


100% Renewable Energy in the NWT

Starting the Conversation



Thanks to partners / supporters

Arctic Energy Alliance (AEA)
 Canadian Association of Physicians for the Environment (CAPE)
 Ecology North
 Public Service Alliance of Canada (PSAC) Social Justice Fund


Volunteer reviewers



Key Messages

- ▶ 100% renewable energy is the only option.
- ▶ The NWT needs bio-fuels to get there.
- ▶ The NWT transition started 10 years ago but needs to accelerate.

"You skate to where the puck is going to be, not to where the puck has been."

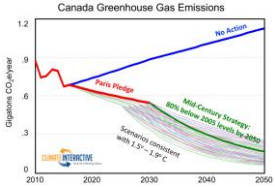


Why 100% Renewable Energy NWT?

- ▶ 197 world leaders signed the Paris agreement on Climate Change.
- ▶ Agreed to work towards limiting global warming to 1.5°C.





Why 100% Renewable Energy NWT?



To return warming to below 1.5°C by the end of the century, the world must be running on 100% renewable energy by mid-century.

World Bank & UN-IPCC



NWT Energy Mix – (2011/12)

Supply


- Imported Fossil Fuel 80%
- Natural Gas 12%
- Wood and Wood Pellets 4%
- Hydroelectricity 4%

Demand

- Industry (heat and power) 36%
- Transportation 34%
- Community Space Heating 21%
- Community Electricity Generation 9%


- ▶ 8% Renewable Energy
- ▶ 1/3 Communities
- ▶ 1/3 Industry
- ▶ 1/3 Transportation

Source: GNWT, 2013, NWT Energy Plan




Evaluation Criteria

- ❑ ***Commercial Availability**
 - ❑ Complete supply chain commercially available?
- ❑ **Technical Viability**
 - ❑ How many years/systems operational?
 - ❑ How many years in the North?
 - ❑ Energy source matches demand?
 - ❑ Easy to transport in the North?
 - ❑ Easy to store in remote locations?
 - ❑ Climate Change Resilient?
- ❑ **Costs**
 - ❑ Will costs be higher or lower than other renewable options
 - ❑ NOT comparing to fossil fuels
- ❑ **Employment in the NWT**
 - ❑ How many permanent new jobs will be created in the NWT – compared to other renewable options?
- ❑ **Human Health**
 - ❑ Will there be human health impacts or benefits compared to other renewable options?
- ❑ **Community Self Sufficiency**
 - ❑ Will more money stay in the NWT economy compared to other renewable options?
- ❑ **Other Environmental Impacts**
 - ❑ Will there be environmental impacts other than GHG reductions – compared to other renewable options.




Commercially Available & Local




WIND POWER




SOLAR POWER




WOOD PELLETS



HYDRO POWER



WOOD CHIPS



FIRE WOOD

- ▶ Heat pumps (air, water or ground-sourced)
- ▶ Biogas from local sources
- ▶ Geothermal Heat / Power



Commercially Available & Imported



BIO JET FUEL

Bio Jet Fuel is made from vegetable oil.



BIOGAS VEHICLES



WOOD PELLETS



BIOGAS EQUIPMENT

Biogas is natural gas made from renewable sources.

- ▶ Renewable electricity from transmission grids in Saskatchewan or Alberta
(assuming that these Provinces switch to 100% renewable electricity.)
- ▶ Bio-diesel
- ▶ Ethanol



Technically Viable in the North?

Matching Supply with Demand

- ▶ Electricity
- ▶ Air Transport
- ▶ In-town transport
- ▶ Highway Transport
- ▶ Barged transport of Goods
- ▶ Mine Ore Handling
- ▶ Space Heating
- ▶ Hot Water and Industrial Process Heating









Technically Viable in the North?

Current Supply Chain & Energy Storage





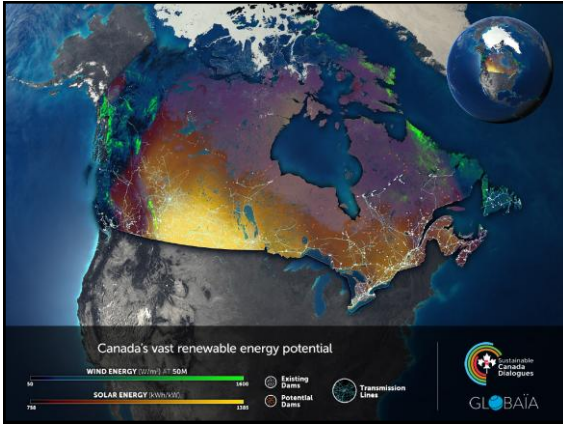
Technically Viable in the North?

