



Renewable Energy and Energy Efficiency Update

January 2016 - June 2018

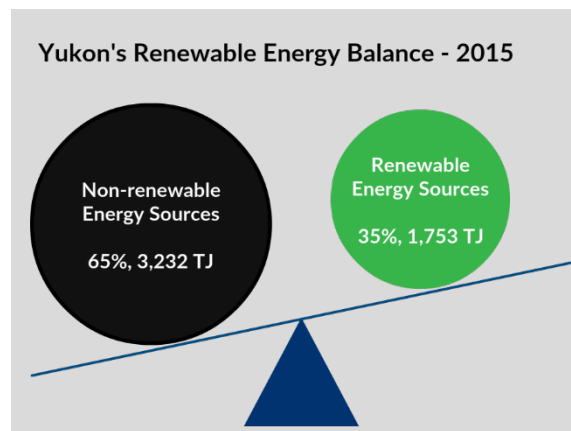


Renewable Energy and Energy Efficiency Update

This report describes how the Yukon government is increasing the availability of renewable energy solutions while reducing reliance on non-renewable sources and lessening energy consumption and greenhouse gas emissions. The report covers the period from January 2016 to June 2018 and follows sequentially from the last Energy Strategy Progress Report that covered up to December 2015.

Section 1 - Renewable Energy

The Yukon government supports locally sourced renewable energy development to meet our growing energy needs and move the territory towards a sustainable and self-reliant energy supply. The Yukon government is working with Yukon First Nation governments, communities, Yukon businesses and individual Yukoners to develop renewable energy projects. This helps diversify Yukon's energy supply and encourages Yukoners to become part of the energy supply solution. Approximately one third of Yukon's total energy supply comes from renewable energy sources. This includes energy used for heating, transportation and electricity, from biomass, wind, solar, hydro and geothermal sources. The following sections describe the Yukon government's activities for each of these renewable energy resources since 2015.



Source: Yukon Energy State of Play, Vector Research

Biomass

The Yukon government adopted the Biomass Energy Strategy in February 2016. The strategy facilitates the development of Yukon's biomass energy sector.

In 2017, the Yukon government, with funding from the Government of Canada, undertook partnerships with Yukon First Nations on five biomass projects. The intent was to stimulate economic development related to forestry within these communities. The Yukon government and First Nations governments completed five projects in March 2017, which included:

1. a biomass training program on harvesting and processing timber and installing biomass heating systems was delivered to Teslin Tlingit Council citizens and Teslin residents;
2. a business plan for developing a commercial-scale district heating system for the Champagne and Aishihik First Nations (CAFN) was completed. CAFN had previously determined that a micro-generation system combining heat and power was economically feasible. The business plan determined the project to be bankable;
3. standards and guidelines were developed for regulating how much deadwood must be retained in stands post-harvest to support sustainable forest management;
4. an assessment was completed on the viability of using wood waste as biomass fuel. The study identified activities generating wood waste along with the available volumes and locations. The project also determined whether the wood waste could be used as feedstock for First Nation biomass projects in Haines Junction and Teslin based on transportation and operational costs; and
5. the first year of a four-year research project on examining the potential of using willow as biomass fuel to heat commercial buildings in Old Crow was completed. The Yukon Research Centre and Vuntut Gwitchin Government are leading this project.

The Government of Canada provided a second round of funding for three biomass projects that the Yukon government and First Nations completed in March 2018:

1. a research project evaluated the opportunities and challenges of developing a biomass industry in Dawson City. This business development project involved the Tr'ondëk Hwëch'in in collaboration with the departments of Energy, Mines and Resources, Economic Development, and Highways and Public Works;
2. a similar research project evaluated the opportunities and challenges of developing a biomass industry in Pelly Crossing. This business development project involved the Selkirk First Nation in collaboration with the Departments of Energy, Mines and Resources, and Economic Development; and
3. a second year of the four-year research project examining willow as a biomass fuel in Old Crow was completed with the Vuntut Gwitchin Government.

