



2030 ENERGY STRATEGY

*A Path to More Affordable, Secure and Sustainable Energy
in the Northwest Territories*

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April 2018

EXECUTIVE SUMMARY

The Northwest Territories (NWT) is large, sparsely populated, and remote from much of the population of Canada. Long, cold, dark winters increase the amount of energy needed to stay safe and comfortable. Energy is required to heat and light our homes and businesses, to transport people and goods, and to power our industries. Our energy supply is highly dependent on imported fossil fuels—such as diesel and gasoline—at the same time that Canada and most nations have committed to reduce the use of fossil fuels.

This Northwest Territories 2030 Energy Strategy (Strategy) sets out the Government of the Northwest Territories' (GNWT) long-term approach to supporting secure, affordable and sustainable energy supply and use in the NWT. The goal of this Strategy is to guide the development of affordable, and sustainable energy for transportation, heat, and electricity, support energy efficiency and conservation, and promote renewable and alternative energy solutions for the NWT.

This Strategy was developed through extensive public engagement that included regional workshops with residents, communities, businesses, Indigenous governments and other stakeholders across the NWT. What we heard is that we need to address climate change, address energy affordability, and develop the NWT's energy potential.

For this Strategy to be successful, the GNWT and its partners—including utilities, governments, communities, residents, business, industry and non-government organizations—must work together, be flexible, and seek funding and investment opportunities.

By 2030, the NWT will have a secure, affordable and sustainable energy system that is less dependent on fossil fuels, and contributes to the economic, social and environmental wellbeing of the Territory and its residents. The GNWT will achieve this vision by following guiding principles in decision-making that include shared responsibility, Indigenous and community engagement, leading by example, as well as transparency and accountability.

This Strategy has six **Strategic Objectives** to reach the overarching 2030 vision:

1. Work together to find solutions: community engagement, participation and empowerment.
2. Reduce GHG from electricity generation in diesel-powered communities by an average of 25%.
3. Reduce GHG emissions from transportation by 10% per capita.
4. Increase the share of renewable energy used for space heating to 40%.
5. Increase residential, commercial, and government building energy efficiency by 15%.
6. A longer-term vision: developing the NWT's energy potential, address industry emissions, and do our part to meet national climate change objectives.

This Strategy takes an adaptive approach to these **Strategic Objectives**, which will be re-evaluated after five years to ensure they represent what is achievable given new technology. The **Strategic Objectives** will be achieved through **Actions and Initiatives** to be undertaken by the GNWT and its partners.

The GNWT will prepare and release public annual reports on its activities and progress relating to this Strategy.

Northwest Territories 2030 Energy Strategy sets out the Government of the Northwest Territories' long-term approach to addressing affordability, security and sustainability of energy supply and use in the NWT.

MESSAGE FROM THE PREMIER



In 2016-17, the Government of the Northwest Territories engaged with the public in six regional centres across the Northwest Territories to discuss energy and climate change issues. We met to gather opinions and ideas that would contribute to

the development of a new Energy Strategy, and the development of a Climate Change Strategic Framework for the Northwest Territories.

We heard that the people of the Northwest Territories support the transition to a lower carbon economy. To achieve a lower carbon economy, we must use less fossil fuel. People understood that our dependence on imported fossil fuels contributes to climate change, causes pollution, and leaves us at the mercy of fluctuating world market prices.

People also understood—only too well—the challenges of life in the North, especially the challenge of our high cost of living. And while most people want to see more renewables and alternatives, they also associate these choices with an increased cost.

We heard—loud and clear—that we must set realistic and achievable emissions targets. We heard that future carbon tax revenues should be redistributed to those impacted. We heard that energy efficiency programs and financial incentives should be expanded and be more flexible.

This 2030 Energy Strategy reflects the Priorities of the 18th Legislative Assembly. The Government of the Northwest Territories supports the use of energy-efficient technologies, increasing the production and transmission of renewable and alternative energy, and implementing a strategy to mitigate and adapt to climate change in collaboration with other governments and organizations. To do this we are building stronger relationships with community governments and other stakeholders.

While we strengthen our relationships within the Northwest Territories, we fulfill our commitments to Canada and to the world. We work with our federal and Indigenous partners within the *Pan-Canadian Framework on Clean Growth and Climate Change* to find alternatives to diesel use in remote communities, improve energy efficiency, promote biomass, and to develop our Taltson hydropower resources to reduce emissions from industry. These initiatives contribute to Canada's commitments as signatory to the Paris Agreement to reduce greenhouse gas emissions.

“We heard that the people of the Northwest Territories support the transition to a lower carbon economy. To achieve a lower carbon economy, we must use less fossil fuel.”

These actions align with the goals set out in the *Canadian Energy Strategy*, including energy sustainability and conservation, technology and innovation and energy delivery.

We are challenged to change. Change can be unfamiliar and difficult. But well-managed change is the pathway to opportunity and growth. By following a strategic path and joining together to address our energy challenges, we can transition to a lower carbon economy, and build a secure, affordable and sustainable energy system to serve the people of the Northwest Territories now and for generations to come.

The Honourable Bob McLeod

Premier of the Northwest Territories



MESSAGE FROM THE MINISTER



The Northwest Territories relies on a dynamic energy mix to meet the needs of residents, business communities, and the demands of industry.

Historically, we have overcome many of the challenges that our vast geography, rugged terrain and climate presents.

Today, we face the challenge of climate change. To reduce the impact of climate change on our land and people, our pathway to the future must include a transition to a lower carbon economy.

As the world commits to lower greenhouse gas emissions and to increase the use of renewable energy, I reflect upon our accomplishments. I consider how we will use what we've learned to inspire and to sustain one another, and to build upon our successes to create our energy future.

Out of all of Canada's provinces and territories, the Northwest Territories is a leader in terms of per person installed solar electricity. A project in Colville Lake is Canada's first of its type – high-penetration solar technology integrated with a new diesel electricity plant and battery storage. Reducing the community's greenhouse gas emissions from electricity by 25 percent, projects like this contribute to our 850 kilowatts of installed solar power as of 2017.

In the installation of commercial-sized wood pellet boilers, we are Canada's leader. More than 20 percent of the space heating of government buildings is currently met with biomass. Government leadership has spurred a local industry for wood pellet and pellet boiler supply, with many residents and commercial businesses switching to wood pellet heat.

We are investing in two to four megawatts of wind power for the community of Inuvik, which will save 1.3 million litres of diesel fuel each year and reduce fuel use in our largest diesel community by 20 percent. A small liquefied natural gas (LNG) storage facility serves the power plant in Inuvik, where LNG successfully displaces 40 percent of the diesel consumed for power generation, lowering greenhouse gas emissions and air pollution.

Each year, we make available millions of dollars through the Arctic Energy Alliance — an organization that delivers programs that make it easier for residents, businesses and communities to invest in energy efficiency and renewable energy solutions. Programs that replace inefficient lighting with LED lights, that supply community woodstoves, and that provide affordable energy audits for buildings, effectively reduces energy consumption and costs in our communities.

We incorporate new technologies to support our transition to a lower carbon economy. This year in the community of Aklavik, to accompany a 52-kilowatt solar project the NWT Power Corporation has started using the Northwest Territories' first variable speed

“Today, we face the challenge of climate change. To reduce the impact of climate change on our land and people, our pathway to the future, to the year 2030 and beyond, must include our transition to a lower carbon economy.”

generator. This technology should allow higher amounts of renewable energy to be supplied to the local electrical grid, and could significantly reduce power plant greenhouse gas emissions.

As we continue working towards better ways to generate, distribute and conserve electrical power, we will turn our attention to the energy that we use for space heating and transportation, while practicing conservation and adopting efficient energy technologies to meet our goals.

I look forward to working with our communities and our industry and government partners to move toward a future of secure, affordable and sustainable energy for the Northwest Territories.

The Honourable Wally Schumann
Minister of Industry, Tourism and Investment

WHAT IS THIS STRATEGY ABOUT?

The goals of the 2030 Energy Strategy (Strategy) are:

- To guide the long-term development of secure, affordable and sustainable energy for transportation, heat and electricity;
- To support energy efficiency and conservation; and
- To promote renewable and alternative energy solutions for the NWT.

For this Strategy, energy security relates to having a supply of resilient, reliable and locally-produced energy. Reliability and resiliency are critical, as even short interruptions in energy supply can quickly become a public emergency in our cold climate. Part of the high cost of energy in the NWT is due to the requirement to have a secure and reliable energy supply. Energy affordability speaks to either stabilizing energy costs or even reducing it. This can be done through either reducing the unit costs of energy or by using less energy. Energy affordability is relative; for example, energy costs for lower income families can be a bigger factor in the cost of living than for other households in the NWT. Energy affordability is also relative to southern Canada where less energy is needed for heat for example, and it costs less to supply and transport that energy.

Energy sustainability is not only related to reducing environmental impacts—including the urgent need to address climate change—but also local job creation, economic development, and local self-sufficiency. We need to balance all three priorities of security, affordability, and sustainability in implementing this Strategy, as sometimes they are at odds with each other.

This Strategy was developed through extensive public engagement that included regional workshops with residents, communities, businesses, Indigenous governments and other stakeholders across the NWT along with extensive written submissions and a survey. For this Strategy to be successful, the GNWT and its partners—including utilities, governments, communities, residents, business, industry and non-government organizations—must work together, be flexible, and seek funding and investment opportunities.

By supporting energy efficiency and conservation, we can reduce the amount of energy used, which results in lower energy bills and reduces environmental impacts.



GNWT ROLES IN IMPLEMENTATION

The **NWT Power Corporation** is a GNWT Crown Corporation that produces most of the electricity in the NWT. It owns and operates the hydroelectric facilities in the NWT as well as most of the diesel electricity facilities. The NWT Power Corporation will lead the development of alternative and renewable electricity solutions to reduce GHGs from diesel electricity generation through its capital plan, in partnership with the GNWT and other stakeholders, such as communities and other utilities.

The **Arctic Energy Alliance (AEA)** provides energy efficiency, conservation, alternative and renewable energy programs and services to residents, businesses, and communities on behalf of the GNWT. The AEA is one of the primary implementation partners and will help the GNWT reach the objectives of increasing renewables for heating, reducing transportation emissions, and increasing energy efficiency.

The **GNWT**, including the **NWT Housing Corporation**, will focus on leading by example by reducing energy use and emissions in its operations, including for transportation. The GNWT will develop and administer application-based funding programs to support communities, commercial enterprises and industry to reduce energy and GHG emissions.

The GNWT will also partner with **communities** and other stakeholders to ensure that the objectives of this Strategy are met.



WHAT IS THIS STRATEGY ABOUT?

THE OPPORTUNITIES AND CHALLENGES

The NWT is large, sparsely populated and remote. Long, cold, dark winters increase the amount of energy needed to stay safe and comfortable. Energy is required to heat and light our homes and businesses, to transport people and goods, and to power our industries. Our energy supply is highly dependent on imported fossil fuels—such as diesel and gasoline—at the same time that Canada and most nations have committed to reduce the use of fossil fuels. In this context providing secure, affordable and sustainable energy in the NWT is a challenge.

The national and international obligation to address climate change has created an opportunity. The technology needed to transition to a lower carbon economy—such as renewables and energy storage—

is becoming less expensive, more reliable, and more suitable for use in the NWT. This changing landscape offers an opportunity to build a more secure, affordable and sustainable NWT energy system.

For communities, supporting energy efficiency and conservation can reduce the amount of energy used, which results in lower energy bills and reduces environmental impacts. By supporting community-scale alternative and renewable energy solutions, we can protect against increasing energy costs over time, make the energy system less reliant on imported fossil fuels, and reduce environmental impacts. These actions will lead to a more secure, affordable and sustainable energy system, and help us meet our climate change commitments.

Pursuing larger-scale energy and transportation corridors that connect our communities and industry to clean energy promotes economic development, job creation and Indigenous partnerships, and we do our part to fulfill our GHG emissions reduction commitments under the *Pan-Canadian Framework*. Most of the GHG emissions in the NWT are related to industry, and to meet our commitment we need a transformative project to provide renewable energy to industry.

Transformative projects like the Taltson hydroelectric expansion are a first step in a longer-term vision to connect the North and South Slave electricity grids with the North American electricity system, and—combined with the development of transportation corridors—to connect mines in the Slave Geological Province to renewable and sustainable energy to support industry.

THIS STRATEGY

This Strategy provides an overview of current **GHG emissions in the NWT** by major sector and the reduction target we must meet. It includes a summary of **What We Heard** in the regional public engagements. It then provides a **Vision** for the energy system in the NWT by 2030, with associated guiding **Principles, Strategic Objectives**, including targets, and multi-year **Actions and Initiatives** to achieve the **Strategic Objectives**.

Under the 2015 Paris Agreement, Canada committed to reducing its emissions by 30% below 2005 levels by 2030. The GNWT, in its 2030 NWT Climate Change Strategic Framework, commits the NWT to reduce its emissions proportionally. The NWT's emissions have increased since 2005. In 2016, emissions increased by 3% to 1,611 kilotonnes from 1,563 kilotonnes in 2005. To reach the Paris target, the NWT must decrease its emission by 517 kilotonnes below 2016 levels to 1,094 kilotonnes by 2030.*

* The 2005 base year estimates and the 2016 GHG estimates are sourced from Environment and Climate Change Canada.



