



NORTHWEST TERRITORIES

Energy Initiatives Report

Reporting on Actions under
the 2030 Energy Strategy

Rapport sur les initiatives énergétiques

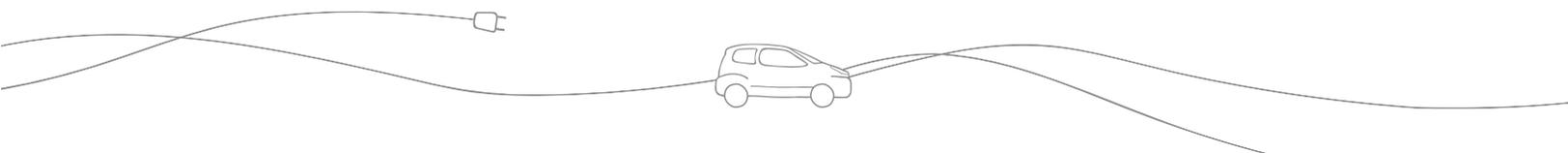
Rapport sur les mesures prises dans
le cadre de la Stratégie énergétique 2030

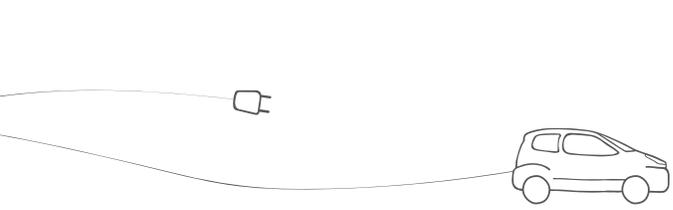
TERRITOIRES DU NORD-OUEST

2019/20

Le présent document contient la traduction
française du résumé et du message du ministre.

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest





Minister's Message

It has been quite a year.



Diane Archie
Minister of Infrastructure

As the COVID-19 global pandemic encompassed the world, the Government of the Northwest Territories (GNWT) was completing the second year of implementing its 2030 Energy Strategy. In 2019/20, the GNWT and its partners initiated and advanced projects and programs designed to ensure NWT communities, businesses and industry have access to secure, affordable and sustainable energy.

Balancing these priorities presents a challenge in the North. Resilient, reliable and locally-produced energy is critical, as even short interruptions in energy supply can quickly become a public emergency in our cold climate. Ensuring our energy supply is secure and reliable while stabilizing or reducing energy costs adds another layer of complexity. The GNWT is also committed to meeting its 2030 greenhouse gas (GHG) emissions reductions targets, as part of a coordinated government effort to address the effects of climate change and deliver integrated reporting on its progress. This is no small task.

Starting with work that has direct and immediate impacts, the GNWT expanded the reach of energy conservation and efficiency initiatives in 2019/20. We continued to upgrade government buildings through the Capital Asset Retrofit Fund (CARF) program, making them more energy efficient. A continuing success story, 75 percent of CARF's annual funding—approximately \$2.8 million—will come from the 2020/21 fiscal year's operation savings in utilities.

Additionally, thanks to funding from the federal Low Carbon Economy Leadership Fund (LCELFF), new and enhanced programs were launched by the Arctic Energy Alliance (AEA). These programs doubled the number of rebates provided from the previous year—worth almost one million dollars—creating energy awareness across the territory and affecting immediate change in NWT households and communities.

The GNWT also continued its GHG Grant Program. Designed for larger GHG reduction initiatives that exceed the AEA's capacity, the program approved applications for two local government projects this year and launched a stream for privately owned buildings and industry projects.

Work was advanced to plan the construction of a transmission line from the Taltson hydroelectric system to bring surplus power to Fort Providence and Kakisa. This project will virtually eliminate diesel-generated electricity and reduce power rates for these communities. Meanwhile, planning for a similar transmission line from the Snare hydroelectric system to Whatì was initiated.

Upgrades to existing hydro infrastructure (Taltson and Snare) began in 2019/20 to ensure this reliable source of green energy. Plans were approved and funding secured for diesel plant overhauls in Łutselk'e and Sachs Harbour, which will make them more reliable, efficient, and able to incorporate renewable energy like solar and wind into their systems. Also, design work began

for a new modular gas generating plant and LNG storage facility in Fort Simpson that is expected to displace 85 percent of diesel use for power generation.

As part of the Taltson Hydroelectricity Expansion Project, a research expedition and study was conducted with our partners at the Arctic Research Foundation (ARF) to map the lakebed of Great Slave Lake for two potential submarine transmission line routes. Five young students from Łutselk'e and the Yellowknife area joined the research team, gaining an invaluable opportunity to learn about exciting career paths and help advance northern science. Once constructed, this strategic infrastructure will provide the resource industry with access to green energy, and create employment opportunities for our Indigenous partners.

It has been quite a year. And despite the recent challenges of COVID-19, we will continue advancing these initiatives, following our long-term vision to ensure a secure, affordable and sustainable energy future and an economy less dependent on fossil fuels.

Quyanaq,
The Honourable Diane Archie
Minister of Infrastructure



Message du ministre

La dernière année aura été mouvementée.



Diane Archie
Ministre de l'Infrastructure

Pendant que nous étions confrontés à la pandémie de COVID-19, le gouvernement des Territoires du Nord-Ouest (GTNO) achevait la deuxième année de mise en œuvre de la Stratégie énergétique 2030. En 2019-2020, le GTNO et ses partenaires ont lancé et poursuivi des projets et des programmes conçus pour assurer un approvisionnement en énergie sécuritaire, abordable et durable aux collectivités et aux entreprises des TNO.

Dans le Nord, il est difficile d'établir un ordre dans les priorités énergétiques. Une production d'énergie locale fiable et souple est indispensable, car même une brève interruption de l'approvisionnement en énergie peut rapidement provoquer une urgence publique dans notre climat froid. Toutefois, il est compliqué d'assurer l'approvisionnement énergétique de façon sûre et stable tout en stabilisant ou en réduisant les coûts. Conformément à l'effort pangouvernemental pour contrer les effets du changement climatique, le GTNO s'engage à respecter ses objectifs de réduction des émissions de gaz à effet de serre (GES) pour 2030 et à produire des rapports intégrés sur les progrès réalisés. Par contre, ce n'est pas une mince affaire.

D'abord, le GTNO a entrepris les travaux qui auront des effets directs et immédiats. En 2019-2020, il a étendu la portée des initiatives de conservation et d'efficacité énergétique. Ensuite, grâce au Fonds de modernisation des immobilisations (le Fonds), il a modernisé les immeubles gouvernementaux pour améliorer leur rendement énergétique. Pour l'exercice de 2020-2021, 75 % du Fonds (environ 2,8 millions de dollars) proviendra des économies réalisées dans les services publics. En outre, grâce au Fonds pour une économie à faibles émissions de carbone du gouvernement fédéral, l'Arctic Energy Alliance (EAE) a pu lancer des programmes nouveaux et améliorés. Ces programmes ont fait doubler le nombre de remises octroyées comparativement à l'année précédente (de presque un million de dollars) et ont contribué à sensibiliser les résidents des TNO aux économies d'énergie et à apporter des changements immédiats dans les ménages et les collectivités.