The Yukon government and the Government of Canada provided funding to the Teslin Tlingit Council for the installation of a district biomass heating system to provide heat to ten of its commercial buildings in Teslin. The Teslin Tlingit Council hopes this project will create six full time jobs and seventeen part-time jobs and replace the use of diesel fuel with a local renewable resource.

In addition, the Yukon government is looking to use biomass heating systems in three community schools.

Wind

Since 2010, the Yukon government has offered a wind prospecting service to property owners to help determine their property's wind generating potential. The government is currently assessing the wind resource at the service's fifteenth and sixteenth site. The detailed results of the assessments are publically available and the summary of results is published on the government's website.

In addition to its ongoing wind research, the Yukon government has committed \$1 million to support the Kluane First Nation in developing and implement a wind-diesel integration project called the N'tsi Energy Project.



Wind monitoring at Kluane Lake. Photo: JP Pinard.

In 2016, the Yukon Energy Corporation completed a “Wind Site Inventory”. The inventory includes a longlist of 26 sites and a shortlist of five sites for which an in-depth review and conceptual design were completed. The results of the inventory are available on Yukon Energy's website.

Solar

Since 2015, the Yukon government has been working with First Nations governments, with the help of federal government funding, to install new solar electric systems in a number of Yukon First Nation communities:

- In 2016/17, the Yukon government worked with the Carcross/Tagish First Nation, First Nation of Na-Cho Nyäk Dun and Tr'ondëk Hwëch'in to install 81.9 kilowatts of solar energy on four commercial buildings across the territory;
- In 2017/18, the Yukon government worked with the Champagne and Aishihik First Nations and the White River First Nation to install an additional 40 kilowatts of solar energy on their administration buildings;
- In 2018/19, the Yukon government is committed to installing an additional 20 kilowatts on Selkirk First Nation-owned buildings; and
- Also in 2018/19, the Yukon government is working with Tr'ondëk Hwëch'in to install a new solar energy system for the Moosehide community near Dawson.



Solar array on Na-Cho Nyäk Dun First Nation's Government House in Mayo. Photo: Solvest.

The Yukon government is assessing the business case and feasibility of installing solar panels on select buildings located in diesel-dependent communities.

The Yukon government is also working with Vuntut Gwitchin Government (VGG) and ATCO Electric Yukon to ensure the successful installation and operation of VGG's community solar-diesel integration project in Old Crow under the Yukon's Independent Power Production Policy.



Hydro

The Yukon's electrical utilities supply about 95 per cent of Yukon's electricity with hydropower. However, the demand for electricity is growing so both the Yukon government and the Yukon Energy Corporation continue to explore new hydro possibilities. Currently the Yukon government is researching the feasibility of increasing our renewable power by connecting to British Columbia's hydro grid and the Yukon Energy Corporation is conducting pre-feasibility work to evaluate the potential for small hydro projects.

Geothermal

During 2015 and 2016, the Yukon government and the Canadian Geothermal Energy Association developed a series of maps and a report describing the geothermal potential for Yukon. Both the map series and the report are publically available on the government's website.

The Yukon Geological Survey is continuing to add to knowledge about Yukon's geothermal resource, by working to identify regions for geothermal resource exploration. This work includes drilling deep monitoring wells to measure ground temperature.

The Yukon Geological Survey drilled the first well in the Takhini Hot Springs area in November 2017 on Ta'an Kwäch'än Council land. Preliminary results reveal anomalously high temperatures at 500 meters depth. The Survey drilled an additional monitoring well in March 2018 in the Ross River area on Ross River Dena Council land. The Survey expects to have preliminary data from that well by the summer of 2018.

Section 2 - Policy and Planning

The Yukon government takes a collaborative approach to energy policy development and planning. This approach involves working with the public and government and non-government agencies: federal, First Nation, territorial, provincial and municipal. Coordinating this level of engagement takes time, but ensures that policies are effective

and programs and projects are founded on solid information and analysis. This section describes the policy and planning that the Yukon government has undertaken since 2015.

Independent Power Production Policy Implementation

The Independent Power Production policy supports the development of renewable energy generation in Yukon. Since the Yukon government adopted the policy in the fall 2015, it continues to work with ATCO Electric Yukon, Yukon Energy Corporation and Yukon Development Corporation to develop regulations, standards and purchase rates required for the independent production of electricity. The Yukon government anticipates having the policy ready for implementation by the end of 2018.