Key Linkages

2030 NWT CLIMATE CHANGE STRATEGIC FRAMEWORK (CCSF)

The CCSF set the GNWT’s overall approach to address climate change. It includes the long-term approach to both GHG reductions and adapting to the impacts of climate change. The 2030 Energy Strategy is the primary mechanism for GHG reduction from energy in the NWT.

PAN-CANADIAN FRAMEWORK ON CLEAN GROWTH AND CLIMATE CHANGE (PCF)

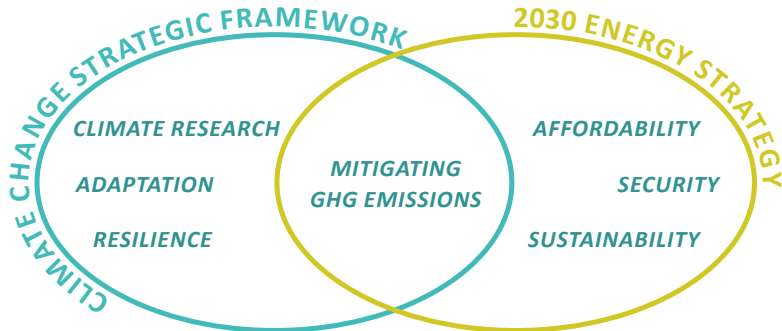
The GNWT is a signatory to the PCF, which is the national plan to address climate change and grow the economy. The NWT has committed to do its part in reaching national GHG reduction targets that Canada committed to under the 2016 Paris Agreement. This Energy Strategy will help us meet our national commitments.

CANADIAN ENERGY STRATEGY (CES)

The CES was endorsed by provincial and territorial Premiers in 2015 and provides a common vision to enable a flexible and cooperative approach to sustainable energy development across Canada. The 2030 Energy Strategy supports the commitments the NWT made under the CES.

NWT PETROLEUM RESOURCES STRATEGY

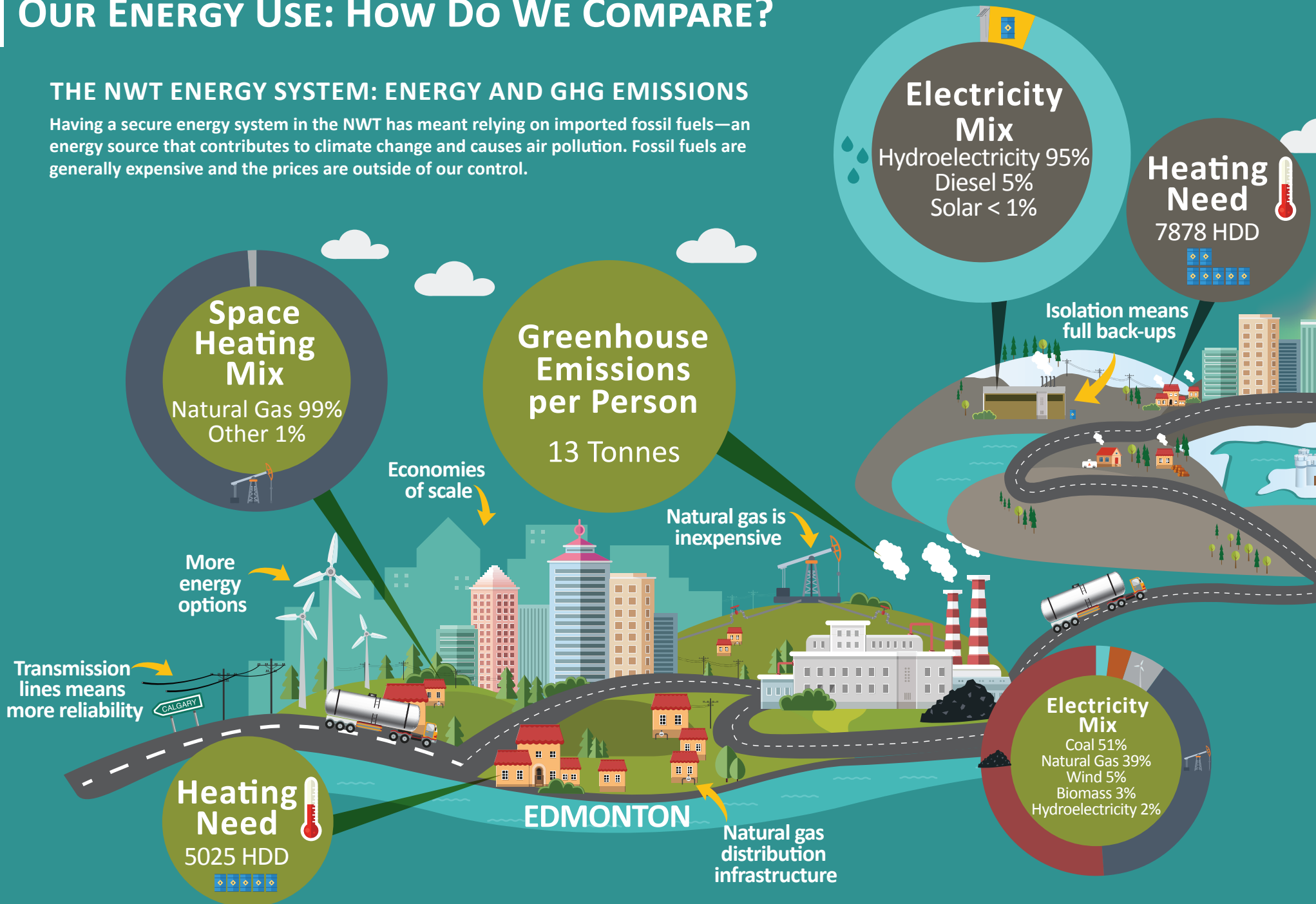
The NWT Petroleum Resources strategy sets the GNWT’s path towards responsible oil and gas development in the NWT. One of the goals of the strategy is to develop local natural gas resources for local use to increase energy security, reduce GHG emissions from imported diesel, and ensure benefits to NWT residents.



OUR ENERGY USE: HOW DO WE COMPARE?

THE NWT ENERGY SYSTEM: ENERGY AND GHG EMISSIONS

Having a secure energy system in the NWT has meant relying on imported fossil fuels—an energy source that contributes to climate change and causes air pollution. Fossil fuels are generally expensive and the prices are outside of our control.



Greenhouse Emissions per Person
10 Tonnes

Heating Need
9137 HDD

Space Heating Mix
Heating Oil
Biomass

Remoteness means higher costs

FORT GOOD HOPE

Greenhouse Emissions per Person
18 Tonnes

Electricity Mix
Heating Oil 99%
Solar < 1%

YELLOWKNIFE

Space Heating Mix
Heating Oil 67%
Biomass 21%
Propane 12%

A terajoule is a unit of energy equivalent to about 27,000 litres of oil. Approximately the amount of energy needed to heat a house for five years or drive a small truck around the globe six times.

Heating Degree Days (HDD)

A measure of how 'cold' a region is. An average house would use about half a litre of oil per HDD.

Electricity Mix

Sources of energy used to power buildings.

Space Heating Mix

Sources of energy used to heat buildings.

WHAT IS THIS STRATEGY ABOUT?

Energy and GHG Emissions in the NWT

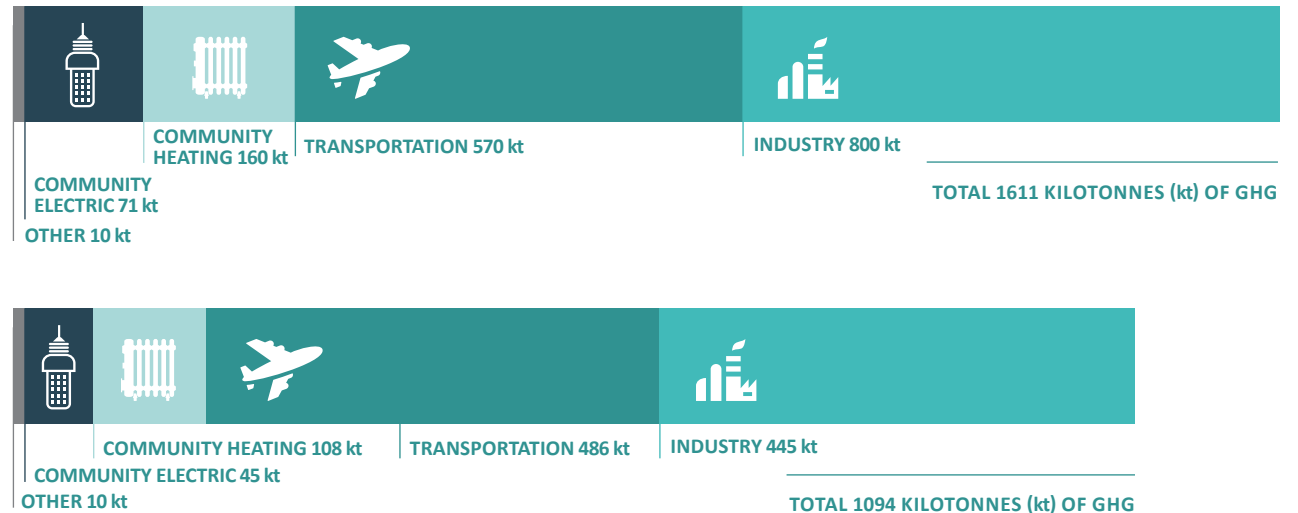
Most GHG emissions in the NWT are from fossil fuel use for heating, transportation and electricity. For 2016, total GHG emissions for the NWT were 1,611 kilotonnes. This represents about 0.2 percent of Canada’s total emissions. On a per person basis, the NWT emits about 37 tonnes of GHG per person, whereas nationally the average is about 19 tonnes per person.

In 2016, industrial activity accounted for about 50% of the GHG emissions in the NWT. This includes most off-road transportation. Other emissions are from heating, transportation and electricity generation for communities. See figure 1 for GHG emissions by sector for the NWT for 2016. Community heating represented 10% of the GHG emissions. Transportation represented 35% of the GHG emissions. For transportation, this includes planes, road vehicles, trains and boats. A significant proportion of these transportation emissions are associated with heavy duty transportation of materials and fuels to communities and industrial sites. Community electricity generation represented about 4% of total GHG emissions for 2016. For our remote diesel-powered communities and all other sectors, a heavy reliance on fossil fuels is unsustainable in terms of cost-of-living and the environment.

Figure 1 shows 2016 GHG emissions in the NWT by sector in kilotonnes (kt), compared to the projected GHG emissions by sector by 2030—based on GNWT actions to meet the *Pan-Canadian Framework* target.

These actions will result in estimated GHG emissions of 1,094 kt by 2030, which meets the PCF target. The 2005 and 2016 GHG estimates are sourced from Environment and Climate Change Canada. These numbers are revised every year, and the GNWT will adapt its approach to meeting the target as emission estimates are revised.

Figure 1: Northwest Territories Greenhouse Gas Emissions in Kilotonnes for 2016 and 2030 based on GNWT Actions to meet the Pan Canadian Framework Target





Summaries of what we heard during the regional engagements are available online on the GNWT website

www.gov.nt.ca

WHAT WE HEARD

The GNWT engaged Northerners in all NWT regions throughout the Fall and Winter of 2016/2017 to gather input on the NWT Energy Strategy and the 2030 NWT Climate Change Strategic Framework. Workshops were held in Inuvik, Norman Wells, Fort Smith, Yellowknife, Fort Simpson, and Hay River. The GNWT also ran an online survey and received extensive written submissions on the public draft of the Strategy. A one-day workshop was also held among industry, regulatory and government officials to discuss specific Strategy considerations for the electricity sector. Here is a summary of What We Heard:

Maintain Affordability and Help Northerners Make Better Energy Choices

The key message we heard is to maintain affordability. There is broad support for the expansion of renewable and alternative energy, and the use of energy efficiency and conservation practices. It was also understood that renewable energy can be more expensive and can increase energy costs, which in the NWT are already high. There is support for setting emissions targets, as long as they are achievable and do not increase energy costs for consumers. Common suggestions we heard to achieve this were:

- Redistribute carbon tax revenues to those impacted and direct the rest into renewable energy projects
- Provide up-front financial incentives to assist consumers in making more energy-efficient purchases
- Expand and increase the flexibility of energy efficiency programs and services

Involve Communities in Energy Development

Participants told us they want more information and involvement in energy decisions. For some people, this means receiving additional information about energy options and why our energy choices matter. For others, it means being a partner in energy planning and decisions, by understanding the choices, contributing traditional and local knowledge, evaluating options, and having a meaningful role in decisions. For some, it means partnering with community and Indigenous governments and businesses to deliver local energy conservation and efficiency programs. For others, it means they want to be the ones generating energy. The GNWT has heard that more communication and outreach is needed to support all of these aspirations for greater involvement and understanding.

Design Locally Appropriate Solutions

Northerners expressed strong support for local and renewable energy projects and biomass-based heating projects. Recent successful GNWT-funded community-based projects have helped build this support. The Colville Lake Hybrid Solar-Battery Project, the Łutselk'e and Fort Simpson Solar Energy Projects, and the Inuvik Liquefied Natural Gas Project are examples of proven technologies that enable communities to reduce their environmental impacts. These projects were tailored to the conditions and needs of the community, with considerable community involvement. On the other hand, we heard concern and uncertainty about the economic and environmental impacts of large-scale hydroelectricity.

