

Distributed Generation in Small Remote Northern Communities



CNS 2012: Western Focus Seminar
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Distributed Generation Potential in Northern Canada



- The word cloud indicates the complexity of introducing a new technology to electricity generation in mines and communities of the North
- Engineering and socio-economics intertwined!

Distributed Generation Potential in Northern Canada

- More than eight hundred remote communities north of 55 Degrees Latitude in boreal and Arctic regions
- Rugged terrain with few roads and warming permafrost
- Many mine sites requiring tens of MW
- Small communities, usually less than 1000 in population, having little understanding of nuclear energy options and safety
- Northern utilities, government, and engineering firms generally receptive to small reactor possibilities

Distributed Generation and Micro-Grids

- A different mode of thinking : a few megawatts instead of a few gigawatts!!
- The cost of distribution to remote communities from a normal grid is much too high
- Provides resilience and independence to communities in times of power failure due to grid shut-down

Diesel-Electric Generation in Canada's Boreal Region

- Of the approximately eight hundred remote communities in the boreal region, most of them are on diesel.
- Most of these remote communities have predominantly Aboriginal populations.
- Not all boreal communities have road access.

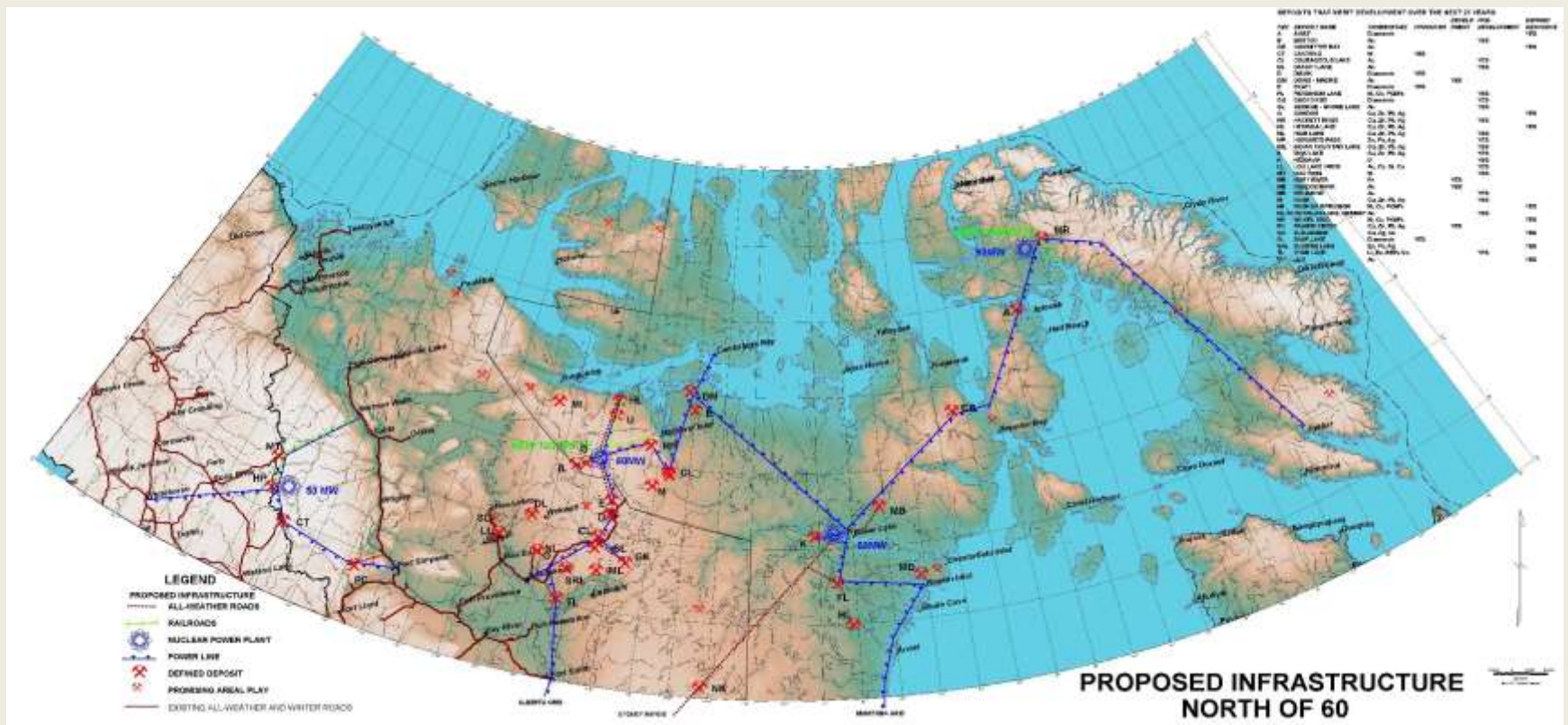
Diesel-Electric Generation in Canada's Boreal Region



