Building Canada

Yukon Green Energy Backgrounder

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Introduction

Under terms of the Building Canada Framework Agreement signed in September 2008, the Yukon Government will receive $183 million over seven years ($26 million per year) from the Government of Canada. The Building Canada funding will be allocated to infrastructure projects that drive economic growth and productivity, achieve environmental goals and build strong, competitive communities. Priority Yukon infrastructure portfolios include drinking water, wastewater, solid waste, road and green energy.

As part of the Agreement and in order to best achieve the objectives of the Building Canada funding, Yukon Government is preparing a Yukon Infrastructure Plan. The Plan will identify infrastructure gaps and priorities in the Yukon, including the priorities of Yukon communities (incorporated, First Nation and unincorporated), over a 10 to 15 year period.

With regard to the green energy infrastructure portfolio, eligible categories of investment under the Building Canada fund include:

1. reinforcement, expansion of existing and construction of new transmission grids to transmit clean electricity;
2. hydrogen infrastructure (generation, distribution and storage);
3. electric vehicle infrastructure (centralized refueling stations);
4. biofuels distribution/storage infrastructure;
5. thermal heat/cooling delivery system (i.e., district energy systems) using renewable or combined heat/power (CHP) plants;
6. clean coal facilities;
7. renewable electricity generation facilities for municipal consumption (e.g., wind energy, solar energy); and
8. municipal building energy retrofits.

A preliminary identification of Yukon green energy infrastructure gaps and priorities was undertaken through a focus group exercise with Yukon Government officials in early 2009. The officials, representing six Yukon Government branches and organizations were selected for inclusion in the focus group exercise on the basis of their expertise in the energy field. This report outlines the Building Canada-eligible green energy infrastructure projects identified by focus group participants that are aligned with the green-energy related strategies contained in the recently released *Energy Strategy for Yukon.*

Yukon's Current Green Energy Circumstances

Green energy is energy from sources that are non-polluting and produce little or no greenhouse gas emissions. The term green energy is synonymous with the term renewable energy. Green energy is generated from naturally occurring resources such as sunlight, wind, tides, biomass, and geothermal heat, all of which are naturally replenished and are, therefore, renewable.

Green energy can also include energy efficiency measures which reduce the consumption non-green energy while achieving the same level of benefits to energy users. For example, a building retrofit which reduces the amount of heating fuel needed

to keep the temperature inside the building at the same comfort level as before the retrofit would be considered a form of green energy.

As the Yukon's stock of green energy infrastructure has not been fully documented, focus group participants were asked to identify all of the green energy infrastructure items they could think of. The green energy infrastructure identified included:

Electricity

Hydro

- Whitehorse Dam (4 turbines)
- Mayo (Wareham) Dam (1 turbine + Mayo B in planning)
- Aishihik Dam (2 turbines + 1 turbine under construction)
- Fish Lake Hydro Facility
- private micro hydro installations

Wind

- Haeckel Hill Vestas & Bonus turbine
- several micro-scale monitoring/demonstration sites (e.g., Yukon College)

Solar

- Yukon College solar photovoltaic (PV) demonstration site
- Yukon Government Main Administration Building photovoltaic demonstration site
- Duncan Building solar wall
- Tourist Centres (Old Crow, Tombstone)
- Off-grid systems (farms, individuals)

Transmission and Distribution Lines

- Whitehorse-Aishihik-Faro grid
- Mayo-Dawson grid
- distribution lines in all Yukon communities

Biomass

- small-scale production of biodiesel from used cooking oil for motive and heating fuel
- institutional buildings with wood boilers
    - Elijah Smith School
    - Yukon College
    - Andrew A. Philipsen Law Centre
    - Kluane First Nation Administration Building
    - Little Salmon Carmacks First Nation Administration Building
    - Eliza Van Bibber School (Pelly Crossing)
- independent firewood suppliers (cordwood)
- Teslin wood pellet plant
- primary heat source in Yukon homes

Geothermal

- Mayo and Whitehorse groundwater heating
- Vanier School (Whitehorse)
- Haines Junction district system
- Whitehorse fish hatchery