The Yukon government has been working with Independent Power Production proponents and has advised them to proceed with environmental and socio-economic assessments and regulatory approvals while it completes the implementation of the Independent Power Production Policy.

Proponents include First Nation communities and the private sector who have come forward with multiple projects. These projects include a wind project and a solar farm project both in Whitehorse, a solar farm project by Vuntut Gwitchin Government in Old Crow, and a wind turbine system by Kluane First Nation in Burwash Landing.

Community Energy Planning

Community energy plans enable Yukon communities to evaluate their energy consumption and costs and determine the best methods for reducing both. The plans focus on the economics of energy, infrastructure development and renewal, and improving energy literacy in Yukon's communities. Community energy planning includes developing community energy inventories and energy projection reports. Since

2015, the Yukon government has completed an energy plan in Burwash Landing and done extensive work on Old Crow's community energy plan. Community energy inventories have been completed for Haines Junction, Teslin, Carcross and Dawson City. Energy projection reports have been done for Old Crow, Haines Junction and Teslin.

Renewable Energy Planning

The Yukon government works closely with ATCO Electric Yukon, Yukon Energy Corporation and Yukon Development Corporation on electricity matters in Yukon.



Participant input at community energy planning meeting. Photo: Government of Yukon.

Following extensive public consultations, the Yukon Energy Corporation released its 20-year resource plan last year. The plan addresses Yukon's electricity requirements while considering technical, financial, environmental, social and economic factors to the year 2035.

Integrated Strategy on Climate Change, Energy and Economy

In close collaboration with First Nation and municipal governments, the Yukon government is developing a new strategy that will include ways we can collectively address climate change, energy and the economy. The new strategy will replace the 2009 Energy Strategy for Yukon and Climate Change Action Plan. Businesses, other stakeholders, and the Yukon public will be invited to provide ideas and feedback throughout 2018 with input provided being used to develop the strategy.

Two early products of the strategy are:

1. Yukon Energy State of Play – this report provides a current (2018) understanding of all aspects of Yukon's energy sector.

2. Climate Change State of Play – this report describes how climate change is affecting Yukon, what adaptation actions Yukoners have already taken, and the key challenges Yukoners will need to address to adapt in the future.

Both of these reports are available on the Yukon government's website.

Section 3 - Research, Training and Market Transformation

Research, training and market transformation initiatives are tools the Yukon government uses to promote energy efficiency and renewable energy, expand our knowledge of emerging energy technologies and reduce energy use and greenhouse gas emissions in the territory. This section describes our research, training and market transformation activities since 2015.

Research and Training

The Yukon government has actively coordinated research and training workshops on renewable energy resources. This has built local technical knowledge and capacity in renewable resource technology. Since 2015, the Yukon government hosted and/or funded workshops focused on solar electric system design and installation, First Nation renewable electricity installation capacity building and First Nation biomass installation and operation capacity building.

The Yukon government continues to actively field test new energy technologies and monitor their performance in cold winter temperatures. For example, the Energy Branch has recently completed working with researchers at the University of Victoria to explore the use of vacuum insulation panels for insulating Yukon buildings.



Solar photovoltaic design and installation course where students practiced installing systems.
Photo: Government of Yukon.

This study will help the construction community, researchers, designers and end-users around the world to better understand how vacuum insulation panels can support energy efficiency.

Another monitoring project is on the use of cold-climate air source heat pumps that Yukoners are increasingly installing in their buildings. These systems provide heat-using electricity more efficiently than an electrical heater or conventional oil furnace, and the Yukon government is monitoring how cold winter temperatures affects their performance.

In 2016, the Yukon government added an electric vehicle to its fleet, to gain a better understanding of how promising this technology is as a viable solution for northern commuters. This pilot project serves to test and track the vehicle battery's range and recharge times at various winter temperatures.

