel handling
3. Fuel Supply and Logistics for small scale generation (quality, storage, shipping)
4. Application of Building Code/Fire Code/Employment Standards Act

Lessons Learned

- Conduct a thorough environmental and regulatory constraints analysis as part of feasibility study;
 - Look at all aspects of regulatory requirements for chosen technology (MOE, TSSA, ESA, CSA etc.)
- Conduct thorough engineering & design costing studies (i.e. Class 10);
- Confirm and verify performance of equipment;

Summary

- Clean and efficient small scale combustion technology exists on the market.
- Widespread European use of biomass based energy systems from residential to large scale institutional applications.
- In Ontario there is no clear regulatory direction on acceptable technology for small scale combustion;
 - TSSA, CSA, MOE, MNR, Building Code, Fire Code etc.

Every project is breaking new ground.

BioEnergy Opportunity

- Significant number of diesel electric/fuel oil/propane dependent communities in Northwestern Ontario, Far North and parts of Eastern Ontario;
- There is an increasing interest in small scale biomass based energy (heat and power);
- Opportunities range from 10 kw (residential), 50 kw (large multi-residential) up to 3 MW (community heat);
- Growing international wood pellet market is driving domestic production opportunities;
- Clean and efficient combustion technologies are on the market and costs are dropping;

Suggested Path Forward

- 1) Update small scale biomass combustion environmental guidelines (underway in Ontario)
- 2) Streamline regulatory permitting for small scale applications
- 3) Establish a provincial (national) fuel standard
- 4) Identify and establish demonstration projects and benchmark performance (cost, energy, environmental etc.)
- 5) Formally identify fuel substitution opportunities and incent conversion as part of provincial GHG reduction strategy

BLRC - Key Features

- 150 kW Dedicated Research Boiler
- Access to the 2 - 500 kW boilers
- Laboratory/Testing Space for proximate analysis
- On-Line Instrumentation including ports for specialized/temporary test instrumentation
- Comprehensive Air Emission Testing Capabilities
- Learning and Training Space

BioEnergy Learning & Research Centre (BLRC) – Vision and Overview

- Biomass champion (<3 mW)
- Market Development and Technology Transfer
- Curriculum Development and Training
- Applied Research (Stump to Stack)
- Regulation and Policy Development.
- Community Development Anchored by Biomass