Cogeneration

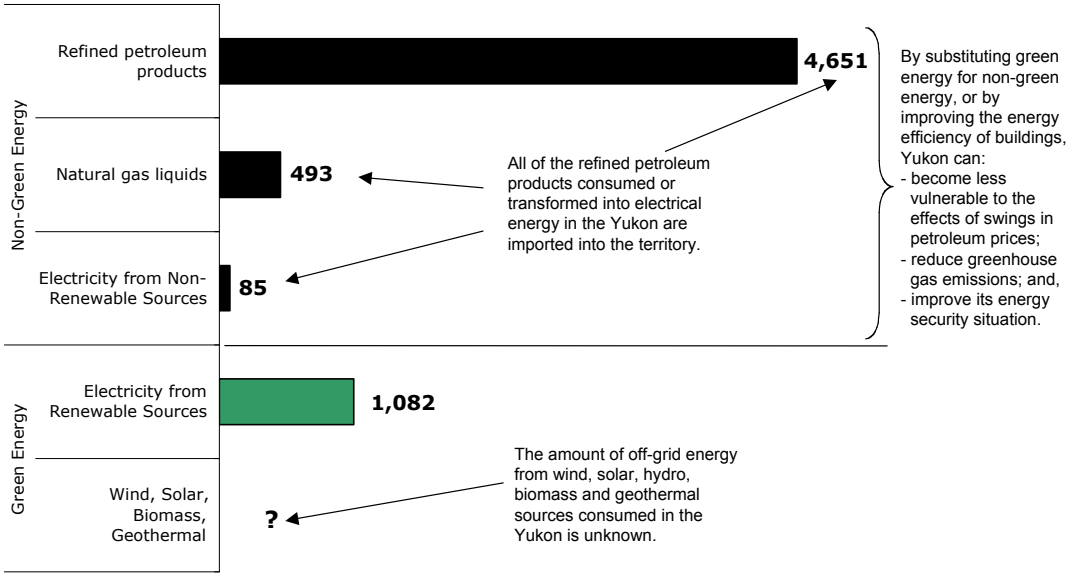
Watson Lake diesel-electric co-generation system

The chart below presents a summary of the current energy situation in the Yukon from a green energy perspective. Statistics Canada data (*Report on Energy Supply-Demand in Canada Cat. No. 57-003*) indicate that in 2007 a total of 6,311 terajoules of energy was consumed in the Yukon. Consumption of refined petroleum products (e.g., diesel, gasoline, heating fuel, etc.) accounted for 74% (4,651 terajoules) of the Statistics Canada total. Natural gas liquids (e.g., propane) accounted for 8% (493 terajoules) and electricity from diesel generators accounted for 1% (85 terajoules) of the Statistics Canada total. On the green energy side of the ledger, 1,082 terajoules of electrical energy was generated from hydroelectric sources. With the exception of hydroelectricity generated by Yukon Energy and the Yukon Electrical Company Limited, the total amount of energy from wind, solar, biomass, hydro, and geothermal sources consumed in the Yukon in 2007, or any other year, is unknown as no consumption data are collected.

By reducing consumption of refined petroleum products – either by substituting green energy for non-green energy or increasing the energy efficiency of buildings – Yukoners can:

- become less vulnerable to the effects of swings in the prices of petroleum products such as heating fuel;
- reduce greenhouse gas emissions; and,
- improve their energy security situation (since all of the refined petroleum products consumed in the Yukon are imported into the territory).

Total Yukon Consumption of Energy - 2007
(terajoules)



Data Source: Statistics Canada, *Report on Energy Supply-Demand in Canada Cat. No. 57-003*, 2009.

Criteria for Identifying Green Energy Priorities

Focus group participants identified a variety of factors that could be used to choose between the different green energy investment priorities.

Green energy investment choices should involve technologies that have been cold-climate proven, reduce or minimize greenhouse gas emissions and have the potential to generate significant new supply.

Investment choices should be consistent with existing policies and regulatory processes and be coordinated with other initiatives. For example, investment choices:

- should be aligned with the *Energy Strategy for Yukon;*
- should recognize that regulatory review (e.g., Yukon Environmental and Socio-economic Assessment Board, Yukon Utilities Board) is not required for green energy measures such as energy efficiency improvements and electricity conservation initiatives; and,
- such as underground electrical and geothermal distributions should be coordinated with other 'in-the ground' infrastructure initiatives.

To the extent possible, investment choices should deliver immediate and direct benefits to Yukon homeowners. Investment choices should:

- ensure that the people intended to participate in energy efficiency programs have financial means to actually participate; and,
- recognize that relatively small programs that target electrical usage in diesel communities outside of Whitehorse can have a large impact.