Look Beyond the Communities

Past GNWT energy plans have focused on electricity use. If this Strategy is to set targets for emissions reductions, then we must look beyond community power generation and government energy use and also target fossil fuel used for heating and transportation across all sectors. We must engage the major energy users—the transportation and industrial sectors—as key partners in setting and achieving targets. While our large area, small population, limited infrastructure and remoteness offer challenges, these sectors represent the largest potential to impact energy use. Industry representatives have stated their commitment to support the transition to a lower carbon future and to a constructive partnership, but they need government support. Some suggest making the carbon tax revenue neutral within each sector, and establishing targeted funds for innovation, infrastructure, research and development of energy systems and energy corridors.

OUR VISION OF NWT ENERGY

By 2030, the NWT will have a secure, affordable and sustainable energy system that is less dependent on fossil fuels and contributes to the economic, social and environmental wellbeing of the Territory and its residents.

This **Vision** reaffirms the GNWT’s commitment to energy affordability and security, while moving the NWT towards a lower carbon economy to address climate change. The **Vision** places energy decisions within the GNWT’s broader goal of promoting the wellbeing of the NWT and its residents.

The Principles, Strategic Objectives, and Actions and Initiatives in this Strategy will help us attain this Vision.

OUR GUIDING PRINCIPLES

The GNWT will apply the following **Principles** to guide actions and decisions relating to the use, generation, distribution and regulation of energy in the NWT.

- **Secure, Affordable, and Sustainable:** The GNWT should balance energy security, affordability, and environmental sustainability in its energy decisions.
- **Meet our Climate Change Commitments:** The NWT has a responsibility to contribute to Canada’s international commitments to reduce GHG emissions. The GNWT will do its part to help Canada achieve its national GHG reduction target.
- **Shared Responsibility:** Reducing greenhouse gas emissions is a shared responsibility between residents, governments, business and industry.
- **Promote Partnerships:** The GNWT should promote partnerships and investment opportunities on energy initiatives—where appropriate—with Indigenous and community governments, businesses, and industry.
- **Indigenous and Community Engagement:** The GNWT should support involvement, empowerment and capacity-building of Indigenous governments and communities to participate in energy initiatives, exchange information and perspectives, meet local needs and include local and traditional knowledge.
- **Lead by Example:** The GNWT should lead the transition to a lower carbon economy by reducing GHG emissions, increasing the use of renewable and alternative energy, and improving energy efficiency within its own operations.
- **Innovation and Impact:** The NWT will investigate and promote innovative solutions that are proven, and have the largest impact in our northern context.
- **Transparent and Accountable:** The GNWT should be transparent and accountable in the implementation of this Strategy.

OUR ADAPTIVE APPROACH

The GNWT has set realistic and achievable **Strategic Objectives** and supporting **Actions and Initiatives**—based on current technology and costs—to achieve its **Vision**. Technologies improve and costs for energy solutions change over time. Because of this, the GNWT commits to flexible implementation of both the **Strategic Objectives** and **Actions and Initiatives**. Over the course of this Strategy, the GNWT commits to continuously reassess and validate options and costs of solutions and adapt the approach to find the best and most economical solutions. The GNWT will re-evaluate the **Strategic Objectives** after five years to ensure that they represent what is achievable given new technology and opportunities.

WHAT WE WILL ACHIEVE

The GNWT has identified six **Strategic Objectives** to achieve its **Vision** of a more secure, affordable and sustainable energy system in the NWT. This Strategy will focus on sector-specific goals that are achievable. The targets are for 2030 and are based on 2016 as a reference year.

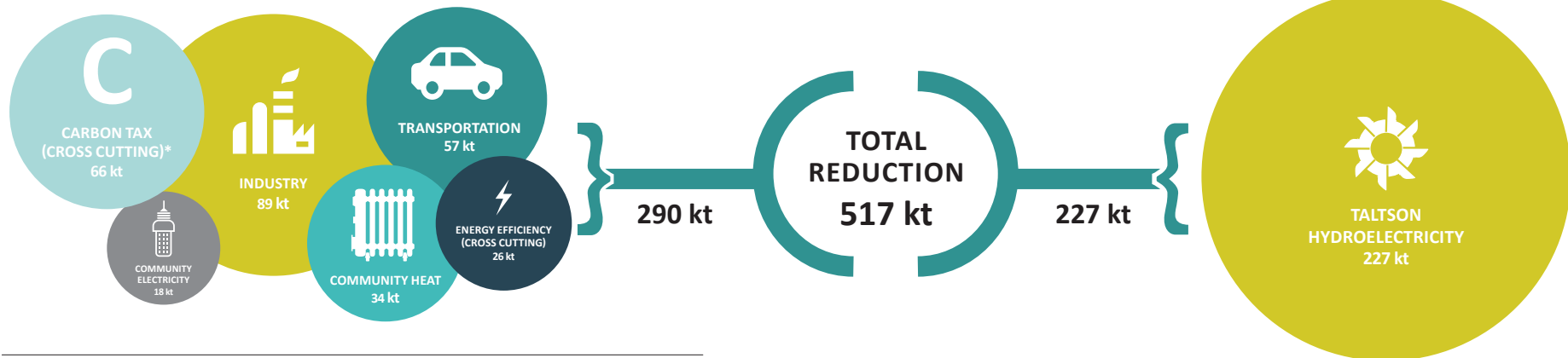
The **Strategic Objectives** are:

1. **Work together to find solutions: community engagement, participation and empowerment.**
2. **Reduce GHG from electricity generation in diesel-powered communities by an average of 25%.**
3. **Reduce GHG emissions from transportation by 10% per capita.**
4. **Increase the share of renewable energy used for space heating to 40%.¹**
5. **Increase residential, commercial, and government building energy efficiency by 15%.**
6. **A longer term vision: develop the NWT's energy potential, address industry emissions, and do our part to meet national climate change objectives.**

Combined, these Strategic Objectives will result in the NWT reducing its 2005 emissions by 30% by 2030 to meet our Paris Agreement and Pan-Canadian Framework on Clean Growth and Climate Change commitments. To meet these commitments, the NWT must reduce its 2016 emissions by 517 kt levels by 2030 based on current GHG emissions estimates.

Figure 2 shows how the Strategic Objectives and Actions and Initiatives in this Strategy will achieve a 517 kt reduction.

Figure 2: Estimated GHG reductions resulting from this Strategy, including the Taltson hydroelectric development, and a \$50 per tonne carbon tax. The resulting 517 kilotonne reduction by 2030 over 2016 levels will meet the Pan-Canadian Framework target.

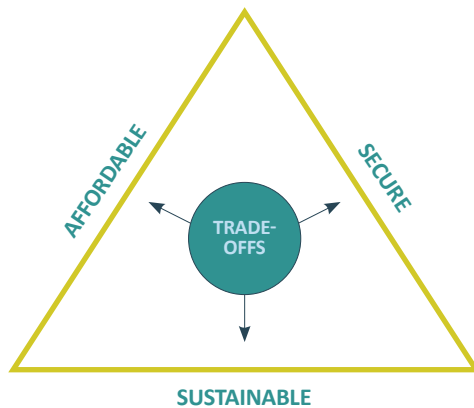


*A carbon tax at \$50 per tonne is expected to reduce emissions by 3 to 5% based on current modeling.

¹This target represents a doubling of heating from renewable sources from current estimates. Estimate is that biomass accounts for 20% of the heating energy in the NWT. Of this about half is from wood pellets and the other half is cord wood. There is a great deal of uncertainty in the cord wood estimate, and actual amounts may be higher or lower. This target may be modified as we better understand current percentages of renewables for heat.

BALANCING PRIORITIES AND DECISION-MAKING

In making decisions on what **Actions and Initiatives** will be undertaken, the GNWT has attempted to balance many competing interests, values and priorities. Energy must be secure, affordable and sustainable in the NWT, and these can be conflicting goals at times.



For instance using renewables is often not the most reliable way to generate electricity, yet GHG reductions from electricity is a priority of the GNWT and many stakeholders in the NWT. We heard during the public engagement that affordability of electricity is one of the biggest concerns. The cost of electricity in the NWT, especially in the diesel communities, can be as much as six times that of heating oil on a unit of energy basis, which often results in electricity bills being higher than heating bills. Renewables can help stabilize electricity costs, and this is one of the reasons electricity and energy efficiency are a priority for this Strategy. It is also the sector that the GNWT has the most direct influence over.

Decisions about what projects and initiatives will be undertaken in this Strategy are based on an approach that takes into account the following main factors:

- Community and Indigenous government engagement, participation, involvement and approval
- Energy security and reliability
- Affordability
- Sustainability
- Optimization of resources, including GHG reduction per dollar invested
- Project complexity and likelihood of success
- Stakeholder interests and needs
- Capacity within a sector to achieve a successful result

By way of example, GHG reductions per dollar invested is a useful way to assess projects against each other, everything else being equal; however, everything else is not equal. One project may have solid community acceptance, have a high likelihood of success, and have relatively short development timelines, and provide reliable energy. This type of project might be given precedence over other projects even with significantly better GHG reductions per dollar invested. The **Actions and Initiatives** in this Strategy represent the GNWT's best attempt to distribute limited capacity and financial resources across priorities, and meet the needs of the greatest number of stakeholders, while at the same time meeting this Strategy's main goals.

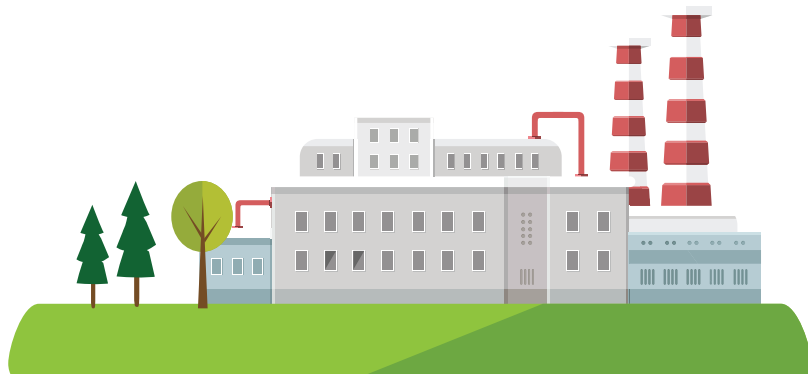
The GNWT and its partners will engage—and where possible, partner—with appropriate communities and Indigenous governments on many of the **Actions and Initiatives** in this Strategy before they proceed.

Renewables can help stabilize electricity costs, and this is one of the reasons electricity and energy efficiency are a priority for this Strategy.

STRATEGIC OBJECTIVES

The GNWT will undertake specific Actions and Initiatives over the life of this Strategy to reach its six Strategic Objectives. Each of the six Strategic Objectives sections in this Strategy includes an introduction of what the GNWT is trying to achieve, a discussion on the approach and short and long-term Actions and Initiatives that the GNWT and its partners will undertake to achieve each Strategic Objectives.

Over the next several years, the GNWT and its partners will spend hundreds of millions of dollars to implement this Strategy. The GNWT will release a three-year action plan that it will update every year, detailing its investments in the Actions and Initiatives to meet this Strategy's Strategic Objectives.



1

WORK TOGETHER TO FIND SOLUTIONS: COMMUNITY ENGAGEMENT, PARTICIPATION AND EMPOWERMENT.

During the public engagement we heard that communities want to be more engaged and to be part of the solution. This included a range of options including being partners in developing solutions, undertaking projects independently, to simply being kept updated on local solutions. The GNWT agrees that our collective know-how and effort is needed, and will work to ensure better communication, engagement, and support for communities.

COMMUNICATIONS, ENGAGEMENT AND CAPACITY BUILDING

The GNWT will continue to engage communities and Indigenous governments on energy initiatives, in keeping with the principles and approach identified in “Respect, Recognition and Responsibility: The GNWT’s Approach to Engaging with Indigenous Governments” (2012). GNWT and its partners will work with communities and Indigenous governments to clarify roles in project design and implementation as appropriate.

The GNWT and its partners will continue to provide understandable and reliable information on energy efficiency and conservation to communities, residents and businesses of the NWT. Effective communication is essential for successful outcomes. The GNWT works with the Arctic Energy Alliance (AEA), which plays a lead role in providing energy information to residents, communities and businesses. With offices in each region, the AEA works one-on-one with communities to answer questions, deliver programs, and support communities in the design and implementation of energy projects.

To support long-term engagement, participation and empowerment, the GNWT will develop energy literacy material for use in NWT schools so that future generations understand the different energy options and emerging technologies, and the impacts of their energy choices on the economy and the environment.

The GNWT will support and partner with communities, Indigenous governments and community organizations that want to get involved in energy planning and projects to build their capacity. It will provide technical advice, advance project ideas, assist with funding applications, or help to find information, resources and funding that may be needed.

COMMUNITY ENERGY PLANNING

The GNWT and the AEA will continue to support the development and implementation of community energy plans. Current community energy planning will include lessons learned from the 2011-12 community energy planning process and focus on implementing solutions.

The GNWT—with input from the AEA—has developed a work plan to provide support to community governments for implementing and updating Community Energy Plans. The GNWT is evolving its capital planning process to promote and encourage the implementation of Community Energy Plans, and is committed to working with community governments and other partners to implement their plans.