BLRC – Community Development

Many of our communities rely on oil, propane or electricity for heat

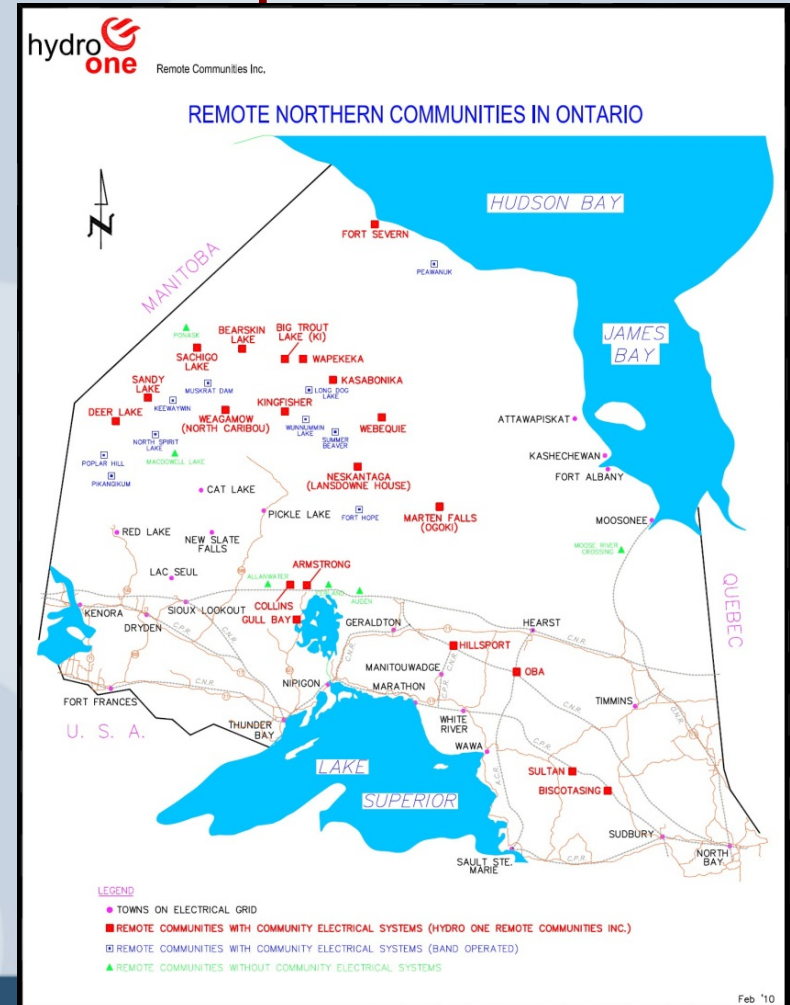


Union Gas service area (only supplier in N. Ont.)

BLRC – Community Development

- 29 northern communities on diesel generation
- 19 are served by Hydro One
- These 19 used 15.6 million litres of diesel 2011

*Hydro One Remote Communities Inc.
2011 Greenhouse Gas Inventory Report
and Action Plan



Community Heating with Biomass

Greenhouse Gas Emissions – Remote Communities

Table 5.1: Emission Source Summary

Source	Emissions (t CO2e)	% of Total
DIRECT GHG EMISSIONS		
Diesel Combustion	43,405	58.73%
Bio-diesel Combustion	31	0.04%
Natural Gas Consumption	37	0.05%
ENERGY INDIRECT EMISSIONS		
Electricity	37	0.05%
OTHER INDIRECT EMISSIONS		
Fuel Transport via ROAD	112	0.15%
Fuel Transport via AIR	30,285	40.98%
TOTALS	73,908	100.00%

*Hydro One Remote Communities Inc.
2011 Greenhouse Gas Inventory Report
and Action Plan

The need to reduce GHG emissions

Applied Research

Thunder Bay is developing a unique BioEnergy cluster to advance research, technology transfer & market development

1. Confederation College BioEnergy Learning & Research Centre
2. Lakehead University
 - FoReST Laboratory - Pellet and Biomass Analysis
 - Wood Science Testing Facility – Wood Property Testing (Physical, Mechanical, Thermal, Chemical)
 - Biorefining Research Institute - biofuels, chemicals and bioenergy from forest biomass
3. FPInnovations/Resolute Forest Products Lignin Plant
4. Ontario Power Generation conversion to wood pellets (industrial and advanced pellets)

BLRC – Current Applied Research Projects

1. Utilization and Enhancement of Urban Forest Biomass for Energy and Value Added Wood Products
 - Partners: BLRC, LU, Rutter Urban Forestry
2. Wood Heating Systems <3MW – ECA Interim Guidance Sub-Project
 - Partners: BLRC, Ministry of Environment, Ministry of Natural Resources
3. Biomass Heat as a Catalyst for Community Development in the Boreal Forest
 - Partners: BLRC, LU, Biomass Innovation Centre, First Nations Communities, Funders

Biomass Heat as a Catalyst for Community Development in the Boreal Forest

Phase I: Pre-Feasibility Study



Pikangikum Lake (B. Kurikka)

Biomass Heat as a Catalyst for Community Development in the Boreal Forest Purpose

The purpose of this project is to determine if two communities in Northwestern Ontario (one remote, one road accessible but not connected to the natural gas grid) are viable candidates for implementing biomass district heating in their communities

Biomass Heat as a Catalyst for Community Development in the Boreal Forest Project Description

In this project the following will be assessed:

- Volume and cost of fossil fuels and/or electricity consumed to produce heat on an annual basis
- Analysis of community infrastructure to determine best district heating option (single district heating plant/multiple plants/single use residential or a combination)

Biomass Heat as a Catalyst for Community Development in the Boreal Forest Project Description

- Analysis of savings (\$ and environmental) by switching to biomass
- Sawmill, Greenhouse, Wind/Solar potential
- Economic impact through job creation
- Permitting/approvals required (policy constraints)
- Analysis of sustainable fuel supply
- Report presentation and next steps (Phase II)

Biomass Opportunities are Growing!

Thank you for this opportunity to present our “up north” initiatives

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Questions?