- The boreal region covers all of the northern regions of the provinces and goes north of 60 down the Mackenzie to the Beaufort Sea

Proposed Mining Infrastructure North of 60

Reference Library Maps in www.miningnorth.com



Nunavut Ratifies Positive Uranium Mining Policy (June 7, 2012)

Nunavut Ratifies Positive Uranium Mining Policy

Iqaluit, NU – June 7, 2012

The Chamber of Mines is encouraged by the Government of Nunavut's ratification today of a positive uranium policy, the result of a series of public consultation sessions held last year in Iqaluit, Baker Lake, and Cambridge Bay.

As per the *Government of Nunavut Uranium Policy Statement*, “the Government of Nunavut regards mining as an important potential source of revenues to meet the needs of Nunavut's growing population and also as a potential source of employment and associated skills development for Nunavummiut”. Further, the Government of Nunavut will support the exploration and mining of uranium subject to a number of principles including the requirement that “Uranium exploration and mining must have the support of Nunavummiut, with particular emphasis on communities close to uranium development.

Proposed Transportation Innovation North of 60

<http://www.discoveryair.com/app/media/1255>



Diesel-Electric Generation in Nunavut

- Nunavut produces 100% of its electricity from diesel-electric generators
- 27 diesel generating stations in Nunavut, ranging in size from 1.0 to 12.6 MW
- Iqaluit the capital has two generating stations for a combined capacity of 14.1 MW

Diesel-Electric Generation in Northwest Territories (NWT)

- NWT produces a considerable amount of its electricity through hydropower (50MW in total) supplying Yellowknife, Dettah, Behchoko, Hay River, Hay River Reserve, Fort Resolution, Enterprise, and Fort Smith (also including a considerable amount of backup diesel electric capacity)
- Other thermal capacities for 19 communities (diesel and natural gas in Inuvik) range from 1.0 to 11.3 MW
- Inuvik natural gas and Norman Wells supply from ESSO face an uncertain future

Diesel-Electric Generation in Yukon

- Yukon produces a considerable amount of its electricity through hydropower (76.7 MW in total) serving Whitehorse, Aishihik, Mayo, and Fish Lake
- One 0.8 MW wind turbine facility at Whitehorse
- 15 communities are supplied with diesel plant capacities ranging from 0.2 to 25.0 MW

Public Acceptance of Small Reactors or Nuclear Batteries

- Extensive trust-building required through community presence
- Suggestion for the three territories: Work through Nunavut Research Institute, Arctic Energy Alliance (NWT), and Yukon Science Institute
- Build trust through major regional land claims corporations (e.g., Inuvialuit Regional Corporation)

Public Acceptance of Small Reactors or Nuclear Batteries

- Government leaders usually not opposed to nuclear energy
- Younger bureaucrats and engineers in favour, but want to see one working in a northern environment
- Public acceptance requires considerable consultation and trust-building at the idea discussion stage

Sustainable Living by Reducing Dependency

- The cost of living in the North is largely dependent upon dependence on outside goods and services throughout local societies and economies
- Given the high cost (often in excess of \$1.00/kWh) of diesel-electric generation in remote communities, diesel replacement by nuclear batteries would be welcomed by many
- Aboriginal leaders are becoming more and more determined to build independent communities

Sustainable Living by Reducing Dependency

- Malcolm (2010) in Pimatisiwin: “Speaking Plainly about Research, Governance and Policy for Sustainable Living”
http://www.pimatisiwin.com/online/?page_id=730
- Helin (2008) book: “Dances with Dependency”
- Helin (2011) book: “The Economic Dependency Trap”
- **Participation through eSustainablePlanet.com**
website: www.eSustainablePlanet.com

Regional Self-Government and the Cultural Context

- A different mode of thinking : communities are independent in their decision-making
- Communities and land claims organizations (e.g., Gwich'in , Inuvialuit, Tlicho in the NWT). not territorial governments, decide what is best for them
- Infrastructure ownership by the communities is often a requirement
- One nuclear option: an Energy Services Company that sells power to the community under suitable financing arrangements

Alternative Energy Sources and the Cultural Context

- Nuclear power generation will never win acceptance by bashing wind and solar power
- The environmental protection movement is now entrenched in western thought and belief
- Nuclear must be seen as acceptable in the scheme of responding to carbon footprint reduction alongside other alternative electricity generation schemes (tidal, wind, solar, biomass gasification)

Distributed Generation Potential in Northern Canada



Questions?