Through its partnership with Yukon College's Cold Climate Innovation, the Yukon government continues to support leading-edge pilot projects that explore the viability of new technologies in a northern climate context. These include:

1. The voltar.
2. The electric vehicle conversion project.
3. The biomass projects in Old Crow.

Community Green Energy Initiatives

The Government of Canada has prioritized improving the use of renewable energy across Canada and is funding energy infrastructure improvements in remote areas through its Pan-Canadian Framework on Clean Growth and Climate Change.

Through its Community Green Energy Initiative, the Yukon government provides direct support to Yukon First Nations communities and municipalities to ensure they tap into and benefit from these federal funding opportunities.

This results in community-driven projects tailored to their needs and delivered at a pace necessary to ensure effective participation from community members. It means funding is secured, training is provided and renewable energy projects are successfully implemented.

From 2016 to 2018, the Community Green Energy Initiative helped support the following projects, listed by community:

Mayo:

- Commercial energy audit of the Government House of First Nation of Na-Cho Nyäk Dun (March 2017);
- Installation of a 27.3 kW solar photovoltaic (PV) array on the Government House of First Nation of Na-Cho Nyäk Dun (March 2017).
- Installation of a 9kW solar PV array on Restaurant Building of Nation of Na-Cho Nyäk Dun (March 2017).

Dawson:

- Commercial energy audit of the Main Administration Building of Tr'ondëk Hwëch'in (March 2017).
- Installation of four 6.4kW solar PV arrays on residences in Trondëk Subdivision of the Tr'ondëk Hwëch'in (March 2017).
- Installation of a 16.3kW solar PV array on the Dänojà Zho Cultural Centre of Tr'ondëk Hwëch'in (March 2018).
- Corporate energy audit for the City of Dawson (April 2018).
- Biomass business development strategy in collaboration with Tr'ondëk Hwëch'in (March 2018).
- Business case for phase 2 of the Dawson District Heating System in collaboration with Tr'ondëk Hwëch'in (March 2018).

Carcross:

- Commercial energy audit of the Learning Centre of Carcross/Tagish First Nation (March 2017).
- Installation of a 20.0kW solar PV array on the Learning Centre of Carcross/Tagish First Nation (March 2017).
- Corporate energy audit for Carcross/Tagish First Nation (March 2018).



Carcross/Tagish First Nation Learning Centre. Photo: Government of Yukon.

Teslin:

- Detailed engineering for the District Energy Node supplying renewable heat to the Main Administration Building of Teslin Tlingit Council (March 2017).
- Commercial energy audit of the Main Administration Building of Teslin Tlingit Council (March 2017).
- Community energy audit for Teslin Tlingit Council/Village of Teslin (March 2018).
- Construction of District Energy Node to the Main Administration Building of Teslin Tlingit Council (February 2018).
- Biomass training program for Yukon College Community Campus in collaboration with Teslin Tlingit Council (March 2017).

Haines Junction:

- Commercial energy audit of the Main Administration Building of Champagne and Aishihik First Nations (March 2018).
- Installation of a 28.8 kW solar PV array on the Main Administration Building of Champagne and Aishihik First Nations (March 2018).
- Da Ku Biomass CHP feasibility assessment in collaboration with Champagne and Aishihik First Nations (March 2017).



- Business case for Haines Junction District Heating System in collaboration with Champagne and Aishihik First Nation (March 2017).
- Haines Junction community energy inventory (March 2017).
- Haines Junction long-range energy consumption forecast report (October 2017).

Beaver Creek:

- Commercial energy audit of the Main Administration Building of White River First Nation (March 2018).
- Installation of a 48.3 kW solar PV array on the Main Administration Building of White River First Nation (March 2018).

Old Crow:

- Phase 1 Northern Biomass Feedstock Assessment in collaboration with Vuntut Gwitchin Government (March 2017).
- Phase 2 Northern Biomass Feedstock Assessment in collaboration with Vuntut Gwitchin Government (March 2018).
- Old Crow community energy inventory (March 2014).
- Old Crow long-range energy consumption forecast report (October 2016).