Le GTNO continue d'offrir son programme de subventions publiques pour la réduction des GES qui a été conçu pour financer les initiatives

de réduction des GES plus grandes qui dépassent la capacité d'EAE. Le GTNO a approuvé les demandes de deux gouvernements locaux au titre de ce programme qui comporte maintenant un volet destiné aux bâtiments privés et aux projets industriels.

Les travaux de planification de la ligne de transmission pour transporter les surplus électriques de la centrale hydroélectrique de Taltson à Fort Providence et Kakisa ont progressé. Ce projet permettra de cesser presque complètement la production d'électricité générée par le diesel et de réduire les tarifs d'électricité dans ces collectivités. Pendant ce temps, les travaux de planification d'une ligne de transmission similaire de la centrale hydroélectrique Snare à Whatì ont été amorcés.

Les travaux de modernisation des centrales hydroélectriques existantes (Taltson et Snare) ont commencé en 2019-2020 pour

assurer un approvisionnement fiable en énergie verte. Les plans de remise en état des centrales alimentées au diesel de Łutselk'e et de Sachs Harbour ont été approuvés et le financement nécessaire obtenu. Les centrales seront plus fiables et plus efficaces, et pourront faire appel à des sources d'énergie renouvelable, comme les énergies solaire et éolienne. De plus, les travaux de conception d'une nouvelle centrale au gaz modulaire et d'une installation de stockage de gaz naturel liquéfié à Fort Simpson ont commencé. Grâce à cette nouvelle centrale, on s'attend à pouvoir remplacer 85 % du diesel pour la production d'énergie.

Dans le cadre du projet d'agrandissement de la centrale de la rivière Taltson, nous avons effectué des recherches et une étude avec nos partenaires de l'Arctic Research Foundation (ARF) pour cartographier le lit de lac du Grand lac des Esclaves afin d'y tracer l'itinéraire de

deux lignes de transmission sous-marines. Cinq étudiants des régions de Łutselk'e et de Yellowknife se sont joints à l'équipe de recherche, jouissant ainsi d'une occasion inestimable pour en apprendre plus sur des carrières intéressantes et faire avancer la science dans le Nord. Une fois terminée, cette centrale stratégique fournira de l'énergie verte à l'industrie des ressources naturelles et créera des emplois pour les partenaires autochtones.

Oui, la dernière année a été mouvementée. Malgré les récentes difficultés attribuables à la pandémie de COVID-19, nous continuons à avancer et à poursuivre nos objectifs à long terme pour bâtir un avenir énergétique sûr, abordable et durable, et une économie moins dépendante des combustibles fossiles.

Quyanaq,
Diane Archie
Ministre de l'Infrastructure

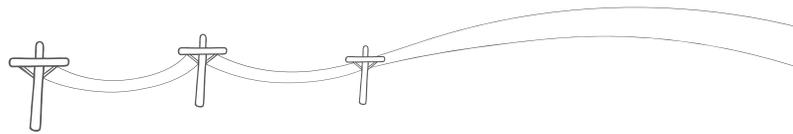


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Executive Summary

The 2030 Energy Strategy (Strategy) sets out the Government of the Northwest Territories (GNWT) long-term approach to supporting secure, affordable and sustainable energy in the NWT.

The 2019/20 fiscal year was the second year of implementing the Strategy. The Strategy is being implemented in tandem with the Climate Change Strategic Framework (CCSF) and the Carbon Tax.

Along with ensuring that energy in the NWT is secure and affordable, initiatives in the Strategy that reduce GHG emissions contribute to Goal One of the CCSF. In 2019/20, the GNWT and its partners made almost twenty-six million dollars in energy-related investments to implement the Strategy and its six Strategic Objectives.

The GNWT's Department of Infrastructure (INF) initiated a Community Microgrid Study, analyzing the five electrical micro-grids in the territory to understand the actual intermittent renewable capacity limit for solar and wind installations and if any changes should be made to the current twenty percent limit.

The Arctic Energy Alliance (AEA), with the addition of new federal funding from the Low Carbon Economy Leadership Fund (LCELF), nearly doubled the number of rebates it provided in 2019/20 compared to the previous year, representing a 150

percent increase worth almost a million dollars. These initiatives included a new Specified Income Home Winterization Program, which helps lower-income homeowners winterize their homes, and the Community Wood Stove Program, which purchases, delivers and installs new wood stoves to select communities on a two-year rotating basis. This year, 66 stoves were delivered and 54 were installed, worth approximately \$230,000. The AEA has offices in six communities across the NWT, and through its Regional Office Program, invested \$800,000 to coordinate work including trade shows, events and other community engagement activities.

The GNWT is proposing to construct a 170-km transmission line from the Taltson hydroelectricity system to Fort Providence and Kakisa/Dory Point. These communities are accessible by road and relatively close to the Taltson system, which has surplus hydropower available. INF selected the highway routing

and updated previous technical and costing studies. Preparatory work was also undertaken to plan formal consultations with affected Indigenous government organizations and project stakeholders.

Projects to replace existing diesel-electric power plants nearing the end of their operating life in Sachs Harbour and Łutselk'e were advanced in 2019/20. Modern plants will be much more efficient and facilitate the addition of renewable energy technologies to the local grid. Both projects were approved by Infrastructure Canada and contribution agreements were signed with the Northwest Territories Power Corporation (NTPC).

In 2019/20, a feasibility report was completed for the design of a new modular gas generating plant and LNG storage and vaporization facility in Fort Simpson. The project is expected to result in 85% diesel displacement and a 27% reduction in GHG emissions.

In Gamètì, over a year's worth of data has been gathered from a water gauge that will be used—along with funding from INF—to assess the potential for construction of a mini hydroelectric facility.

Through 2019/20, work continued to refit the GNWT Marine Transportation Services' (MTS) tug Jock McNiven, and to replace the ferry MV Lafferty's two 10-year-old engines. Work on the Lafferty was completed in time for the 2020 operating season and will yield over 150,000 litres in fuel savings and more than 420 tonnes of GHG reductions.

Work completed in 2019/20 will lead to the AEA's launch of the Electric Vehicle Rebate Program in 2020. The Program will provide a \$5,000 rebate for new electric vehicles, and up to \$500 for charging infrastructure in hydropower communities. The GNWT—through INF's Energy Division and Fuel Services Division—continues to monitor developments in the Government of Canada's Clean Fuel Standard (CFS) program. In 2019, the GNWT engaged the Saskatchewan Research Council to conduct a study to assess the feasibility of transporting, storing and using biofuels in the NWT.