“Down South” vs. “Up Here”

- ▶ **Energy demands:**
 - ▶ Peak electricity - Air Conditioning (in some Provinces)
 - ▶ Urban Transportation
 - ▶ Industry
 - ▶ Heating
- ▶ **Supply Strategy:**
 - ▶ Electrify (almost) everything.
 - ▶ Use grid to move Hydro, Wind and Solar electricity to where it is needed
 - ▶ Store energy in hydro dams.
 - ▶ Solar matches with Air Conditioning.





Solar, Wind & Hydro - Technically Viable in the North?

- Transmission lines are expensive due to long distances between relatively few customers.
- Hydro systems do not have much storage capacity.
- Highest demands are in the winter, when solar is at lowest.
- Windy only in a few places in the NWT.
- Long distance transport requires large, on-board energy source.
- Solar, wind & hydro could supply more renewable electricity, but cannot get to 100%.
- How to meet remote community, heating, aircraft, highway transport & industry energy demands?

WIND POWER

SOLAR POWER

HYDRO POWER

Alternatives North

Biofuels - Technically Viable in the North?

- Biodiesel, ethanol and bio-jet fuel need research on cold-temperature and long-term storage issues.
- Wood pellets are easy to store and handle.
- Wood chips are cheaper than pellets if you don't transport them too far.
- Biogas is chemically the same as natural gas.
- Natural gas already used in Inuvik.
- Long-term storage?

WOOD CHIPS

WOOD PELLETS

BIOGAS EQUIPMENT

BIO JET FUEL

BIOGAS VEHICLES

Alternatives North

100% Renewable Long Distance Transport

- Air**
 - Bio Jet Fuel
- Highway**
 - Electric Vehicles with charging stations
 - Compressed Bio-gas
- Barge**
 - Compressed Bio-gas

BIO JET FUEL

ELECTRIC VEHICLES

BIOGAS VEHICLES

BIOGAS VEHICLES

Alternatives North

100% Renewable Local Transport

- Electric Vehicles**
 - Where renewable electricity available – North & South Slave
- Biogas Vehicles**

ELECTRIC VEHICLES

BIOGAS VEHICLES

BIOGAS VEHICLES

ELECTRIC VEHICLES

Alternatives North

100% Renewable Heat

- Super-insulated homes & buildings.
- Firewood
- Wood pellets
- Local wood chips
- Combined heat and power
- Ground source heat pumps (South Slave)
- District heating?

WOOD CHIPS

WOOD PELLETS

FIRE WOOD


Super-insulated homes & buildings

District heating?

Alternatives North

100% Renewable Electricity


- ▶ **North Slave**
 - ▶ Expanded Snare & Bluefish Hydro
 - ▶ Expanded hydro storage
 - ▶ Wood chip fuelled combined heat and power as back-up.
- ▶ **South Slave**
 - ▶ Expanded Taltson Hydro
 - ▶ Wood chip fuelled combined heat and power as back-up.



HYDRO POWER


WOOD CHIPS

WOOD PELLETS



100% Renewable Electricity

- ▶ **“Thermal” Communities**
 - ▶ Wood chip / pellet combined heat and power
 - ▶ Supplement with hydro, wind and/or solar where available.




WOOD PELLETS

WOOD CHIPS

HYDRO POWER


WIND POWER

SOLAR POWER



100% Renewable Electricity

- ▶ **Mines**
 - ▶ New mines could help pay for hydro expansion.
 - ▶ Existing mines and mines too far from hydro – wood fired combined heat and power.
 - ▶ Supplement with small hydro, wind & solar where economical.




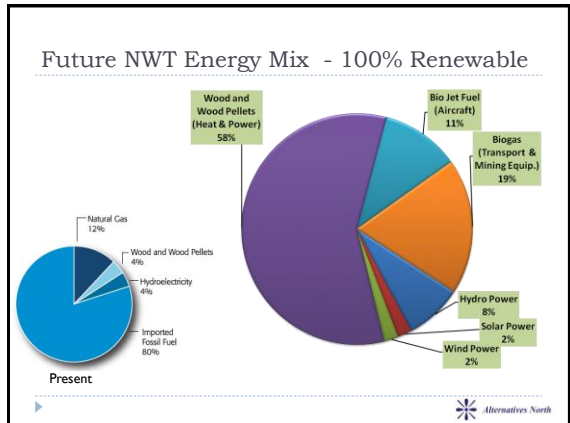
WOOD PELLETS

WOOD CHIPS

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Next Steps

GNWT Energy & Climate Change consultations
Monday, Dec 5th, 2016, 7pm, Explorer Hotel

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