SUPPORT INVESTMENT PARTNERSHIPS

It is a long-standing government policy that Indigenous governments should be offered the opportunity to partner in larger energy developments on Indigenous-owned lands that have a business case. The GNWT will continue to seek opportunities to partner with Indigenous groups to invest in major projects developed on traditional lands that serve new energy markets, such as energy for export. The Taltson hydroelectricity expansion is a good example of the type of project that could provide investment opportunities for Indigenous governments.

For community-based projects, the high cost of energy infrastructure in the NWT means that most renewable or alternative power projects require a subsidy to keep electricity rates from going up. Where the government chooses to subsidize a project, the subsidy will benefit electricity users, and the government will cover the added cost of investing in renewable energy solutions.

SUPPORTING PARTICIPATION IN COMMUNITY SCALE RENEWABLE GENERATION

What we heard during our regional engagements is that communities want to be part of the solution and want to produce renewable-generated electricity to replace diesel-generated electricity. The NWT has already adopted Net Metering, which allows customers to install up to 15kW of renewable electrical generation on buildings to offset their power use.

To complement Net Metering, the GNWT will support two new options for communities and Indigenous governments to participate in renewable electricity development in diesel electricity communities. Please see the side box: ***Renewable Electricity Participation Model for Diesel Communities.***



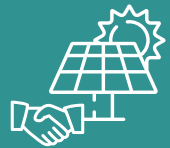












The first new option is based on the Łutselk'e model where the community builds, owns and operates a medium-scale renewable project tied directly to the local grid. This option is available for projects of more than 15kW, and is limited to the community's renewable generation cap to ensure a reliable local grid. For this model the community or Indigenous government invests in the project and receives the payments from the utility based on the value of diesel fuel displaced by the renewable. This revenue model ensures that the renewable energy installed does not increase the cost of power to communities. This approach is not the conventional independent power producer model that occurs in the south where the utility issues a request for more generation to meet increasing electricity demand. Rather, it is a solution made in the NWT where we do not need more electricity generation, but we do need to displace generation from fossil fuels.

The second new option for community and Indigenous government participation in diesel community based renewable electricity development is to partner in larger scale projects that require significantly more resources to develop. This option is based on the fact that for diesel electricity communities, NTPC does not make a profit on electricity sales and the GNWT subsidizes renewable generation to help keep power rates as low as possible. For this option community and Indigenous governments can opt to provide debt financing for the renewable project and earn a low risk return consistent with the investment terms available to our crown utility. This keeps money in the NWT and provides a low-risk way for Indigenous organizations to invest in northern energy infrastructure, and benefit from the steady returns that southern lenders would normally secure.

The community of Łutselk'e—with support from the GNWT, the Arctic Energy Alliance, and a private company—recently became a community-based power producer. The community sells solar power to NTPC and re-invests the revenues in the community. Łutselk'e has embraced the project, which displaces about 2% of the diesel fuel used each year for power generation. The project raised awareness of energy issues in the community, and residents are proud to be part of a renewable energy solution, contributing to the transition to a low carbon economy.

Renewable Electricity Participation Model for Diesel Communities

The *GNWT Renewable Electricity Participation Model* for Diesel Communities is intended to ensure that communities and utilities have clear consistent guidelines that ensure fairness, ensure power produced is affordable and sustainable, help to develop sustainable northern communities, support Indigenous and community involvement, and increase community capacity and self-reliance. It is intended to allow communities to support the transition to a lower carbon economy and be part of the solution. The guidelines also help manage community expectations on how much renewable energy can be installed in isolated communities, as there are technical limitations to how much intermittent power can be installed before a community grid becomes unstable.

	SMALL-SCALE RENEWABLES ON BUILDINGS	MID-SCALE RENEWABLES DIRECT TO GRID	LARGER-SCALE RENEWABLE PARTNERSHIP
CATEGORY			
PARTICIPANTS	 Residents/Business/Community & Indigenous Governments	 Indigenous & Community Governments	 Indigenous & Community Governments
OWNERSHIP	Direct-Ownership	Community-Ownership	Partnership with utility
SCALE	 Up to 15 kilowatts	 More than 15 kilowatts	 Larger Scale New Renewable Capacity
FUNDING	 Self-financing + Potential Government Grants	 Self-financing + Potential Government Grants	 Partner Financing
REVENUE POTENTIAL	 Net Metering: displaced electricity costs and energy credits	 Payment for the reduced cost of diesel	 Low-risk interest
DETAILS AND LIMITATIONS	<ul style="list-style-type: none"> • Renewable Community Capacity Limit • Net Metering Guidelines 	<ul style="list-style-type: none"> • Renewable Community Capacity Limit • Upfront connection agreement 	<ul style="list-style-type: none"> • Negotiated terms and contract • May be subject to regulatory oversight

ACTIONS: WORKING TOGETHER TO FIND SOLUTIONS

On-going

Support community-based energy projects by providing technical and financial support to help communities advance renewable energy and energy-saving projects

Provide opportunities for mentorship and hands-on training of community representatives for energy projects

Create partnership opportunities in local renewable energy projects for community and Indigenous governments that support local capacity development

Support the development and implementation of community-based energy plans

Provide opportunities for community and Indigenous governments for equity buy-in positions in energy projects with a business case

Continue to involve and engage communities on energy projects

Undertake education, energy literacy, curriculum development and outreach initiatives

2018-21 Short term

Expand community-based energy planning

Implement a new application-based Government Energy Fund to support community energy efficiency, renewable and alternative energy projects

Plan and initiate education, energy literacy, curriculum development and outreach initiatives

Create a plan to provide opportunities for mentorship and hands-on training of community representatives for energy projects

2

REDUCE GREENHOUSE GAS EMISSIONS FROM ELECTRICITY GENERATION IN DIESEL COMMUNITIES BY 25%.

During the regional engagement sessions we heard that reducing reliance on diesel electricity generation in communities was a priority. Community diesel electricity generation produces on average 72 kt of GHG emissions, accounting for about 4% of the NWT's annual total. The GNWT and partners will implement renewable and alternative energy solutions appropriate to each community and region to reduce GHGs from diesel electricity by 25% by 2030. A 25% reduction equates to a reduction of 18 kt tonnes by 2030 over average historical levels.

Addressing fossil fuel use in electricity is a priority because the cost of this electricity is high and a significant contributor to the cost of living in the NWT. Through its ownership of the Crown Corporation NTPC, the GNWT will work to reduce the amount of electricity generated by diesel to reduce emissions and stabilize electricity costs.

As a primary approach to reduce greenhouse gas emissions in NWT communities, the GNWT will support the displacement of diesel electricity generation through the installation of renewable and alternative energy solutions. Over the life of this Strategy, the GNWT will work with federal, provincial and territorial counterparts to share ideas and seek solutions to reduce diesel use in communities.

Energy solutions might include wind, solar, mini-hydro, liquefied natural gas, geothermal, transmission lines, combined heat and power, energy storage, variable speed generators, more efficient generators, and other solutions as they become available.

The GNWT has identified representative options, including GHG reduction and cost to achieve the 25% reduction target using renewable and alternative electricity.

Figure 4 shows the breakdown of GHG emissions from the electricity system, how this relates to the 25% reduction target, and the potential solutions to meet the target.

Renewable energy technology has become economic in many places in the south but has yet to become economic in the North. Implementing renewable electricity solutions in the North has so far been more expensive in part due to remoteness, high operating costs, and lack of economies of scale. To date, all recent renewable electricity solutions in the NWT, such as Fort Simpson, Aklavik or Colville Lake solar, have required government subsidies to maintain and not increase electricity rates, even with the high cost of diesel power.

The GNWT will seek federal government support, community and Indigenous partnerships, and provide resources to ensure that these projects succeed. The GNWT estimates that based on current technology, over \$200 million in investment will be required over the next decade to reach this target and to stabilize electricity rates.



The GNWT will work with partners to identify the most effective approach to achieving this target over the course of this strategy, taking into account stakeholder support, available funding, evolving technology options, and partnership opportunities.

Figure 3 provides details of cost and emissions reduction of representative renewable and alternative energy solutions to help meet the 25% target.

Everything else being equal, transmission lines to connect diesel communities to hydroelectricity are more desirable than Inuvik Wind, even though the upfront cost is higher as compared to yearly GHG reduction because transmission lines last several times longer than wind turbines, and therefore have higher lifetime GHG reductions.

There are other factors involved in deciding what projects should proceed. For instance, in small communities, solar panels are easier to implement than a large wind turbine or transmission lines and might occur first even though the costs per GHG reduced is better for large wind or transmission. Similarly, large wind might be simpler to implement than transmission lines even though transmission has a better cost per lifetime GHG reduced. Availability of funds, and other factors such as community acceptance, can also play a role in what projects proceed first.

Renewable energy technology has become economic in many places in the south but has yet to become economic in the North.

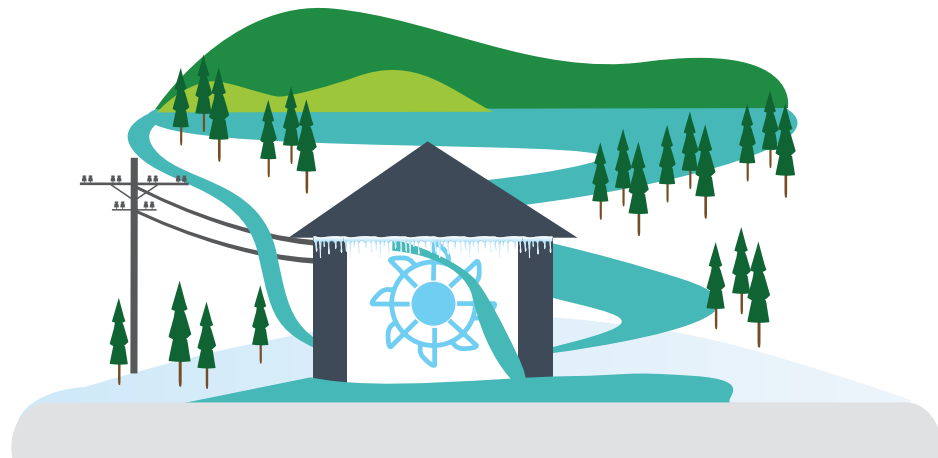
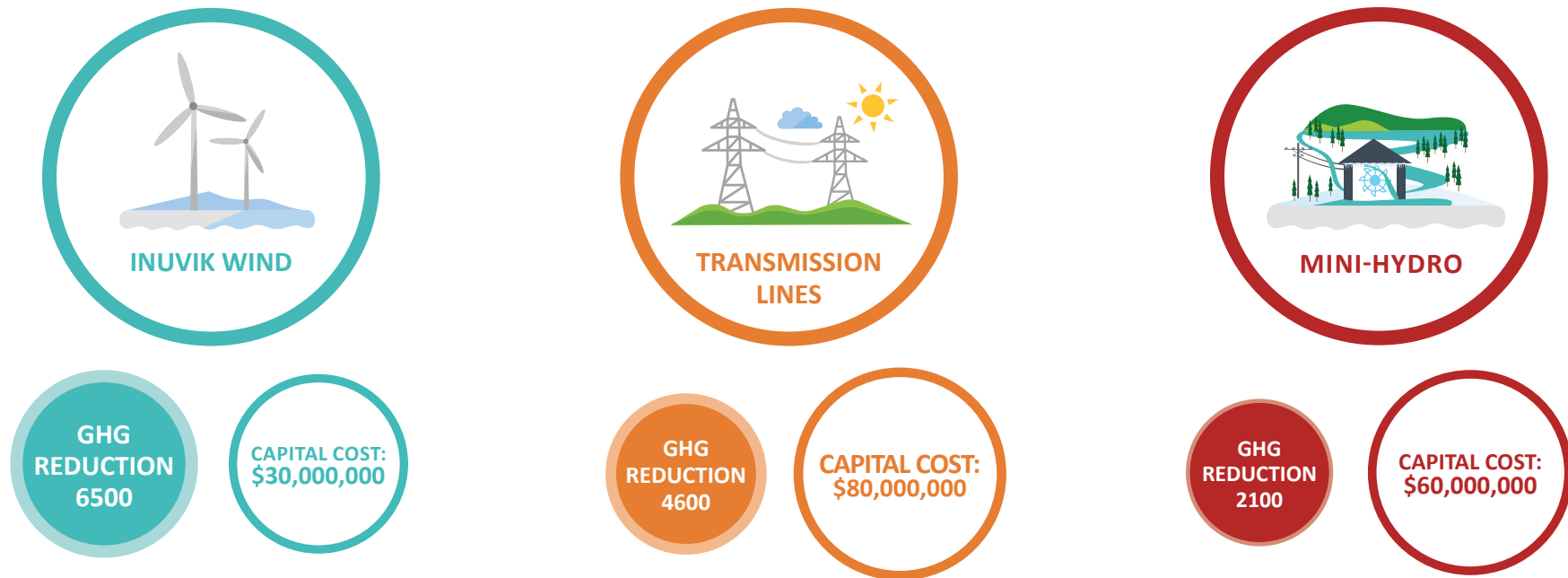


Figure 3: Cost and Emissions Reduction of Representative Renewable and Alternative Electricity Solutions

This graphic provides a cost and emissions reduction of representative renewable and alternative energy solutions to help meet the 25% target. The solid-coloured circles show the potential annual GHG reductions for the proposed renewable energy solution. The unfilled lower circles show the estimated upfront capital cost of each solution. These solutions are ordered based on their potential lifetime cost of GHG emissions reductions.



