Ontario Power Generation BioEnergy Learning and Research Centre

A Recent Biomass Installation at Confederation College, Thunder Bay – Lessons Learned & Opportunities in Northwestern Ontario

OPG BLRC HISTORY

- 2010 Confederation College makes decision to proceed with biomass (why?) as source of energy for major heating retrofit using wood chips (why chips?)
- General Contractor prepares fatal flaw analysis and establishes business feasibility of retrofit
  - regulatory constraints received only cursory review (was not apparent at the time)
- Biomass Boiler Vendor Selected

OPG BLRC HISTORY (cont.)

- 2011 Draft ECA issued using 1990 Wood Combustor Guidelines as standard conditions (Now A 14 (under 3 MW))
  - Vendor could not meet ECA conditions
- New vendor (Evergreen Bioheat / Froling) selected
- College proceeded with amending Draft ECA to reflect new unit
- 2012/13 ECA for 1 MW Froling unit received

OPG BLRC HISTORY (cont.)

- 2013 Froling attempts to get CSA/ASME Certification for 1 MW unit
  - ASME suggests modification to controls and water wall thickness as condition of certification
  - Would require full re-tooling and engineering of production line for increased cost per unit and efficiency loss
  - Froling presents 2 x 500kw option to College
- 2014 ECA finalized to reflect changes (not problematic)

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OPG BLRC HISTORY (cont.)

- 2015 Commissioning and Emissions Research
- 2016 Operational Assessment
- 2017 Fuel Feed System Replaced (!)

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CHALLENGES

Air Emissions Permitting

1) College did not have up to date site–wide ECA, biomass energy project triggered full site-wide update including new dispersion modelling ~$30 000 cost)

CHALLENGES (YOU WON'T HAVE!)

Air Emissions Permitting (con't)

1) ~~Application of 1990 Combustor Guidelines were not designed for small factory built equipment (temperature is major issue)~~ Now A 14

2) ~~Continuous Emissions Monitoring is a significant financial constraint~~ Up to 30% of the total project cost is now avoidable

3) ~~Application processing times were upwards of 12 - 18 months~~ EASR for certified systems

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THANK YOU:

- OPG
- OMECC
- NR Can
- LU
- OMNR
- Froling / Evergreen Bioheat / Biothermic

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CHALLENGES

Equipment and Suppliers

1. Domestic supply of equipment that can meet both CSA/ASME <u>and</u> environmental performance* requirements
2. Engineering/Design expertise for small scale fuel handling

* In my opinion the biomass sector needs robust emissions guidelines given history in Ontario

CHALLENGES

Equipment and Suppliers (con't)

1. Lack of "Wood Culture" - Application of Building Code/Fire Code - Acceptance in Insurance Sector
2. Market Development (Chicken and Egg)
3. Fuel Supply Logistics / Chip Quality

LESSONS LEARNED - CHIPS

- Fuel Quality (pick one fuel spec and enforce it)
- Fuel Quality (watch for sand contamination)
- Fuel Quality ($ / energy unit vs $ / tonne)

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LESSONS LEARNED - GENERAL

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

LESSONS LEARNED - GENERAL

- You will probably know as much or more as your General Contractor. Don’t be shy!

SUMMARY

- In Ontario - A 14 has removed a significant barrier to adoption of CLEAN biomass heat technology and its associated benefits*
- Note: CHP in Ontario must also consider the REA (Renewable Energy Act)

* For many communities the socio economic befits are perhaps more important than cost or carbon savings