The Capital Asset Retrofit Fund (CARF) program continued to deliver energy efficiency projects for GNWT facilities to reduce GHG emissions, energy use and operation costs. Savings resulting from projects completed in 2019/20, including schools in Hay River and Paulatuk, the Inuvik Regional Hospital and the Stanton Legacy Building are estimated to average \$209,700 annually.

In 2019/20, the GNWT's GHG Grant Program for Government approved two projects for funding, including energy efficiency and heating upgrades in three municipal buildings in the Town of Fort Smith, and the installation of wood pellet boilers in two Yellowknife school facilities.

A multi-year initiative to refurbish the components of the existing Taltson and Snare Forks hydroelectric generating facilities continued in 2019/20. Once completed, these projects will ensure forty to sixty more years of clean hydroelectricity from the 18-MW Taltson facility, and the continued reliability of the electricity supply from the 10 MW Snare Forks facility. These upgrades will also avoid potential GHG emissions from an unexpected shutdown, and slightly increase the NWT's hydroelectricity supply.

In 2019/20, discussions continued with Indigenous Government partners towards developing a Memorandum of Understanding (MOU) on the Taltson Hydro Expansion Project. Technical work is underway is on transmission routing—including bathymetry work to map a portion of the lake bottom—as well as the remaining design feasibility and the preliminary business case.

Looking ahead, the GNWT will continue advancing the Fort Providence/Kakisa transmission line project, as well as a similar

project to connect Whatì to the Snare hydroelectric system. A study on the promotion of electric vehicles and the deployment of a charging station network in the NWT is scheduled to be initiated, and a scope of work has been developed for a review of the Net Metering Program, which allows utility customers to produce renewable energy for the electrical grid and receive a kilowatt hour (kWh) credit for their future consumption. The GHG Grant Program will be supporting the already approved Fort Smith Electric Heat Project and YK1 Pellet Boiler Installations for Mildred Hall and Range Lake Schools. Both streams of the program will continue to accept applications for potential projects.

Sommaire

La Stratégie énergétique 2030 des Territoires du Nord-Ouest (la Stratégie) présente l'approche à long terme du gouvernement des Territoires du Nord-Ouest (GTNO) en vue d'assurer la stabilité, l'accessibilité et la durabilité de l'approvisionnement énergétique aux TNO.

En plus de garantir que l'approvisionnement en énergie aux TNO est fiable et abordable, les initiatives de la Stratégie prévues pour réduire les émissions de gaz à effets de serre (GES) contribuent à l'atteinte du premier objectif du Cadre stratégique. En 2019-2020, le GTNO et ses partenaires ont réalisé près de 26 M \$ d'investissements en lien avec l'énergie pour mettre en œuvre la Stratégie et atteindre ses six objectifs.

Le ministère de l'Infrastructure du GTNO a lancé une étude des microréseaux communautaires, analysant les cinq microréseaux électriques du territoire afin de comprendre la limite de capacité réelle des installations d'énergies intermittentes (solaire et éolien), et si des changements devraient être apportés à la limite actuelle de 20 %.

Arctic Energy Alliance (AEA), grâce à l'ajout de financement fédéral au titre du Fonds du leadership pour une économie à faibles émissions de carbone, a presque doublé le nombre de rabais qu'elle a accordés en 2019-2020 par rapport à l'année précédente, ce qui représente une augmentation de 150 % qui équivaut à près d'un million de dollars. Ces initiatives comprennent un nouveau programme d'aménagement

hivernal pour les propriétaires à faible revenu, et le programme communautaire de remplacement des poêles à bois qui, suivant un plan d'alternance de deux ans, facilite l'achat, la livraison et l'installation de nouveaux poêles à bois dans certaines collectivités. Cette année, 66 poêles ont été livrés et 54 ont été installés, pour une valeur d'environ 230 000 dollars. L'AEA a des bureaux dans six collectivités des Territoires du Nord-Ouest et, par l'intermédiaire de son programme de bureaux régionaux, a investi 800 000 dollars en coordination d'activités comme des salons professionnels, des événements et autres activités de consultation communautaire.

Le GTNO propose la construction d'une ligne de transmission de 170 km pour brancher Fort Providence et Kakisa et Dory Point à la centrale hydroélectrique de la rivière Taltson. Ces collectivités sont accessibles par la route et relativement proches du système de Taltson, qui dispose d'un surplus d'hydroélectricité. Le Ministère a sélectionné le tracé de la ligne de transmission et a mis à jour les études techniques et de coûts déjà effectuées. Des travaux préparatoires ont également été entrepris pour planifier des consultations officielles avec les organisations gouvernementales

autochtones et les parties prenantes du projet concernées. Les projets de remplacement des centrales électriques alimentées au diesel de Sachs Harbour et Lutselk'e, qui approchent de la fin de leur durée de vie utile, ont progressé au cours de l'exercice 2019-2020. Les nouvelles centrales seront beaucoup plus efficaces et faciliteront l'intégration des sources d'énergie renouvelable au réseau local. Les deux projets ont été approuvés par Infrastructure Canada et des accords de contribution ont été signés avec la Société d'énergie des Territoires du Nord-Ouest.

En 2019-2020, un rapport de faisabilité a été réalisé pour la conception d'une nouvelle centrale modulaire de production de gaz et d'une installation de stockage et de vaporisation de gaz naturel liquéfié à Fort Simpson. Le projet devrait permettre une réduction de l'utilisation du diesel de 85 % et une réduction des émissions de GES de 27 %. À Gamètì, plus d'une année de données ont été recueillies grâce à une jauge d'eau qui sera utilisée, grâce au financement octroyé par le Ministère, pour évaluer la possibilité d'y construire une mini installation hydroélectrique. En 2019-2020, les travaux se sont poursuivis pour remettre en état le remorqueur Jock McNiven du

Service de transport maritime du GTNO et pour remplacer les deux moteurs du traversier MV Lafferty, âgés de dix ans. Les travaux sur le Lafferty ont été achevés à temps pour la saison d'exploitation 2020, et permettront des économies de carburant de l'ordre de 150 000 litres, et des réductions des émissions de gaz à effet de serre de l'ordre de 420 tonnes par saison.

En 2020, les travaux achevés en 2019-2020 permettront le lancement du programme de remise pour les véhicules électriques de l'AEA. Ce programme offrira une remise de 5 000 dollars à l'achat d'un véhicule électrique neuf, et une remise pouvant atteindre 500 dollars pour les infrastructures de recharge dans les collectivités desservies par un réseau hydroélectrique. Le GTNO, par l'intermédiaire de la Division de l'énergie et de la Division de l'approvisionnement en combustible du Ministère, continue de suivre l'évolution du programme de Norme sur les combustibles propres du gouvernement du Canada. Toujours en 2019, le GTNO a demandé au Saskatchewan Research Council de mener une étude visant à évaluer la faisabilité du transport, du stockage et de l'utilisation des biocarburants liquides aux TNO. Le Fonds de modernisation des immobilisations a continué de réaliser des projets en lien avec l'efficacité énergétique afin de réduire les émissions de GES, la consommation d'énergie

et les coûts d'exploitation des installations du GTNO. Les économies découlant des projets réalisés en 2019-2020, notamment dans les écoles de Hay River et de Paulatuk, l'Hôpital régional d'Inuvik et à l'ancien Hôpital Stanton, sont estimées à 209 700 dollars par an en moyenne.