Inuvik uses more diesel to generate electricity than any other community in the NWT.

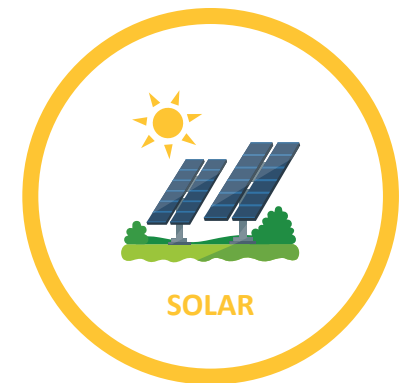
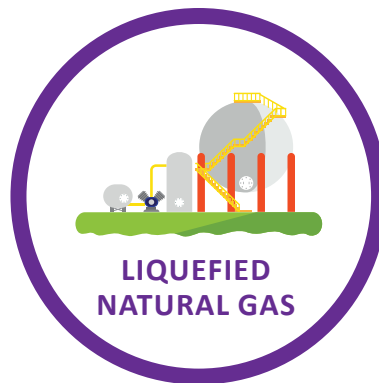
It also has wind available that is suitable for generating electricity. The GNWT conducted feasibility studies at a site close to the airport, and has concluded that the site would be suitable for 2 to 4 MW of wind power. This could reduce GHG emissions about 6.5 kt per year. Historically, larger scale wind turbines were not designed for use in our cold northern climate. Turbine technology with cold weather enhancements now makes operation in extreme cold conditions possible, as shown by the success of the 9.4MW wind farm at the Diavik Diamond Mine. Wind power is viable in Inuvik, and this is a priority project.

Connecting diesel communities to renewable hydroelectricity would almost entirely eliminate diesel use, except for emergency backup electrical generation.

There are three communities close enough to be connected to existing hydroelectric power transmission lines—Fort Providence, Kakisa, and Whati. If these communities were connected, GHG emissions would be reduced by about 4.6 kt per year. No additional generation would be needed as they would use surplus hydropower that is presently available in the Snare and the Taltson hydroelectricity systems. Fort Simpson and Jean Marie, could be considered in future phases of transmission expansion.

In several diesel communities, mini-hydro in the range of 500 kilowatts is possible.

Mini-hydro is desirable because it is reliable and can displace almost 100% of diesel generation with clean, renewable power. Mini-hydro is considered run-of-river, which is to say that you do not need dams or to flood land and create a reservoir. To proceed with mini-hydro, community partnership and consultation will be required. Mini-hydro also needs environmental regulatory approval, which makes this a longer term solution. Installing mini-hydro in two communities will cost approximately \$60 million, and reduce GHG emission annually by about 2.1 kt.



A few smaller communities have wind speeds suited for small wind turbines that could be installed to reduce diesel generation.

In the past, small turbines were ill-suited to the NWT’s cold climate. However, wind turbines can now be delivered with features that make them more robust and reliable for cold climate use. Small wind turbines can be installed to reduce diesel use in remote communities year-round. They have the potential to annually produce more electricity than solar, which is limited in the winter. If small wind were installed in two communities, GHG emissions could be reduced by about 2.5 kt a year.

Natural gas could replace diesel fuel for power generation in road-connected communities.

Liquefied Natural Gas—or LNG—is transported in low-pressure insulated tanks, and produces 25% less GHG than diesel at the point of combustion. Depending on price and shipping distance, LNG-produced electricity can be cheaper than diesel-produced electricity. The GNWT is saving money by replacing diesel with LNG in Inuvik, and looking to do the same in communities with all-season roads. Regular delivery eliminates the need for expensive storage tanks, while local gas reserves could eventually replacing imported LNG in regions where they exist.

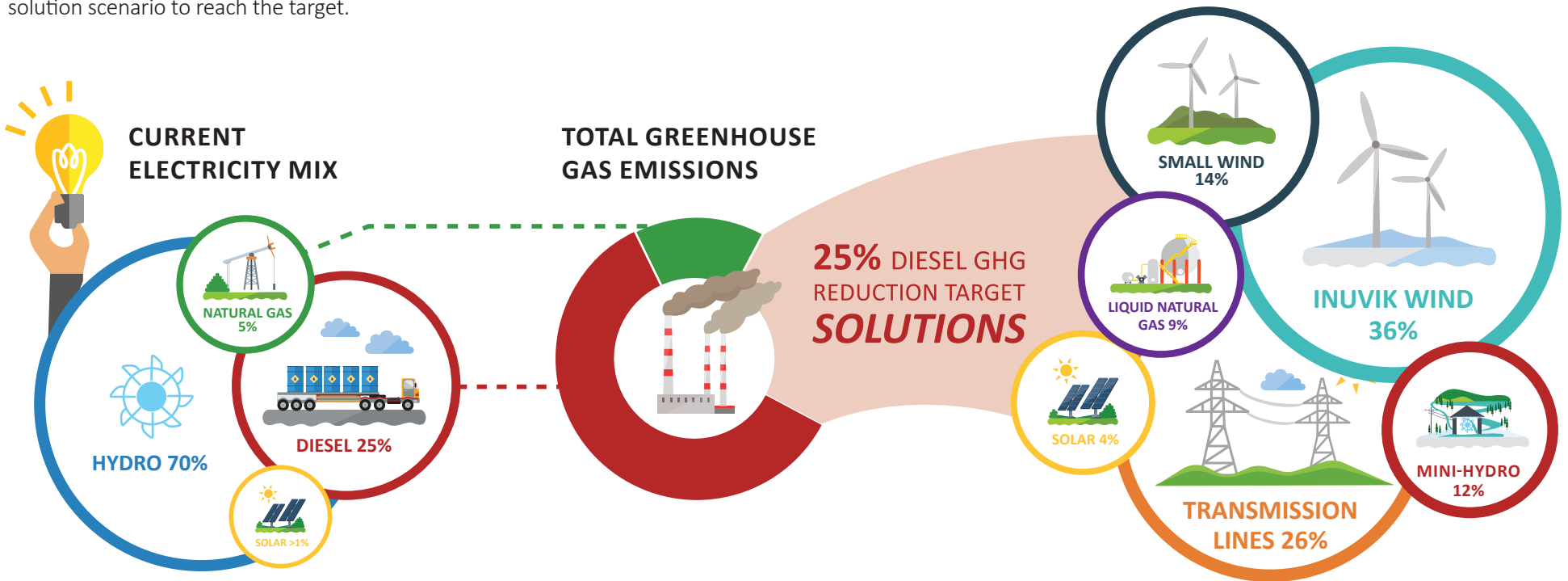
Solar Panels, Energy Storage and Efficient Generators. The NWT has long daylight hours in the spring and summer, and can harness solar power for up to 8 months of the year.

There is a 20% community solar capacity cap in the NWT because solar electricity causes conventional diesel generators to work less efficiently and make the system less reliable. Solar power paired with variable-speed generators (VSG) or batteries allows for more installed capacity and efficient power production, but costs roughly double. However, this can reduce diesel use by 20%, compared to 2- 4% from solar alone. Solar panel solutions in 13 communities—some paired with battery storage and VSGs—will reduce GHG emissions by 700 tonnes per year.

STRATEGIC OBJECTIVE 2

Figure 4: Current Electricity Mix and Proposed Solutions to Meet 25% GHG Reduction Target

The first part of this graphic shows how electricity is currently generated. Most electricity is generated using hydropower and the remaining is from fossil fuels. The middle represents GHG emissions from electricity generation and the 25% reduction target. The right side of the graphic shows a renewable and alternative energy solution scenario to reach the target.



The GNWT will work with partners to identify the most effective approach to achieving this target over the course of this strategy, taking into account available funding, evolving technology options, and partnership opportunities.

ACTIONS: REDUCE GREENHOUSE GAS EMISSIONS FROM ELECTRICITY GENERATION

2018-21 Short term

- Inuvik Wind sanction, design and build*
- Conventional or high-penetration solar in three diesel communities*
- Install LNG electricity generation in two diesel communities*
- Continue to undertake research and feasibility work on alternative and renewable energy*
- Initiate Fort Providence transmission line development*
- Initiate wind in either Sachs Harbour or Norman Wells*

2021-30 Long term

- Continue to undertake research and feasibility work on alternative and renewable energy*
- Conventional or high-penetration solar in 11 diesel communities*
- Initiate wind development in Sachs Harbour or Norman Wells*
- Initiate and build the Whatì transmission line*
- Initiate and build two community-based mini-hydro project(s)*

3 THE GNWT WILL REDUCE EMISSIONS FROM TRANSPORTATION BY 10% PER CAPITA.

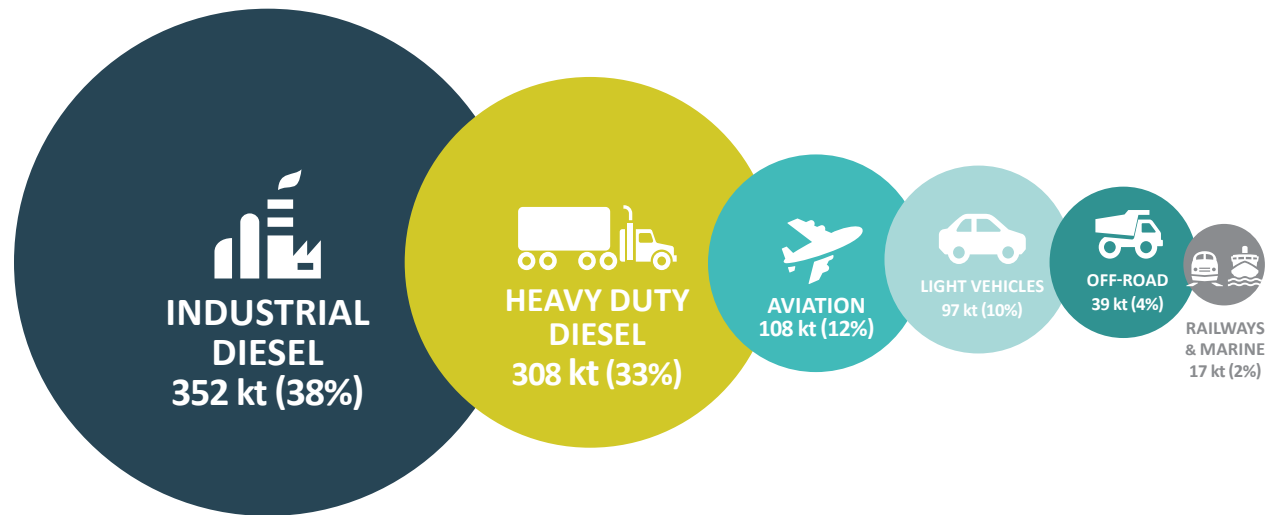
During our public engagement sessions, we heard that, though it will be challenging in the NWT context, the GNWT should address emissions from the transportation sector. Large distances between communities, and the distance from southern markets, means that goods and people must travel much farther than in most southern jurisdictions. Distances and cold weather are challenges for alternative fuel options such as electric vehicles and biofuels. In general, to reduce costs and emissions for transportation the following range of initiatives are possible: drive less, use alternative modes of transportation such as cycling or public transit or less air transportation and more marine transportation, use smaller vehicles and more efficient electric or hybrid vehicles for commuting, and use less GHG-intensive fuel sources, such as renewable electricity or biofuels.

In 2016, the transportation sector, including on-site industrial transportation, produced approximately 921 kt of GHG emissions, or approximately 57% of total NWT emissions. Of the total transportation emissions, light vehicles accounted for 11%, aviation accounted for 12%, on-site industrial diesel 38%, heavy duty on-road diesel 33%, and marine and rail 2%. Please see Figure 5 for the 2016 percent and kt breakdown for transportation.

The GNWT is committing to reducing GHG emissions from transportation by 10% by 2030 over 2016 levels on a per person basis. With a population of approximately 44,000 the per person emissions from non-industrial transportation is 13 tonnes per person, and a 10% reduction results in 11.7 tonnes per person, or about 57 kt. We will see additional reductions due to the carbon tax as well as action by industry for off-road transportation.

Figure 5: Emissions in the Transportation Sector

NWT BREAKDOWN OF GHG EMISSION BY TRANSPORTATION MODE AND FUEL TYPE.



Reducing emissions from aviation requires a national approach to efficiency and fuel standards. It is a similar situation for road vehicle and marine fleet efficiency standards. The GNWT will advocate at the national level for higher efficiency standards for road, air and marine transportation. The GNWT will lead by example, making wise choices in the selection and operation of vehicles and heavy equipment, improving efficiency of vessels and taking advantage of new technologies as it replaces and retrofits its marine fleet and ferries.

Given this context, the GNWT is committed to the following activities to reach the emissions reduction target for this sector:

LOW OR ZERO EMISSION VEHICLE PILOT PROGRAM

The GNWT will offer a pilot grant program for the purchase of low or zero emission vehicles in communities that are serviced by hydroelectricity. The program will provide a subsidy for eligible vehicles and installation of charging stations. The GNWT and AEA tested a hybrid gasoline-electric vehicle and found that the technology works in our climate and does result in GHG reductions, but has a higher up-front purchase cost.

This grant is limited to hydroelectricity communities because using electric vehicles in diesel electricity communities actually results in more GHG emissions than driving a regular gasoline vehicle.