Investment choices should also recognize where viable industries already exist without government involvement (e.g., fuelwood supply) and consider that the viability of green energy options is constantly changing as other biophysical and market factors change.

Green Energy Aspects of the *Energy Strategy for Yukon*

Green Energy Principles

On January 23, 2009 the Yukon Government released its *Energy Strategy for Yukon*. Seven principles that are to be systematically considered in future energy decisions to ensure the vision is achieved are also outlined in the Strategy. Four of the principles contained in the Strategy have a direct link to future green energy infrastructure development. The four principles include:

Sustainability: developing an energy sector that is environmentally, economically and socially sustainable for present and future generations.

Energy security: ensuring a secure and reliable supply of energy at a reasonable cost and reducing dependence on non-renewable energy sources.

Self-sufficiency: promoting the environmentally, economically and socially responsible development and use of Yukon's energy resources.

Climate change coordination: coordinating climate change and energy policies and identifying opportunities to reduce greenhouse gas emissions.

Green Energy Strategies

The *Energy Strategy for Yukon* also outlines a variety of specific strategies designed to achieve its goals and priorities. Strategies with relevance to green energy infrastructure include:

GES 1. Encouraging the planning and development of energy efficient communities;
GES 2. Replacing fossil fuels with cleaner, renewable energy sources where possible;
GES 3. Demonstrating leadership in developing renewable energy infrastructure;
GES 4. Investing in research and development of renewable energy technology;
GES 5. Identifying strategic opportunities to develop new renewable energy sources;
GES 6. Developing a wood based bio-energy industry in Yukon by building a local market for wood energy technologies and wood fuel products;
GES 7. Encouraging cost effective, small-scale renewable energy production to foster innovation and diversify Yukon's supply of electricity resources;
GES 8. Enhancing the supply of electricity and managing demand to ensure access to a secure, reliable and cost competitive source of electricity;
GES 9. Maximizing the use and efficiency of existing hydroelectric infrastructure;
GES 10. Increasing and diversifying Yukon's supply of electricity from renewable sources to decrease diesel use and minimize greenhouse gas and air emissions; and,
GES 11. Considering renewable energy and cleaner sources such as natural gas for all new electricity generation projects.

Possible Projects to Bridge Yukon's Green Energy Infrastructure Gaps

The table below outlines possible projects to bridge the Yukon's green energy infrastructure gaps identified by focus group participants that are aligned with the principles and strategies of the *Energy Strategy for Yukon.*

Green Energy Strategy Number	Gap-bridging Projects Aligned with the *Energy Strategy for Yukon*
GES 1.	Neighborhood-scale district heating or combined heat and power system (e.g., Whistle Bend geothermal).
GES 1. GES 2. GES 10.	Pilot renewable energy project (biomass, wind, solar) in a community currently served by diesel-generated electricity (e.g., Watson Lake, Old Crow, Beaver Creek, Destruction Bay, Burwash Landing) to displace diesel.
GES 2.	Suite of green energy programs designed to improve energy efficiency and reduce consumption of non-renewable energy.(program tools to target infrastructure upgrades)
GES 2. GES 6.	Program for the conversion of oil/propane systems to biomass.
GES 3. GES 5. GES 8.	New hydroelectric generation facilities connected to transmission grid (several small projects, one or two large ones).
GES 4. GES 9.	Improved use of spilled hydro energy at the Whitehorse Dam: • modifying the secondary sales program to allow for incremental bringing on and taking off of secondary sales customers; (program tool) • storage of electrical energy (batteries, pump water uphill, flywheels, hydrogen, conversion to heat and storage in ground); • district electrical heating of public and institutional buildings in the heating season shoulder months of September, October, April and May; and, • development of capacity for dual-source (electricity plus another source) heat in homes to absorb surplus hydro.
GES 8.	Increased hydro storage upstream from Whitehorse Dam (Marsh Lake, Atlin Lake, other Southern Lakes).
GES 8.	Integration of the completed Yukon electricity transmission grid with the British Columbia or Alaska transmission grids.
GES 9. GES 10.	Electricity transmission grid integration to connect existing green energy sources and to allow expanded distribution of green electrical energy (e.g., connection of the Whitehorse-Aishihik-Faro-Pelly grid with the Mayo-Dawson line).
GES 9. GES 10.	Mayo B hydroelectric project.