En 2019-2020, le financement nécessaire pour deux projets a été autorisé au titre du Programme de subventions publiques pour la réduction des émissions de GES : des travaux de mise à niveau de l'efficacité énergétique et des systèmes de chauffage dans trois bâtiments municipaux de la ville de Fort Smith, et l'installation de chaudières à granulés de bois dans deux écoles de Yellowknife. Une initiative pluriannuelle visant à remettre à neuf des éléments des centrales hydroélectriques existantes de Taltson et de Snare Forks s'est poursuivie au cours de l'année 2019-2020. Une fois terminés, ces projets permettront d'assurer de 40 à 60 années supplémentaires de production d'hydroélectricité depuis l'installation de Taltson de 18 MW, et de consolider l'approvisionnement en électricité à partir de l'installation de Snare Forks de 10 MW. Ces travaux de mise à niveau permettront également d'éviter les émissions potentielles de GES attribuables à un arrêt inattendu, et d'augmenter légèrement la capacité hydroélectrique des TNO. En 2019, la relation de travail du GTNO avec ses partenaires des gouvernements autochtones dans l'élaboration du projet

d'expansion du réseau hydroélectrique Taltson a été encadrée par l'adoption d'un protocole d'entente. Les travaux techniques en cours portent sur le trajet proposé pour la ligne de transport (y compris des travaux de bathymétrie pour cartographier une partie du fond du lac), l'étude de faisabilité restante, et l'analyse de rentabilité préliminaire. À l'avenir, le GTNO continuera de faire progresser le projet de ligne de transmission vers Fort Providence et Kakisa, ainsi qu'un projet similaire pour connecter Whatì au système hydroélectrique du lac Snare. Une étude sur la promotion des véhicules électriques et le déploiement d'un réseau de stations de recharge aux TNO doit être lancée, et un cahier des charges a été établi en vue de la révision du programme de facturation nette, qui permet aux clients des services publics de produire de l'énergie renouvelable pour le réseau électrique et de recevoir un crédit de kilowattheure pour leur consommation future. Le Programme de subventions publiques pour la réduction des émissions de GES permettra d'appuyer le projet de chauffage électrique de Fort Smith déjà approuvé, ainsi que l'installation de chaudières à granulés dans les installations de la commission scolaire YK1. En outre, on continuera d'accepter des demandes de projets dans les deux volets du programme.

Balancing Priorities and Decision Making

THE GNWT WEIGHS THE FOLLOWING FACTORS WHEN MAKING DECISIONS ABOUT ENERGY INITIATIVES:

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





Introduction

The 2019/20 Energy Initiatives Report: Reporting on Actions under the 2030 Energy Strategy (Report) summarizes the key energy actions and initiatives undertaken by the GNWT and its partners over the past year, looks ahead to potential future projects, policies and programs, and provides a high-level review of the Northwest Territories' current energy and greenhouse gas emissions situation.

All of the actions and initiatives in the Report fall under the 2030 Energy Strategy (Strategy), which sets out the GNWT's long-term vision for transitioning to a lower-carbon economy while ensuring the NWT has access to secure and affordable energy. 2019/20 represents the second year of implementing the Strategy.

This year's Report highlights the tremendous amount of energy conservation and efficiency initiatives that were undertaken by the GNWT through programs like the Capital Asset Retrofit Fund (CARF) and delivery agents like the Arctic Energy Alliance

(AEA). These initiatives create energy awareness and provide immediate energy savings and benefits for people and communities.

The Report also shows how the GNWT is setting the stage for even more ambitious energy projects, from community-led renewable energy solutions; to electric vehicle infrastructure; to major infrastructure like transmission lines, wind, hydro and power plant upgrades. As these initiatives come online, they will ultimately lead to greater energy reliability, dollar savings and GHG emissions reductions.

The Report begins with a snapshot of the current energy situation in the NWT, including a breakdown of energy use and emissions by various sectors over time. It then presents the major 2019/20 energy initiatives. Each initiative is placed in a section that corresponds to one of the Strategy's six Strategic Objectives (detailed on page 7) where they are most relevant. The Report concludes with a look ahead on the projects, initiatives and programs the GNWT and its partners will be focusing on over 2020/21.

NWT ENERGY SNAPSHOT

NWT Energy Supply and Use

Providing reliable, affordable and sustainable energy to the NWT’s many small, isolated communities is a constant challenge. Historically, the NWT has been highly dependent on imported petroleum products for its energy requirements, which results in high energy costs and environmental impacts. Over time, Northerners are slowly increasing their use of alternative energy sources, such as wood for heating and solar panels for electricity, to help reduce energy costs and greenhouse gas emissions.

Figure 1: 2018 Energy Use by Sector (Terajoules)

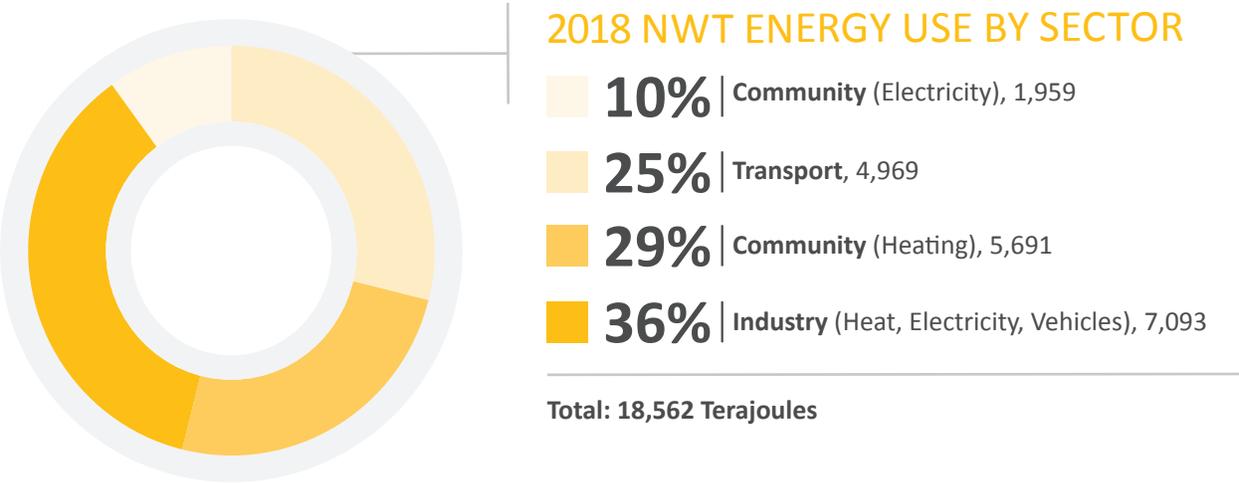


Figure 2: 2018 Energy Use by Sector, Excluding Industry (Terajoules)