GOVERNMENT LEAD BY EXAMPLE: GOVERNMENT FLEET MANAGEMENT

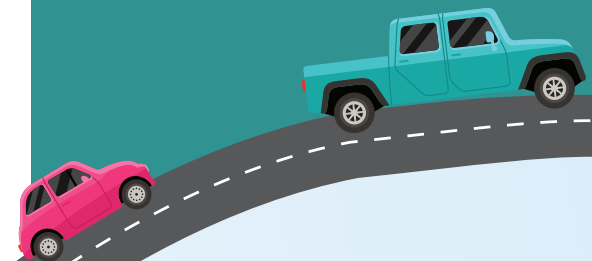
Government will lead by example by undertaking fleet management for its vehicles. Fleet management will increase the efficiency of vehicles within the fleet, and change driving habits. Fleet management includes the following elements:

- Fleet right-sizing – dispose of older and larger fuel-inefficient vehicles, improve fleet management to optimize asset life-cycle management, develop fleet utilization standards so the right vehicle is chosen for the task.
- Assess the percentage of low or zero emission vehicles that can be integrated into the government fleet based on application, and maximize these opportunities.
- Implement fleet management software to manage and track performance.
- Continue training and communications on fuel efficient driving.
- Pilot the use of auxiliary heaters to reduce idling vehicles. These heaters keep fluids and cabs warm during rest periods in cold weather, allowing vehicles to be turned off rather than idling, greatly reducing vehicle emissions. If successful, the GNWT will offer a grant and education program to assist businesses with the purchase of in-line fuel heaters and auxiliary power heaters for fleet vehicles and heavy duty vehicles.



Arctic Energy Alliance Electric Vehicle Pilot Project

In 2014, the Arctic Energy Alliance piloted the use of a Chevrolet Volt in Yellowknife to test the vehicle's efficiency and effectiveness, especially in cold weather. The Volt can be charged by plugging into a regular household outlet or with an electric vehicle charging station, which is a specially designed outlet that charges faster. The vehicle also has a gasoline generator to recharge the batteries for long distance travel. The pilot project demonstrates that electric vehicles are reliable and can effectively reduce vehicle emissions in hydro-powered communities, but a subsidy is required to be cost effective given the higher purchase price of the vehicle.



STRATEGIC OBJECTIVE 3

COMMUNITY-BASED INITIATIVES

The GNWT and the AEA will work with NWT communities to identify and implement programs to assist them to reduce their emissions from transportation. Programs may include the following:

Community Based Solutions: Within larger population centres such as Yellowknife, programs aimed at increasing use of public transit (e.g. subsidized bus passes). Viable solutions include car-pooling and car sharing initiatives, and improving the fuel efficiency of transit vehicles.

Active Transportation: Active transportation means walking, cycling (or skiing or snowshoeing!) instead of driving. This reduces vehicle emissions, saves money by burning less fuel, and promotes personal health and wellbeing. Existing programs and competitions, such as Walk-To-Tuk and Commuter Challenges promote active transportation. Expanding similar programs to run year-round or making it easier or safer for residents to choose active transportation, such as building a sidewalk along a main road, create incentives for people to leave their vehicles behind more often.

EDUCATION AND AWARENESS

The GNWT will undertake an education and awareness campaign to promote green driving behaviour such as smart idling, efficient driving practices, encourage efficient vehicle choice, and promote alternative transportation choices such as transit, car-pooling or ride-sharing, and active transportation. This action will support and complement many of the other actions listed.

VEHICLE STANDARDS AND BIOFUELS

The GNWT will continue to work with the federal government to continually improve vehicle efficiency standards, and to ensure that renewable fuel standards are appropriate for the North. The GNWT will periodically assess the status of liquid biofuels—such as biodiesel and ethanol—for transportation. Their use will be assessed in the NWT context, including price and availability, stability of long-term storage at low temperatures, and cold weather performance. It should be noted that biofuel can still cause air pollution, and have land use and potential food security concerns.

The GNWT and the AEA will work with NWT communities to identify and implement programs to assist them to reduce their emissions from transportation.

The GNWT will advocate at the national level for higher efficiency standards for road, air and marine transportation.



ACTIONS: REDUCE EMISSIONS FROM ROAD TRANSPORTATION

2018-21 Short term

GNWT to lead by example, implementing fleet management and efficiency improvements for vehicles, heavy equipment and marine vessels through a new Government GHG Fund

Design and initiate a rebate program for low or zero emissions vehicles and charging stations in hydro communities

Support community-based transportation initiatives through a new Government GHG Fund that reduce emissions, such as active transportation, public transportation, and community fleet efficiency

Create program to support efficiency in long-haul trucks and the installation of in-line auxiliary heaters for fleet vehicles and heavy duty vehicles to reduce idling

Undertake an education and awareness campaign to encourage efficient vehicle choice, "Smart Idling", efficient driving practices, and alternative transportation choices

Assess the status of LNG and biofuels for transportation in the NWT context, including availability, price, long-term storage and cold weather stability

Work with the federal government to ensure that renewable fuel standards are applicable to the North

Work with the federal government to continually improve vehicle efficiency standards

2021-30 Long term

Assess the feasibility and complete Zero-Emission Vehicle Transportation Corridors in the NWT

Pilot biofuel use in the NWT once the technology is deemed suitably mature for our northern context

Continue work with the federal government to ensure that renewable fuel standards are applicable to the North

Work with the federal government to continually improve vehicle efficiency standards

4 INCREASE THE SHARE OF RENEWABLE ENERGY USED FOR COMMUNITY HEAT TO 40% BY 2030.

Community space heating is a significant contributor to the cost of living and GHG emissions in the NWT. Community heating with fossil fuels produces about 108 kt of GHG per year, or approximately 13% of total NWT emissions. Space heating in the NWT is primarily fueled by heating oil, propane and renewable biomass. We heard from the public that the GNWT should support the greater use of renewables for heating to make heating more affordable and sustainable.

Wood pellets are considered to be a renewable resource when harvested sustainably or sourced from waste. Currently, it is estimated that 20% of non-industrial heating needs in the NWT are met by biomass such as cord wood or pellets. There is some uncertainty in this estimate and the GNWT will work with its partners to better understand how much wood is used in the NWT, and the potential to expand the use of renewable energy for heat in the NWT.

This strategy sets a target of increasing the share of heating met by renewable energy to 40% by 2030 over 2016 levels. This represents a reduction of about 34 kt of GHG over current emissions. Additional reductions will be achieved through energy efficiency.

A promising way to increase the use of renewable energy is to encourage greater uptake in the use of biomass for heating. In the short-term, the GNWT will continue to expand the wood-pellet supply chain including local production, support the early adoption of wood-pellet boilers in communities, and provide incentives to switch to wood fuel for heat.

Currently for South Slave communities that receive electricity generated by the Taltson hydroelectric project, electric heat is available to consumers at a reduced rate that is less than the cost to heat with oil. The GNWT and its partners will promote this program and look for ways to support electric heat.

The GNWT will lead by example and continue to install biomass and electric heating in new and existing government buildings. The GNWT and its partners will also support renewable heating options in Yellowknife schools and in larger commercial buildings.

The GNWT will investigate and will consider supporting other technologies, such as heat recovery, combined heat and power, heat pumps, district heating and solar heating, and will continue to assess advances in technology, products and methods that contribute to our long-term energy solution.

Figure 6: Current Energy Type for Community Heating



BIOMASS SUPPLY

While firewood has been—and continues to be—a common fuel source for heating homes in the NWT, expansion of biomass energy supply is challenged by the absence of major forestry activities, as well as limited road transportation infrastructure. Wood pellets or chips are most commonly produced from waste wood from timber harvesting and processing. The NWT does not have a low-cost supply of waste wood, so we must harvest trees to produce pellets or gather biomass from other sources, such as road building, forest clearing, burn areas, or waste materials.

Most wood pellets used in the NWT are imported from Alberta or British Columbia. Local pellet production is on the horizon, a development that will create local economic development and jobs, and may reduce the cost of pellets. Wood pellets are generally a less expensive heating source than heating with oil or propane. Wood pellets are also considered to be a renewable resource when harvested sustainably and are therefore carbon neutral.

The GNWT is developing a strategy for our forest industry in co-operation with Indigenous governments and organizations. To support job creation and business opportunities in the forest industry, the GNWT has negotiated Forest Management Agreements with Indigenous development corporations. Completing this forest strategy will facilitate the sustainable growth of the NWT's forestry industry, which will increase the accessibility of local biomass supplies for energy production in communities.

Complementary to this, the GNWT will work with its partners and communities to establish a new program to support community-based firewood harvesting, to encourage small business opportunities, provide a stable local supply of firewood, and support increased use of cord wood for space heating.

BIOMASS USE

The GNWT is committed to expanding the use of biomass for space heating in the NWT. To understand the needs, opportunities and barriers to increased biomass use in the NWT, the GNWT will refine its estimates of biomass use for heating. The GNWT will undertake an assessment of the quantity of cord wood, wood chips and pellets used in residential, commercial and government applications.

AEA currently provides rebates for the purchase of residential wood stoves and wood-pellet stoves. Funding is also available to community governments, businesses and individuals to support the purchase and installation of biomass heating systems such as pellet boilers. These popular programs promote the installation of biomass-fired boilers and biomass district heating systems, among other renewable technologies. The GNWT will continue to provide funding to the AEA to continue and expand on their success in these programs.

The GNWT will support the installation of biomass boilers in larger privately owned commercial buildings, which are currently too large and costly to be funded through the current AEA programs. Replacement of large oil-fired boilers with biomass boilers produces significant GHG reductions.

The GNWT will lead by example and continue to install pellet boilers in new and existing government buildings and facilities across the NWT, using the GNWT Capital Asset Retrofit Fund (CARF). With 28 biomass boiler systems as of the end of 2016, the GNWT met 24% of its total heat load.

DISTRICT HEATING SYSTEMS

Burning diesel and natural gas to generate electricity is inefficient. Sixty-five percent of the energy produced is typically lost as waste heat. That heat can instead be recovered and used to heat nearby buildings. There are also opportunities to build district biomass boilers. This reduces the amount of fuel transported, stored and used for heating. The GNWT will support opportunities to make use of residual and biomass districting heating for buildings in the NWT.

OTHER RENEWABLE HEATING TECHNOLOGY

Solar energy can also be used for space and water heating purposes. Through the AEA, the GNWT promotes the use of solar air and water heating systems, and offers rebates for residential and commercial applications. The GNWT and its partners will continue to research, monitor, test and promote new technologies for use in the NWT.

ACTIONS: INCREASE THE SHARE OF RENEWABLE ENERGY USED FOR COMMUNITY HEATING

2018-21 Short term

- Adapt AEA programs and services to better support renewable heating*
- Enhance the AEA Alternative Energy Efficiency Technologies Program*
- Inventory large non-government commercial buildings for biomass heating potential and support biomass adoption*
- Support larger scale private sector and commercial biomass heating through a new Commercial and Industrial GHG Fund*
- Release and implement the Forest Industry Development Strategy*
- Continue to support and expand the biomass supply chain*
- Support residual heat and biomass district heating systems*
- Support small-scale and community-based biomass combined heat and power through the new Government GHG Fund*
- Continue the GNWT Capital Asset Retrofit program and choose biomass and renewable-based electric heating over fossil fuel heating of GNWT buildings*
- Continue AEA Biomass Energy Program*
- Continue AEA Wood Stove for Communities Program*
- Develop AEA grant program to support electric heat in the South Slave hydroelectricity region*
- Evaluate—and if viable—encourage expansion of solar heating, and assess its potential for wider deployment and AEA/GNWT support*

2021-30 Long term

- Periodically review AEA programs and services for efficiency and effectiveness*
- Continue to provide and improve AEA programs and services for renewable heating*
- Continue CARF and NWTCH programs for renewable heating*
- Continue government support for larger scale public and private sector renewable heating as needed*
- Create a community-based firewood harvesters support program*
- Implement renewable heating in public housing*

5

INCREASE COMMERCIAL, RESIDENTIAL AND INSTITUTIONAL BUILDING ENERGY EFFICIENCY BY 15% OVER 2016 LEVELS BY 2030.

During the regional public engagement we heard that supporting building energy efficiency is key in addressing energy affordability and reducing greenhouse gas emissions in the NWT. In fact, energy efficiency and conservation are often the least costly solution and the easiest to implement. For this reason energy efficiency is being pursued as an objective in this Strategy, and will help meet the other Strategic Objectives. Energy efficiency—in heating and electricity in particular—will help the NWT reach its objectives and targets.

In terms of measuring this target, energy efficiency can mean many things. For this Strategy, energy efficiency refers to the reduced total energy use for buildings in residential, commercial, public/institutional settings combined, and for space heating and electricity on a per person basis. This will allow us to compare energy use now with future use in buildings—even with population changes. In 2016, 133 Gigajoules per person was used on average for commercial, residential and government buildings in the NWT. A 15% improvement means a reduction of about 20 Gigajoule to 113 Gigajoules per person of energy use for commercial, residential and institutional building. This is the target and will result in a 38 kt reduction in GHG emissions by 2030.

The GNWT delivers energy efficiency and conservation programs and services to the public through the AEA. These programs help many people and organizations across the NWT, and are in high demand. The GNWT is a major energy user in the NWT, and leads by example through efficiency upgrades in its buildings and through the activities of NWT Housing Corporation to continuously improve energy efficiency in government buildings.