ONTARIO BIOENERGY OPPORTUNITY

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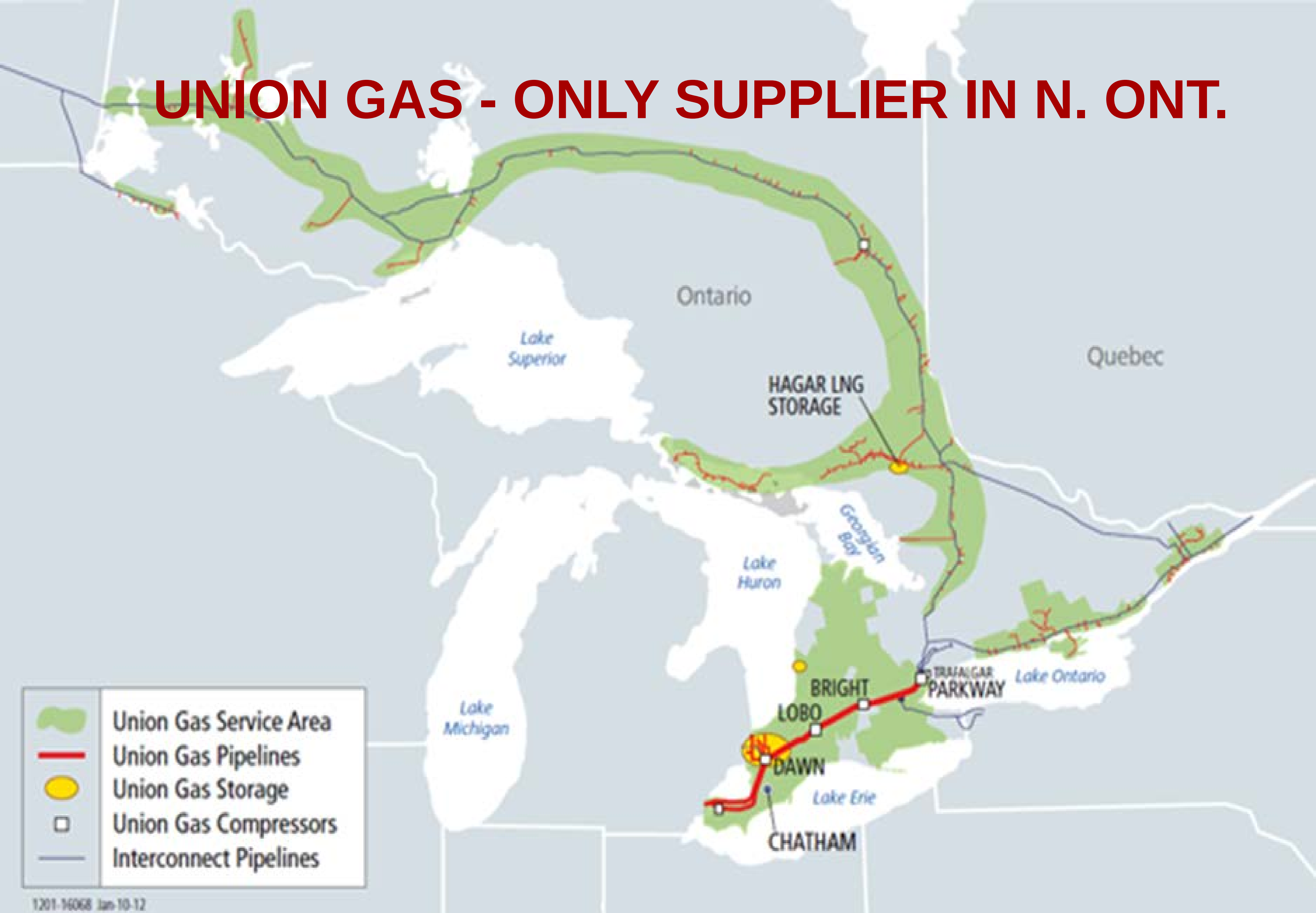
ONTARIO BIOENERGY OPPORTUNITY

- Significant number of diesel/fuel oil/propane (high $) 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;