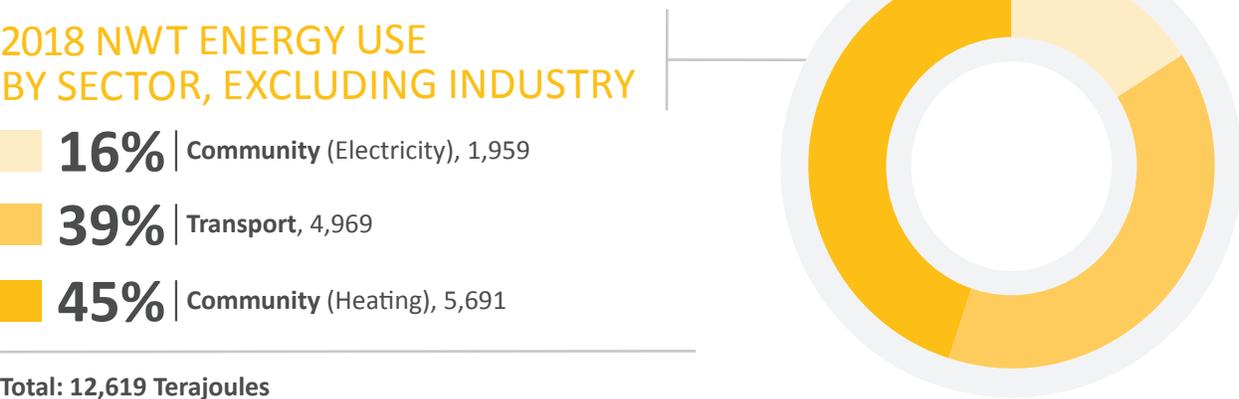
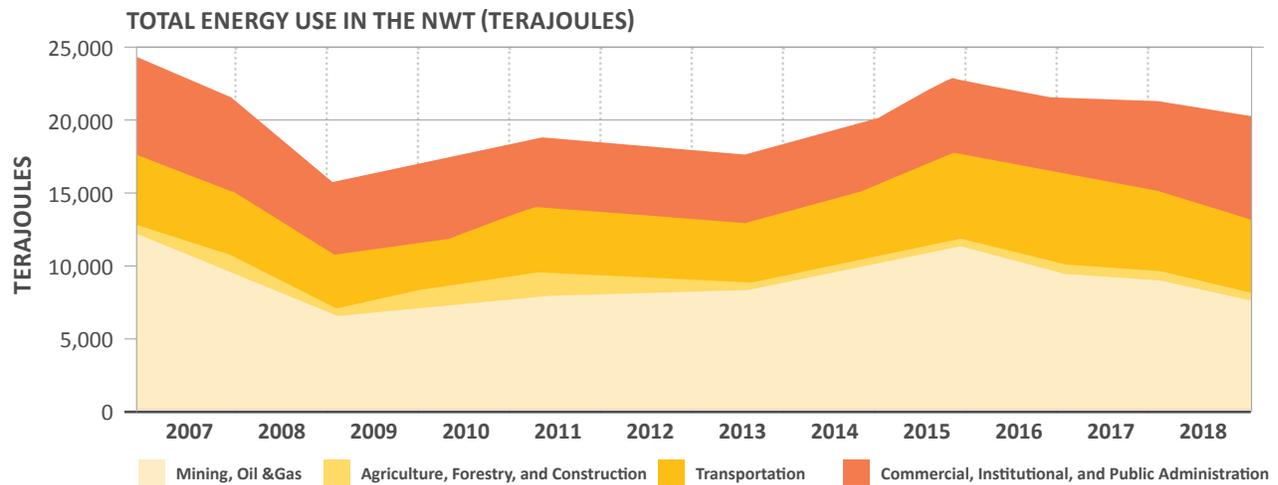


Figure 3: Total Energy Use Trend by Sector in the NWT



NWT ELECTRICITY GENERATION

Unlike most of Canada, the NWT is not connected to the North American electrical grid. Without access to electricity from the North American grid, NWT communities must have their own source of full-scale electricity generation including redundant back-up, which adds costs that affect electricity rates.

Most of the electricity generated for NWT residents (Figure 4) comes from hydroelectric facilities, where the energy of flowing rivers is transformed into electricity. Communities not connected to our hydroelectric grid rely on diesel or natural gas generators for electricity, but are also transitioning to

an increased use of renewable energy technologies, such as solar photovoltaic systems (Figure 5). The territory’s mines also use diesel generators to produce most of their electricity, with the exception of one diamond mine that incorporates an on-site wind farm to supplement diesel generation.