GOVERNMENTS LEADING BY EXAMPLE: REDUCING GNWT ENERGY USE

The GNWT Capital Asset Retrofit (CARF) program uses money saved through energy efficiency improvements to government buildings to fund further improvements. Government facilities are significant energy users, and this program has effectively reduced GHG emissions in the NWT. The GNWT will continue the CARF program and continue to improve the energy efficiency of government buildings.

The GNWT has set a target to exceed the 2011 National Energy Code for Buildings by 10% for new government buildings. The 2015 National Energy Code of Canada for Buildings has been released, and the GNWT is reviewing this to determine if a similar target can be cost effectively reached with the new code.

SUPPORTING PUBLIC ENERGY EFFICIENCY

The GNWT will enhance support to the AEA as the lead agency providing energy efficiency and conservation programs and services in the NWT. The GNWT will conduct periodic reviews of AEA programs and services to ensure that funding is achieving best results, that the programs meet the needs of the NWT, and that the programs align with the objectives of this Strategy.

Additionally, the AEA will be funded to expand the energy efficiency, conservation and renewable energy program to include eligibility for non-profit organizations, include new and retrofit whole-building energy rating grants, and provide support for low-income home owners, for example.

The GNWT will also look for ways that community governments can support energy efficiency. The GNWT will engage with community governments to get feedback on proposed amendments to the *Cities, Towns and Villages Act*, that would enable communities with sufficient capacity to provide loans to assist residents and businesses to improve the energy efficiency of their properties.

Figure 7: Energy Types Used to Heat NWT Buildings



ACTIONS: INCREASE BUILDING ENERGY EFFICIENCY BY 15%.

2018-21 Short term

- Support for larger scale private sector and commercial energy efficiency through a new Commercial and Industrial GHG Fund*
- Optimize AEA programs and services based on the 2017-18 program review*
- Enhance and continue the AEA Energy Efficiency Rebate/Incentive Program*
- Enhance and continue the AEA Alternative Energy Efficiency Technologies Program*
- Enhance and continue the AEA Commercial Energy Conservation and Efficiency Program*
- Support NWT HC energy upgrades through a new Government GHG Fund*
- Develop and initiate energy efficiency and conservation education and outreach*
- Continue to provide AEA energy audits and rating service*
- Continue to provide the AEA Community Government Energy Retrofit Program*
- Introduce new AEA programs including a whole building retrofit energy-rating grant program and support for low income home owners*
- Introduce a Low-Income Home Winterization Program*
- Introduce Energy Efficiency and Conservation Retrofits for Non-Government Organization*
- Engage with the tax-based communities around potential changes to the Cities Towns and Villages Act, that would enable community governments to set up programs that help finance energy efficiency retrofits*
- Continue other AEA programs and services*

2021-30 Long term

- Continue AEA programs and services for energy efficiency*
- Regularly review AEA programs and services for efficiency and effectiveness*
- Continue the CARF program for energy efficiency*
- Continue NWT HC programs for energy efficiency*
- Continue government support for larger scale public and private sector efficiency improvements*

6

A LONGER TERM VISION: DEVELOP THE NWT'S ENERGY POTENTIAL, ADDRESS INDUSTRY EMISSIONS, AND DO OUR PART TO MEET NATIONAL CLIMATE CHANGE OBJECTIVES.

The NWT has significant conventional, renewable and alternative energy potential. Developing this potential improves our economy, creates jobs, and ensures a more sustainable energy system for the NWT and Canada.

We heard consistently from the public that the GNWT must do more, be more innovative, and address industrial emissions. Connecting the NWT to the North American electrical grid, connecting the North and South Slave electrical systems, and connecting industry to renewable energy, are initiatives that would significantly reduce GHG emissions, and reduce the cost of living and doing business in the NWT. Developing the Taltson hydroelectric system would enable the NWT to make a significant contribution to the national GHG reduction targets agreed under the *Paris Agreement*.

Achieving a transformative reduction in the NWT's GHG emission requires a transformative solution targeted at our largest emitting sector. Bringing 60MW of renewable hydroelectricity from Taltson to industry will allow us to reduce industrial GHG emissions by about 224 kt. This is 44% of the required 517 kt required to meet our Pan-Canadian Framework target of 30% below 2005 levels by 2030. The Taltson development requires Government of Canada support to proceed. Without federal support for Taltson, the NWT will not be able to reach its target.

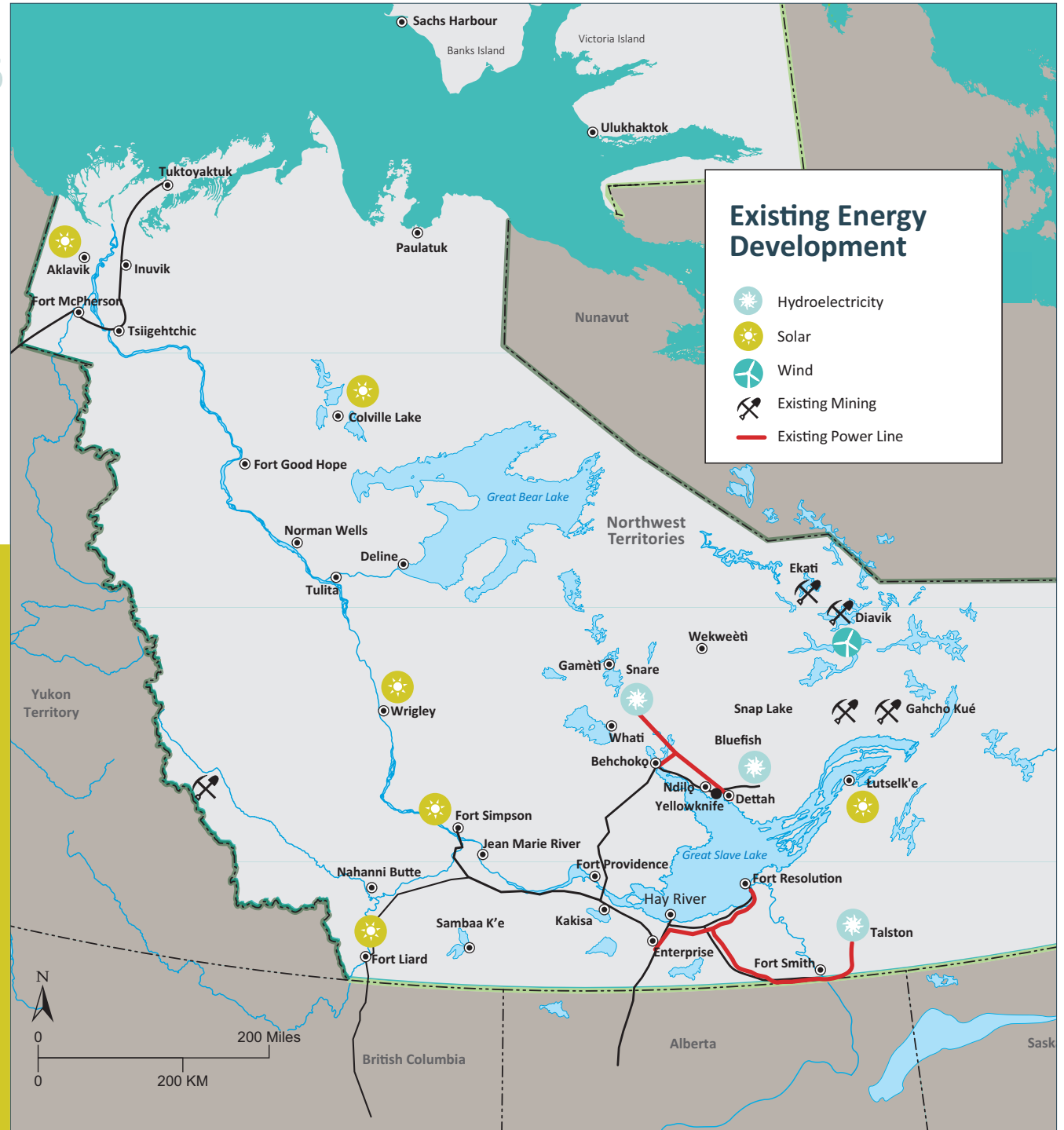
The construction of all-season transportation corridors to mining development in the Slave Geological Province and to the community of Whatì could allow us more economically built transmission lines to link renewable hydroelectricity to industry. Extending the Mackenzie Valley Highway will provide an opportunity to bring renewable energy such as wood pellets to more communities. Having road access makes energy more accessible and affordable. Extending the all-season highway system and developing affordable and sustainable energy systems are interlinked.

IMPLEMENTING A CARBON TAX IN THE NWT TO MEET OUR PAN-CANADIAN FRAMEWORK COMMITMENTS

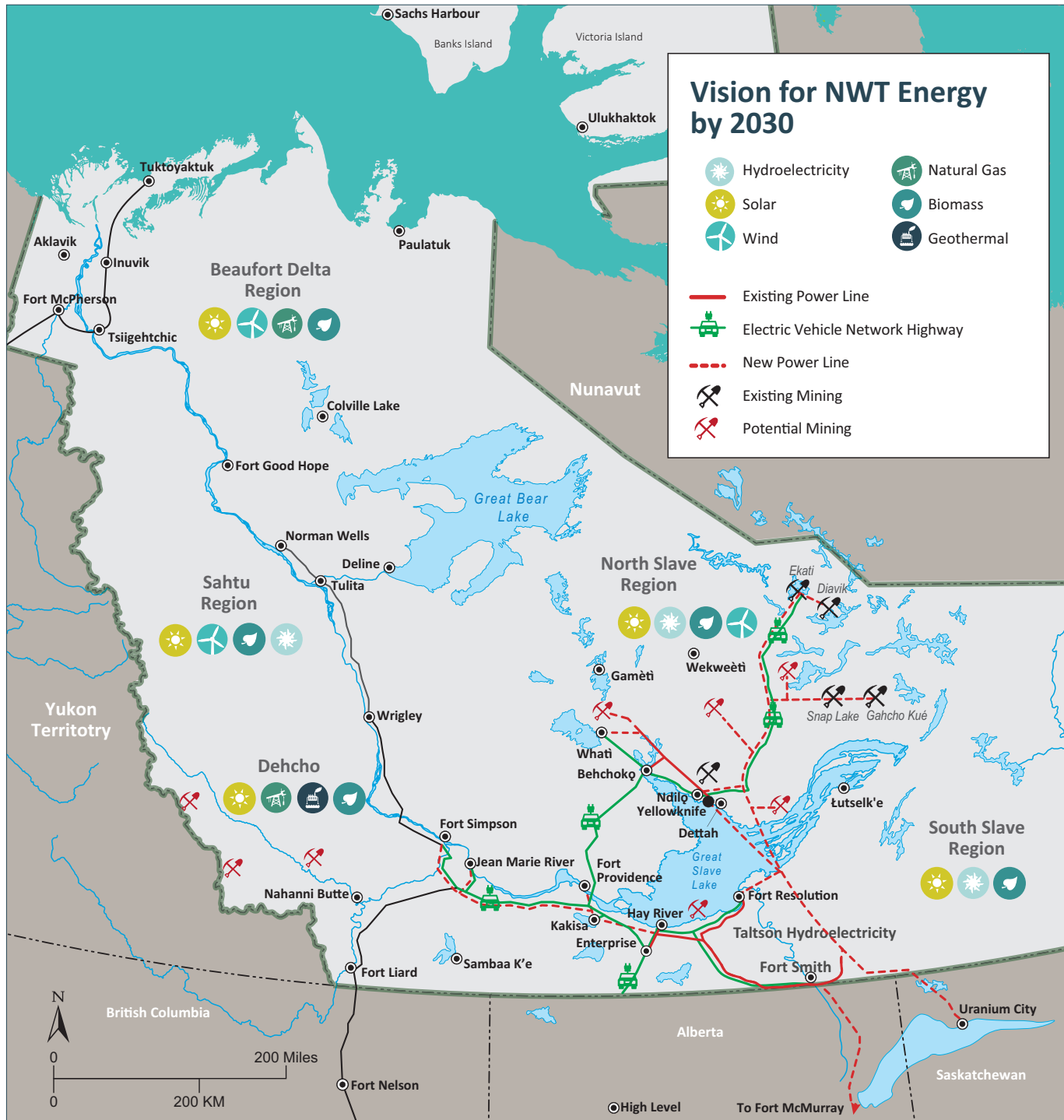
Implementing a price on carbon in the NWT is a commitment under the Pan-Canadian Framework on Clean Growth and Climate Change. A price on carbon in the form of a carbon tax, the 2030 Energy Strategy and the 2030 NWT Climate Change Strategic Framework are the primary mechanisms by which the GNWT will meet its commitment to reduce the NWT's emissions to 30% below 2005 levels by 2030. The GNWT is working on an approach to implementing carbon pricing that encourages energy conservation and fuel substitution to reduce greenhouse gas emissions, while minimizing increases to the cost of living and barriers to economic development.

STRATEGIC OBJECTIVE 6

This map shows existing (2017) renewable electricity in the NWT. All regions have solar power installed to displace diesel electricity. The separate North and South Slave electricity systems are both primarily powered through hydroelectricity. There is also over 9 megawatts of wind power installed at Diavik mine. In addition, all regions use renewable biomass such as wood pellets and cord wood for heating to various extents, and Inuvik uses liquefied natural gas for electricity generation alongside diesel (not shown).