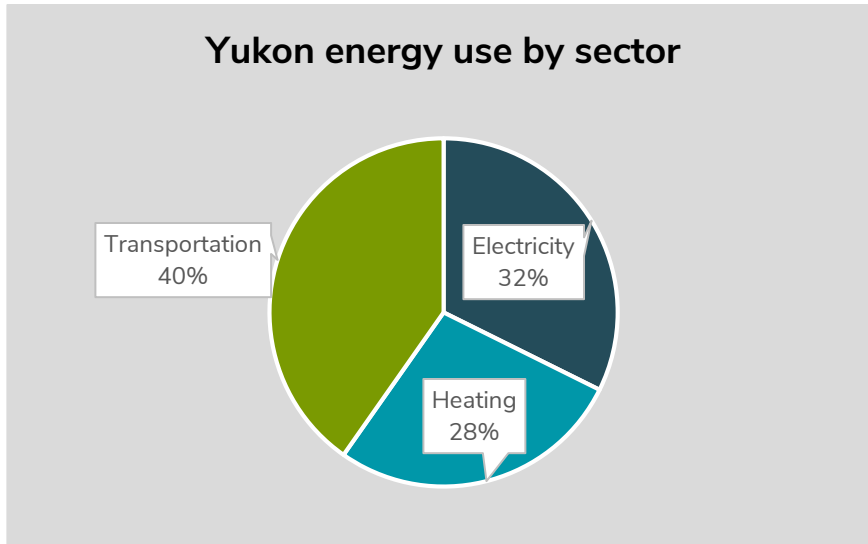
Pelly Crossing:

- Biomass business development strategy in collaboration with Selkirk First Nation (March 2018).

Burwash Landing:

- Residential CHP pre-feasibility assessment in collaboration with Kluane First Nation (March 2017).
- Kluane energy plan (October 2016).
- Net-zero residential pre-design (March 2018).





Source: Yukon Energy State of Play, Vector Research (2018).

The Community Green Energy Initiative continues to support Yukon projects, with approximately 20 projects, ranging from energy planning to commercial building retrofits, in progress in the 2018-2019 fiscal year in eight communities.

Commercial Energy Incentive Program

The Yukon government's Commercial Energy Incentive program offers incentives for improving energy use in multi-family dwellings and commercial buildings through building retrofits or lighting system upgrades.



Between May 2015 and June 2018, participation in the program has been high, with 61 LED lighting systems retrofits completed to date. Rebates totaling \$112,000 have been paid to participants. Collectively, these commercial buildings have saved five gigawatt-hours of energy (equivalent to 1.1 per cent of Yukon's total



Renovation upgrades, adding exterior insulation to an institutional building.
Photo: Government of Yukon.

electrical generation in 2016 and enough energy to power approximately 417 non-electrically-heated homes for one year). Participants saved \$789,000 in energy costs and prevented 448 tonnes of carbon dioxide from being emitted.

Residential Energy Incentive Program

The Yukon government's Residential Energy Incentive program offers incentives to homeowners to improve air tightness and insulation levels in their existing residences by providing rebates for insulation, ENERGY STAR® windows/ doors and heat recovery ventilation. The program also offers an incentive for building super-insulated new homes and for private residences to install renewable energy systems for generating electricity.

The impact of the super-insulated homes rebate has been significant. Since the program's launch in January 2015, approximately three quarters of all the new homes constructed in Whitehorse were built to a super-insulated standard. From January 2015 to June 2018, Yukoners built 358 super-insulated new homes that qualified for the program's \$10,000 incentive.



Participants in the super-insulated home incentive have saved 4.2 gigawatt-hours of electricity (equivalent to 0.9 per cent of Yukon's total electrical generation in 2016 and enough energy to power approximately 350 non-electrically-heated homes for one year). Participants saved \$657,000 in energy costs and prevented 281 tonnes of carbon dioxide from being emitted. Participation in this program continues to be strong.

Uptake of the residential energy incentive for existing homes has been strong. From January 2015 to June 2018, 1,274 retrofit rebates have been issued to Yukoners for a total of \$843,000 in rebates paid out. Participants in the retrofit incentive have saved 1.74 gigawatt-hours of energy (equivalent to 0.4 per cent of Yukon's total electrical generation in 2016 and enough energy to power approximately 145 non-electrically-heated homes for one year). Participants have also saved \$215,000 in energy costs and prevented 468 tonnes of carbon dioxide from being emitted.