Figure 4: Power Generation Trend

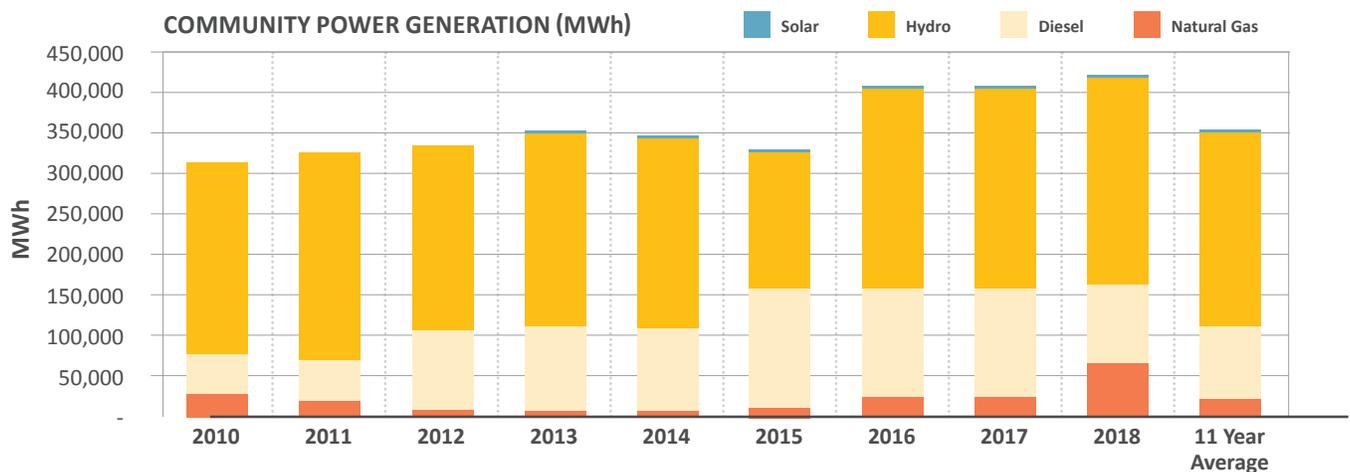
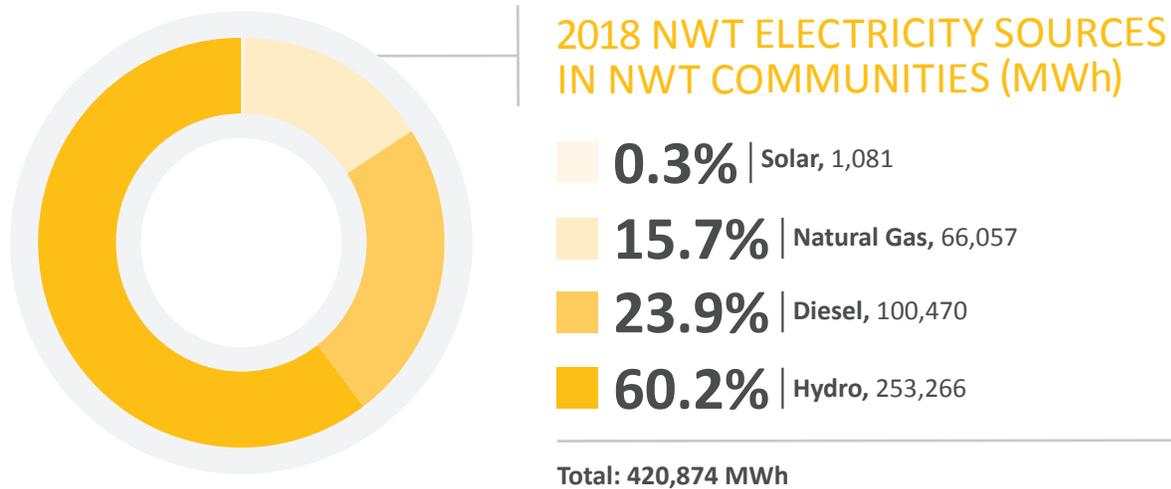


Figure 5: 2018 Electricity Generation by Source (Megawatt-hours)



NWT GREENHOUSE GAS EMISSIONS

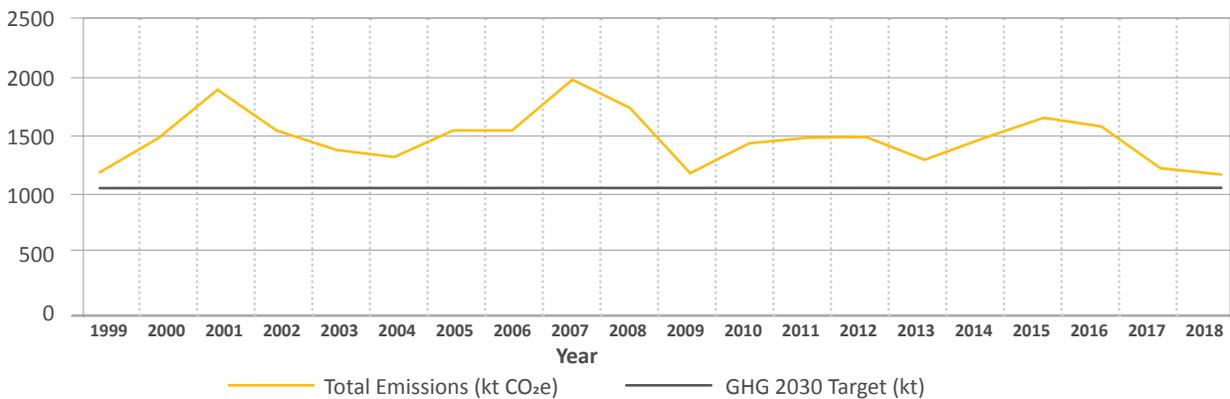
Under Goal #1 of the 2030 NWT Climate Change Strategic Framework (CCSF), the NWT is committed to reducing greenhouse gas (GHG) emissions by 30% below 2005 levels by 2030. In 2005, the NWT's total GHG emissions were 1,563 kilotonnes (kt) CO₂e.

To reach the 30% reduction target, the NWT's total annual GHG emissions need to be reduced to 1,094 kt CO₂e by 2030.

Figure 6 below shows the NWT's historical total annual GHG emissions. For 2018, the most recent year for which data is available, the NWT's total

annual emissions were 1,260 kt CO₂e. Each year, the NWT's GHG emissions fluctuate somewhat depending on economic activity, climatic conditions and investments in renewable energy systems, all of which affect the total demand for fossil fuels.

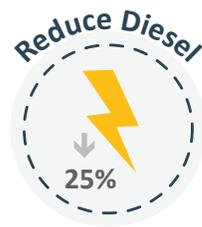
Figure 6: NWT Historical Greenhouse Gas Emissions 1999 – 2018 kt CO₂e



Information on the projected decrease in total NWT GHG emissions due to implementation of the 2030 Energy Strategy can be found in Appendix D.

2030 Energy Strategy

Released in 2018, the 2030 Energy Strategy (Strategy) sets out the GNWT's long-term approach to supporting secure, affordable and sustainable energy in the NWT. The 2019/20 fiscal year was the second year of implementing the Strategy, through Actions and Initiatives in the three-year Energy Action Plan. The Strategy has six (6) Strategic Objectives to guide decision-makers.



KEY LINKAGES TO THE CLIMATE CHANGE STRATEGIC FRAMEWORK AND CARBON TAX

The Strategy is being implemented together with the Climate Change Strategic Framework (CCSF) and the Carbon Tax. Along with ensuring that energy in the NWT is secure and affordable, initiatives in the Strategy that reduce GHG emissions contribute to Goal One of the CCSF.

ORGANIZATIONAL ROLES

Responsibility for implementing the Strategy is shared between the GNWT, the Northwest Territories Power Corporation and the Arctic Energy Alliance.

We also work with communities and Indigenous partners across the NWT on shared objectives that advance the Strategy.

Government of the Northwest Territories (GNWT): Led by the Department of Infrastructure (INF), the GNWT develops policy and designs and administers application-based funding programs to support communities, commercial enterprises and industry to reduce energy use and GHG emissions. The GNWT also partners with communities and other stakeholders to achieve the strategic objectives of the Strategy.

Northwest Territories Power Corporation (NTPC): A GNWT Crown Corporation, the NTPC owns and operates the NWT's hydroelectric facilities and most of the territory's diesel electric facilities. Through its capital plan and in partnership with the

NWT communities and other utilities, NTPC leads conventional, alternative and renewable electricity solutions to maintain a reliable and affordable electricity system, as well as reduce GHG emissions from diesel-generated electricity.

Arctic Energy Alliance (AEA): A primary energy implementation partner, the AEA provides energy efficiency, conservation, renewable and alternative energy programs and services to residents, businesses and communities on behalf of the GNWT. The AEA helps NWT residents implement solutions, increasing the use of renewable energy for heating and reducing transportation emissions.