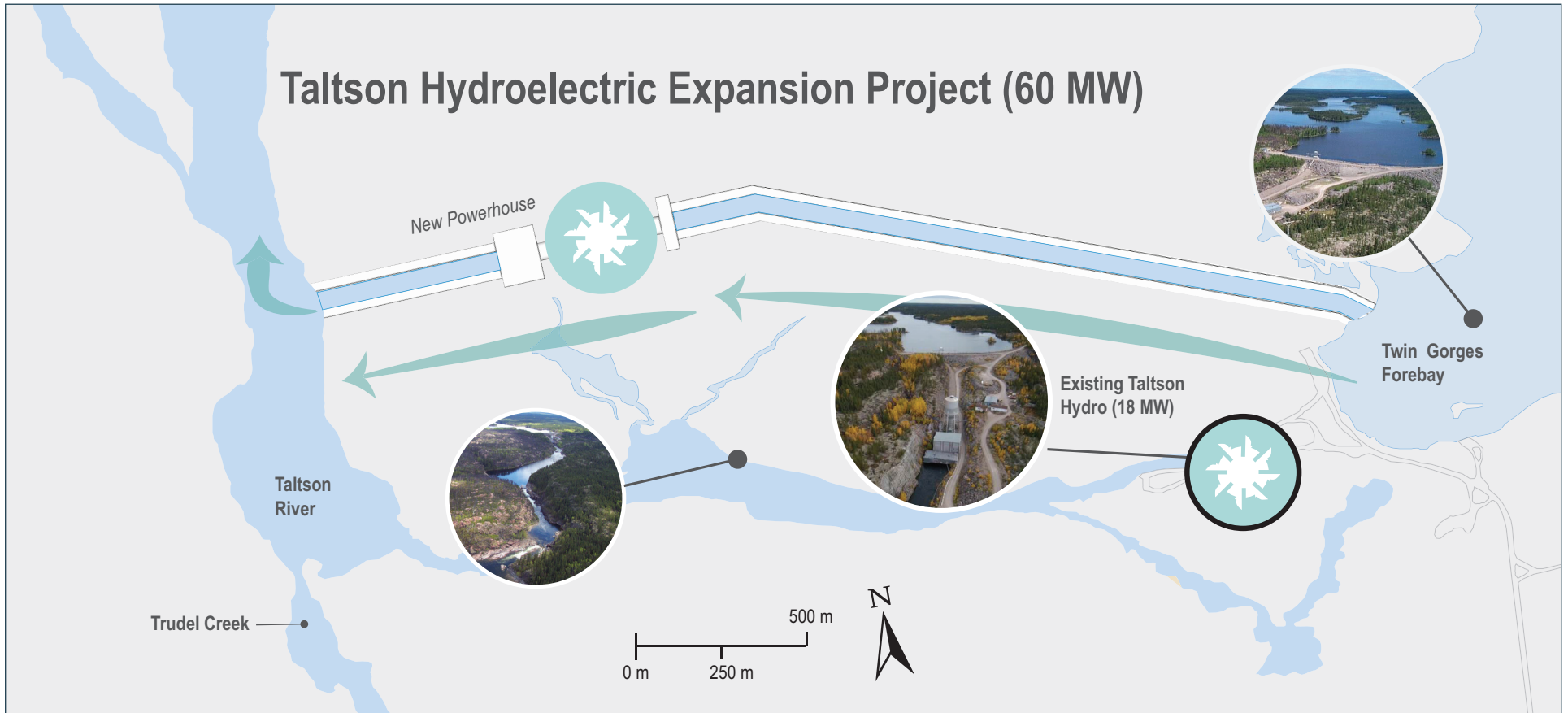


2030 ENERGY STRATEGY



The 2030 vision for energy in the NWT includes the Taltson hydroelectricity expansion, connecting the North and South Slave electricity system, as well as power lines to Fort Providence, Kakisa, Whatì and to the Slave Geological Province to supply communities and industry with renewable hydroelectricity. Over the long term the GNWT envisions an electric vehicle corridor starting at the NWT border to take advantage of clean hydroelectricity and future hydro transmission to Fort Simpson and Jean Marie River. The GNWT also envisions expansion and use of cleaner and renewable local energy resources such as wind, solar, natural gas, geothermal, and biomass.

STRATEGIC OBJECTIVE 6



MEETING NATIONAL CLIMATE CHANGE OBJECTIVES: TALTSON HYDROELECTRICITY EXPANSION AND CONNECTION TO SOUTHERN GRID

The Taltson hydroelectric system has additional capacity which is not currently being harnessed to produce power. A 60 Megawatt (MW) expansion next to the existing 18 MW hydro plant on the Taltson

River could deliver green energy to market within 5-10 years. This would rely on existing water storage with no new flooding, and would include a transmission line to connect to the southern grid. In the longer term, future phases of expansion could add up to 140 MW.

This clean renewable power could be exported south to displace coal use, contributing to national GHG reduction targets and providing a long-term revenue stream that could be invested in the North. Revenues

could fund energy projects that would stabilize the cost of energy in the NWT and make energy development a net contributor to the NWT economy.

If the Taltson project can be connected to either Alberta or Saskatchewan, it has the potential to save as much as 360 kt of GHG emissions a year for the life of the facility, likely longer than 50 years. This is equivalent to displacing about 22% of the total GHG emissions of the NWT.

SUPPORTING INDUSTRY WITH TALTSON

Connecting the North and South Slave grids, and expanding the Taltson system, would pave the way to connecting industry to clean renewable hydroelectricity. Hydroelectricity could provide industry with access to cheaper, renewable power, lowering energy costs for current and future development. As industry is the largest energy user and GHG emitter in the NWT, connecting industry to renewable power will result in a significant reduction in GHG emissions.

The biggest challenge for this action is the initial cost of connecting the widely dispersed industrial customers to the distant hydropower systems that serve our largest communities. Federal infrastructure funding is required to make this possible, as are long-term partnerships with industry. This investment would develop the long-term economic and environmental sustainability of the NWT.

Outside of transmission expansion to connect industry to hydroelectricity, there is the potential for the GNWT, and its Crown Corporation, NTPC, to work with industry and institutions to study and deploy new technologies, and to partner with industry to fund renewable energy projects.

SUPPORTING INDUSTRY THROUGH INCENTIVES

Industry is the largest single user of energy and emitter of GHG in the NWT. Industry also has access to skilled labour, specialized expertise and would lower operating costs by reducing fuel use and associated ghg emissions. For this reason the GNWT will introduce a Commercial and Industrial GHG Fund that will make up to \$2 million a year available to industry for GHG reduction projects. This fund will be competitive, application based, and will provide up to 25% rebate on approved project costs. This fund will incent industry to invest in projects that will lower the carbon intensity and make operations more competitive and efficient.

NATURAL GAS

Natural gas (NG) is a fossil fuel that has the potential to displace diesel and other fuels. It is a cost-effective alternative to diesel fuel for electricity, heating and transportation applications. It has the advantage of being cleaner burning and produces less GHG for the same amount of energy as diesel. The combustion of natural gas results in 25% less greenhouse gas emissions than diesel fuel, per unit of energy. Natural gas is odourless and non-toxic, and can be liquefied (liquefied natural gas or LNG) or compressed (compressed natural gas or CNG) and safely and efficiently transported over long distances to locations not supplied by pipeline or a NG local resource.

LNG is presently used for power generation in Inuvik—accounting for approximately 40% of power production—with the rest coming from diesel. Feasibility studies have been carried out to assess the business case for LNG power generation in Fort Simpson and Tuktoyaktuk. Small-scale LNG supply facilities could be developed in other NWT communities as additional natural gas resources are developed. There is potential to expand LNG use even more as new all season road corridors are developed in the NWT.

NWT natural gas resources could be extracted for local use. This avoids the need to import natural gas from the south and could produce local economic development and job creation. In the Beaufort Delta Region, with the opening of the Inuvik-Tuktoyaktuk Highway, there are natural gas resources potentially available to develop. The GNWT commits to work and partner with Indigenous governments in the region to explore the potential of extracting this local natural gas and using it locally and regionally. *The NWT Petroleum Resources* strategy addresses this opportunity.

EXPLORE EMERGING ENERGY TECHNOLOGIES

While there is potential for many forms of renewable energy throughout the NWT (hydroelectricity, solar, wind, geothermal, biomass), not all are proven to function reliably in a cold, remote environment. The GNWT will continue to monitor emerging technologies and will look for opportunities to partner with leaders in these fields to pilot promising new technologies within the NWT.

See Figure 8 on the next page for details.

STRATEGIC OBJECTIVE 6

Figure 8: Emerging Energy Technologies

■ SHORT TERM ■ MEDIUM TERM ■ LONG TERM



BIOENERGY

PROVEN VIABLE AND COST EFFECTIVE FOR HEAT
 LOCAL AIR POLLUTION REDUCED GHG
 MORE COMPLEX FOR ELECTRICITY
 WELL-ESTABLISHED TECHNOLOGY AND LOCAL RESOURCES



BIOMASS COMBINED HEAT AND POWER

PROVEN TECHNOLOGY BUT SCALE ISSUES FOR USE IN NWT
 LOCAL AIR POLLUTION REDUCED GHG
 HEAT AND ELECTRICITY
 LOCAL BIOMASS PREFERRED FOR BETTER ECONOMICS



NATURAL GAS

IN USE NOW IN THE NWT FOR POWER
 LESS EXPENSIVE THAN DIESEL
 STILL PRODUCES GHG
 IMPORTED, BUT LOCAL RESOURCE MAY BE AVAILABLE



ENERGY STORAGE

ALREADY IN USE IN THE NWT
 COSTLY
 ALLOWS FOR ↑ RENEWABLES, ↓ GHG
 SHORT LIFESPAN



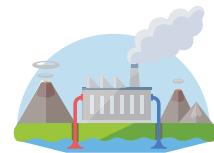
ELECTRIC THERMAL STORAGE

USES ELECTRICITY TO STORE HEAT FOR LATER USE
 UNTESTED IN THE NWT
 A WAY TO USE SURPLUS HYDROPOWER



LIQUID BIOFUELS

ISSUES WITH COLD WEATHER AND STORAGE
 OPTIONS FOR GASOLINE AND DIESEL REPLACEMENT
 TECHNOLOGY IS QUICKLY ADVANCING
 POTENTIAL ENVIRONMENTAL IMPACTS FROM PRODUCTIONS AND FOOD SECURITY



GEOHERMAL

SIGNIFICANT THEORETICAL POTENTIAL IN THE NWT
 REQUIRES COSTLY TEST WELLS BEFORE INVESTMENT
 ESTABLISHED TECHNOLOGY
 SMALL SCALE COULD RESULT IN COSTLY POWER



ENERGY FROM WASTE/BIOGAS

BEGINNING TO BE USED IN THE SOUTH
 UNPROVEN IN COLD CLIMATE
 UNKNOWN VIABILITY FOR VEHICLE USE
 LOCAL RESOURCE MAY BE TOO SMALL



SMART GRIDS AND DISTRIBUTED GENERATION

BECOMING MORE POPULAR AND AVAILABLE
 REMOTE COMMUNITIES ALREADY DISTRIBUTED
 SMART METERS ALREADY PILOTTED IN NWT
 MAY BE THE FUTURE OF GENERATION IN REMOTE COMMUNITIES



VERY SMALL NUCLEAR

NONE ARE LICENCED FOR USE IN CANADA
 COST OF POWER IS UNKNOWN
 REQUIRES COMMUNITY ACCEPTANCE
 COULD BE USED FOR HEAT AND POWER

ACTIONS: A LONGER TERM VISION: DEVELOP THE NWT'S ENERGY POTENTIAL, ADDRESS INDUSTRY EMISSIONS

2018-21 Short term

Advance the Taltson hydropower expansion project and transmission line connection to the North American electricity system

Advance opportunities and partnerships to connect the North and South Slave electricity systems together and connect to industrial developments

Support and partner with industry to increase renewable energy use and energy efficiency to reduce GHG emissions and make industry more competitive

Support industrial energy efficiency and GHG reductions through a new Commercial and Industrial GHG Fund

Explore and undertake feasibility of emerging technologies to applicability to the North and look for opportunities to partner with energy leaders

Seek opportunities to replace diesel with natural gas for heating and electricity

Work and partner with the appropriate Indigenous governments to explore the potential of developing local natural gas resources for use locally and regionally

Continue to explore and undertake feasibility of emerging technologies to applicability to the North and look for opportunities to partner with energy leaders

2021-30 Long term

Initiate development of the Taltson hydropower expansion project and transmission line connection to the North American electricity system

If feasible develop local natural gas resources for local use

Advance opportunities and partnerships to connect the North and South Slave electricity systems together and connect to industrial developments

Continue upgrades to hydropower infrastructure across the NWT

Continue to explore and undertake feasibility of emerging technologies to applicability to the North and look for opportunities to partner with energy leaders

Overhaul of NTPC Snare and Taltson hydropower assets for capacity increases, reliability, and efficiency

Bluefish hydroelectric plant overhaul and expansion

Advance the LaMartre Hydro expansion to service industrial development

Continue to explore and undertake feasibility of emerging technologies to applicability to the North and look for opportunities to partner with energy leaders

REPORTING ON OUR SUCCESS

The GNWT will prepare and publicly release annual reports to track and communicate activities and progress towards its Strategic Goals.