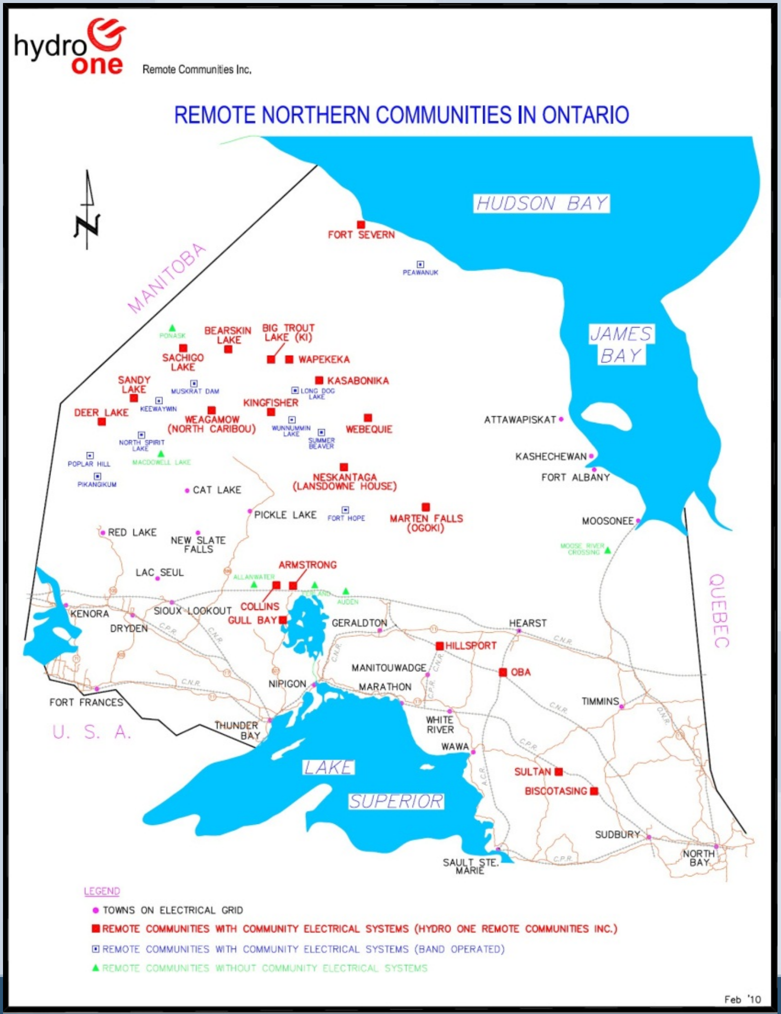
UNION GAS - ONLY SUPPLIER IN N. ONT.



REMOTE COMMUNITIES – NOT ON GRID

- 29 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



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GREENHOUSE GAS EMISSIONS

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

ESTIMATING THE NWO REGIONAL BIOMASS HEAT MARKET

- **30 FN Remote Communities (not connected to electrical grid)**
- **20 + FN and Municipalities on grid but no natural gas**
- **Assume each community = at least 5 MW total heat load**
- **Assume Priority Heat Load = 1.5 MW**
- **Individual Community Project Cost Estimate = $3 million**
  - **50 communities x $3 million per community**

= $150 million realistic near term capital market for NWO

+ Annual O+M ?

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FUEL SUPPLY MARKET

- 75 MW = 75,000 – 100,000 tonnes per year in fuel demand
- Assume $70/tonne chips

  $200/tonne pellets

  50/50 split
- Total = $2,625,000 – $3,500,000 in annual chip sales

  \+

  $7,500,000 – $10,000,000 in annual pellet sales

CARBON CAP AND TRADE

- 80% less emissions than NG (Pembina Institute)

- >80% reductions for switching from Gasoline, Diesel, Coal

- 50 + installations = significant cumulative reduction

PROJECT FINANCING

- Need to get past Capital vs Operating Budgets in MUSH sector
- Incentive Programs (grants / loans tailored to cost savings)
- 3rd Party Financing based on guaranteed Annual Cost Savings
- Carbon

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THE PATH FORWARD

1) ~~Establish a national fuel standard~~
2) Identify and establish (more) demonstration projects and benchmark performance (cost savings, energy metrics, carbon reduction, job creation)
3) Formally identify fuel substitution opportunities and incent conversion as part of provincial/national GHG reduction strategy
4) Establish National Network of Practitioners…