ENERGY INVESTMENTS

The GNWT and its partners—including the federal government, NTPC, and the AEA, as well as residents, communities, business and industry—are making significant investments to implement the Strategy.

Figure 7 provides a breakdown of \$25.84 million in energy-related investments the GNWT made during 2019/20 (including federal funding support) by strategic objective:

Figure 7: 2019/20 GNWT Energy-Related Investments by Strategic Objective

2019/20 GNWT ENERGY-RELATED INVESTMENTS BY STRATEGIC OBJECTIVE	
STRATEGIC OBJECTIVE	INVESTMENT
1. Working Together	\$103,000
2. Electricity	\$12,444,000
3. Transportation	\$421,000
4 & 5. Energy Efficiency and Space Heating	\$9,379,000
6. Long Term Vision	\$3,492,000
TOTAL	\$25,837,000

Figure 8: 2019/20 GNWT Energy-Related Investments by Funding Stream

2019/20 GNWT ENERGY-RELATED INVESTMENTS BY STRATEGIC OBJECTIVE	
STRATEGIC OBJECTIVE	INVESTMENT
GHG Grant Programs	\$159,000
Arctic Energy Alliance (Core Funding and LCELF Funding)	\$4,990,000
Federal Low Carbon Economy Leadership Fund Portfolios (Excluding AEA Supplement)	\$449,000
Federal Investing in Canada Infrastructure Program Projects	\$11,814,000
Indigenous and Northern Affairs Canada Funding (Taltson Expansion)	\$2,288,000
Energy Core Funding	\$843,000
Capital Asset Retrofit Fund (CARF)	\$3,800,000
Salaries and Admin Expenses	\$1,494,000
TOTAL	\$25,837,000

Figure 8 provides a breakdown of \$25.84 million in energy-related investments the GNWT made during 2019/20 by funding stream.

2019/20 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 1 – WORK TOGETHER

WORK TOGETHER TO FIND SOLUTIONS:

COMMUNITY ENGAGEMENT, PARTICIPATION AND EMPOWERMENT

The GNWT understands that communities want to be more engaged and involved in energy solutions. This includes

being partners in developing solutions, undertaking projects independently, and simply being updated on local solutions.

The GNWT is working to ensure better communication, engagement and support to the communities.

OUTREACH & ENERGY LITERACY

Energy Lesson Plans

As we transition to a lower carbon economy, energy production, distribution and reliability are real-world challenges that students will have to face. Green energy production and new energy technologies can provide solutions to future energy needs for Northerners.

In 2018, INF developed eight energy-focused lesson plans to meet outcomes in the NWT high school experiential science curriculum. They encourage students to learn how their communities generate energy, explore alternative ways of producing green electricity, and help them understand climate change mitigation and GHG reduction strategies.

Activities and projects are hands-on and student-directed. They provide a venue for students

to research, learn and discuss community energy needs, and understand the process for producing energy for business and homes. By exploring perceptions and behaviours around energy usage, students will be able to create projects that are not only informative to them and their classmates, but to their communities.

In 2019/20, these lesson plans were designed and produced into a teacher's resource package that can be taught conventionally or digitally through platforms like Google Classroom. Packages will be available to schools in the 2020 school year.

Biomass Training

The Northwest Territories continues to lead in the deployment of biomass heating

systems. When properly maintained, biomass heating systems can reduce costs in the range of 10% to 40% compared to traditional fuel systems. The solid fuel is also considered greenhouse gas (GHG) neutral. However, owners and operators have said that maintenance is more labour intensive and technically challenging than fossil fuel-based heating systems. The GNWT wants to ensure owners and operators have the knowledge and skills to overcome these challenges.

In order to benefit from the economic and GHG savings realized from biomass heating, a technical training course was developed by INF and delivered by the Department of Municipal and Community Affairs' (MACA) School of Community Government.

In March 2019, INF piloted a Biomass Training Course in Yellowknife. Several local boiler operators with various technical backgrounds audited the course. These operators provided feedback to technical consultants who completed the final draft of the student workbook and testing materials.

On September 14-15, 2019, the first Biomass Training Course was held in Yellowknife. Boiler operators from NWT communities, different levels of government, and industry

were invited. Fifteen students completed the course and there is demand for more training in 2020.

Energy Minutes

In 2019/20, INF developed eight radio screenplays called Energy Minutes. A cross between a radio ad and a public service announcement, the Energy Minutes were designed to address frequently asked questions, such as where does our energy come from, how can I make my home

more energy-efficient, why can't we go 100% renewable, and why does the power go out?

Due to COVID-19, airing of the Energy Minutes was delayed. They are planned to air in 2020/21.

COMMUNITY PROJECTS

Community Microgrid Study

Out of the 33 communities in the NWT, 25 are small, isolated, and not connected to an electricity grid. They are primarily reliant on fossil fuel (mostly diesel, some natural gas) generated electricity. The electricity loads in these communities range from 40kW to 4 MW.

While the GNWT promotes the increased use of local and renewable energy for electricity production, it has also had to set a cap on the amount of intermittent renewable energy that can be installed in each community to ensure grid stability and generator efficiency. This cap was set at 20% of the community average annual load, which means it is considered low penetration. Due to increased deployment of small scale (< 15kW) and medium scale (>15 kW) intermittent

renewable energy projects in recent years, several NWT communities are approaching, or have met, this 20% limit. In practice, this 20% cap means that the amount of diesel that can be displaced by renewables is quite low. For instance, in the case of solar this may typically amount to about 2% diesel displacement. The GNWT has investigated the use of a battery solution (Colville Lake) that allowed installation of solar panels at 100% average annual load, which resulted in a reduction in annual diesel use of approximately 15%. However, battery solutions are extremely expensive.

In 2019/20, INF initiated a power system stability analysis on each of the as-built electrical micro-grids within Inuvik, Łutselk'e, Tulita, Fort Liard

and Fort Simpson. The GNWT is seeking to understand the actual intermittent renewable capacity limit for solar and wind installations, the limiting factors in maintaining grid stability above the actual intermittent renewable capacity, what changes, if any, should be made to the 20% limit, and what combination of intermittent renewables and stability/storage solutions are optimal for these communities. The study is scheduled to be completed in 2020/21.

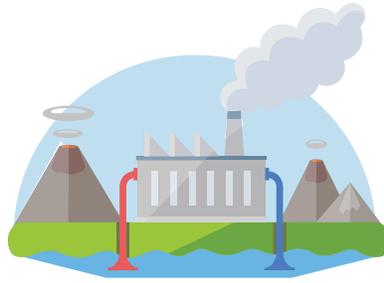


Raised beds at Gamètì Greenhouse

Gamètì Greenhouse

The Community of Gamètì' has been operating a 1,600 square foot greenhouse and farm operation (2 acres) since the summer of 2014. With a biomass boiler, the greenhouse had the capability to heat growing space and extend the growing season.