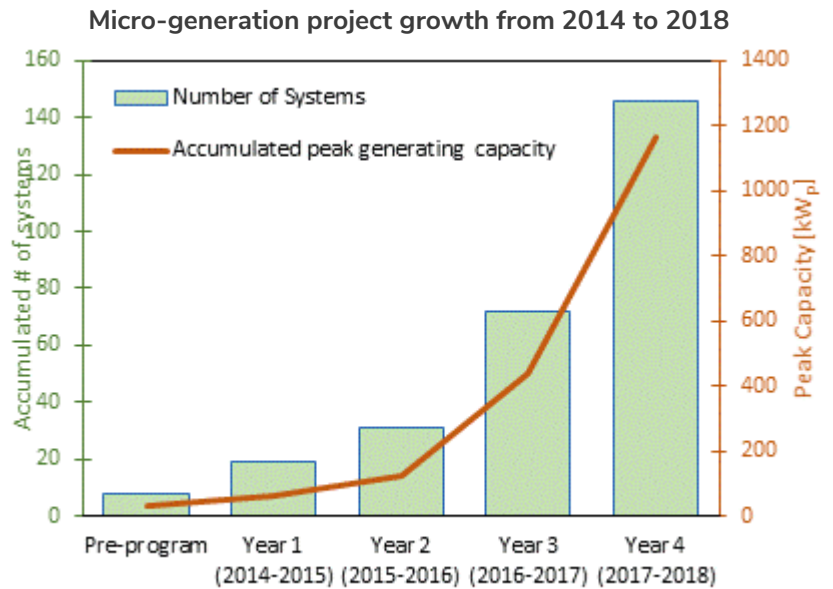
Good Energy Incentive Program

Launched in 2007, the Good Energy incentive program plays a significant role in promoting the purchase of energy efficient ENERGY STAR® appliances and in reducing Yukon residential electrical loads. Since 2007, 16,734 Good Energy incentive rebates have been issued, with a total value of close to \$2.8 million. Participants in the Good Energy incentive have saved 13.7 gigawatt-hours of energy (equivalent to 3.1 per cent of Yukon's total electrical generation in 2016 and enough energy to power approximately 1,143 non-electrically-heated homes for one year). Participants have also saved over \$7.3 million in energy costs and prevented 37 kilotonnes of carbon dioxide from being emitted.

Since 2015 more than 1,043 old, inefficient refrigerators have been retired through the Refrigerator Retirement program. Participants have saved approximately 1.1 gigawatt-hours of electricity (enough to power nine non-electrically-heated Yukon homes for one year). Participants have also saved \$169,000 in energy costs and prevented emission of 64 tonnes of carbon dioxide.

Micro-generation

The Micro-generation Program provides the opportunity for individuals and small businesses, as existing utility customers, to generate their own electricity from renewable energy sources and sell their unused electricity to the grid. Since 2015, micro-generation has grown rapidly in Yukon with the total capacity provided by micro-generators increasing by an order of magnitude from 113 kW to 1,310 kW as of May 2018. All of the micro-generation projects to May 2018 have been solar projects, many of which this report highlights in the solar section.



Innovative Renewable Energy Initiative

The Innovative Renewable Energy Initiative is a \$1.5 million fund to support and encourage community participation in commercial-scale electrical or heat generation from renewable sources. The funding is available right now for projects proposed by community-based governments, public-membership community organizations, or private-sector organizations. The funding will support projects using wind turbines, photovoltaic solar panels, gasification or run-of-river hydro.

Applications have already been received for a number of projects:

- Teslin Tlingit Council – district biomass system
- Carcross/Tagish First Nation – wind generation (up to 20 megawatts)
- Kwanlin Dün First Nation – wind generation (up to 3.6 megawatts)
- Kluane First Nation – wind generation (up to 285 kilowatts)
- ORO Enterprises – run-of-river hydro (up to 2 megawatts)
- Vuntut Gwitchin Government – solar generation (up to 400 kilowatts)