In 2019/20, the Community Government's Sustainable Northern Agriculture Project (SNAP) received funding from the GNWT's GHG Grant Program to make efficiency upgrades to the operation, including installing insulation, thermal curtains and an energy management system to the greenhouse, and installing an anaerobic digester in a repurposed building. This resulted in increased capacity for local food production in the community and the ability to extend the growing season.



Fort Liard Geothermal

INF and the NWT Geological Survey engaged with the Acho Dene Koe (ADK) First Nation of Fort Liard to develop a study to understand and characterize the geothermal resource in the Fort Liard area. This included conducting an analysis of previous seismic data, potential lab/core reviews, outcrop exploration as well as the potential for a drilling program to obtain temperature profiles. This work will remove significant risk for a potential future geothermal development.

INF provided \$150,000 in 2019/20 to fund the desktop work (Phase 1) and committed \$100,000 in 2020/21 to fund the field and lab work in the summer of 2020 (Phase 2). The work from both phases would be used to publish a study that would facilitate moving the project towards an exploratory drilling program (Phase 3). However, the COVID-19 situation led to the 2020 field season work being cancelled.

The GNWT and ADK are currently discussing a recovery schedule, with Phase 2 delayed until at least the summer of 2021.

Specified Income Home Winterization Program (AEA)

Winterization is a low-cost, high-impact way to save energy. With additional funding from the GNWT and the Government of Canada through the Low Carbon Economy Leadership Fund (LCELFF), the AEA was able to deliver this program, which provides lower-income homeowners with the supplies, knowledge and other resources to winterize their homes, as well as additional energy-saving products such as LED light bulbs. Based on a community partnership model, each community partner hires a community liaison worker trained by the AEA, holds workshops for lower-income homeowners in their community, and helps ensure the contents of energy efficiency kits are properly installed in each participant's home. In 2019/20 the AEA held six community workshops and distributed 120 energy efficiency kits worth \$41,000.



Whatì resident with new wood stove.

Community Wood Stove Program (AEA)

Biomass heating is an effective way to reduce the NWT's carbon emissions. Under the Community Wood Stove Program, the AEA forms a two-year partnership with a community government or community-based organization to purchase, deliver and install wood stoves for residents. The AEA provides half of the funding for each project and the community partner provides the other half.

Many of the stoves installed are replacements for older stoves. New stoves burn less wood for the same amount of heat, are installed according to proper safety codes, and produce fewer particulate emissions. For recipients that did not have a wood stove, installing one reduces heating oil consumption and greenhouse gas emissions. Under this program, stoves are purchased and delivered in the first year. In the second year, they are installed.

In 2019/20, 66 stoves were delivered and 54 were installed,

worth approximately \$230,000. Stoves that had been delivered the previous fiscal year were installed in Behchoko, Gamètì, Wekweeti and Whatì. Additional stoves were delivered to Deline, Jean Marie River, Sambaa K'e, Whatì and Gamètì. They included 52 replacement stoves and two to recipients with no previous stove. These stoves are anticipated to displace 10 tonnes of GHGs, along with 49 cords of firewood and 2400 kg of particulate emissions. They will also save 3000 gigajoules of energy.

Regional Office Program (AEA)

While the Arctic Energy Alliance is well known for its rebate and energy evaluation programs, community engagement is just as important. By engaging with community members, the AEA can provide education and advice, and promote and coordinate its programs across the NWT. The AEA has offices in six communities across the NWT: Fort Simpson, Hay River, Inuvik, Norman Wells, Whatì and Yellowknife. These offices allow a closer connection to the communities throughout the territory and regional coordinators visit each community in their region at least twice a year.

The AEA's Regional Office Program invested \$800,000 in 2019/20 to coordinate the work of these offices, including trade shows, events and other community engagement

activities. They also partner with organizations throughout the NWT to inform Northerners about AEA programs and the importance of responsible energy use. When people are energy conscious, they are more likely to adopt efficient and renewable energy practices. Engagement is one of the main tools the AEA uses to foster that energy consciousness.

2019/20 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 2 – REDUCE DIESEL

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

Reducing reliance on diesel electricity generation in communities is a priority. The GNWT and partners are working

to implement renewable and alternative energy solutions appropriate to each community and region. The intent is to

reduce GHG emissions from diesel electricity by 25%, or 18 KT, below average historical levels by 2030.



TRANSMISSION LINES

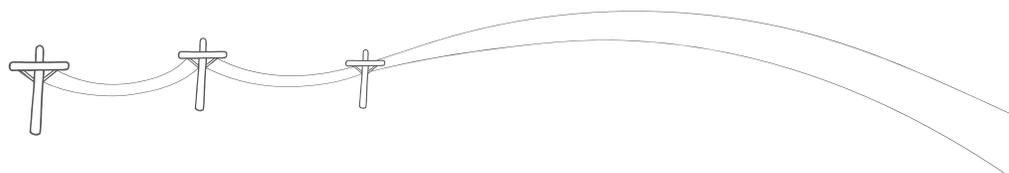
TRANSMISSION LINES

Fort Providence and Kakisa Transmission Line

As part of its commitment to reduce greenhouse gas emissions (GHG) from electricity generation in diesel-powered communities, the GNWT is proposing to construct a 170-km transmission line from the Taltson hydroelectricity system to Fort Providence and Kakisa/Dory Point. These communities are accessible by road and relatively close to the Taltson system, which has surplus hydropower available. In 2019/20, INF advanced the project by selecting the highway routing and updating previous technical and costing studies to reflect this decision. Preparatory work was also undertaken to

plan formal consultations with affected Indigenous government organizations and engagement activities with project stakeholders. The results of this work will support the project development activities planned for 2020/21.

This project will reduce diesel fuel consumption for power generation by about 1,000,000 liters and reduce GHG emissions by 3,000 tonnes per year. Replacing diesel electricity with hydroelectricity will also help reduce the cost of power in these communities (see following page).





Fort Providence

Connection to NUL

Dory Point

Kakisa Lake

Kakisa

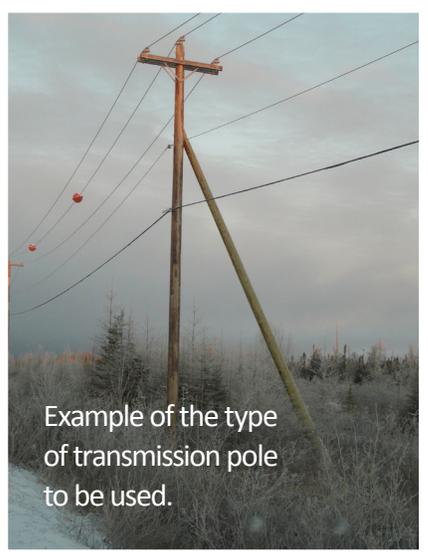
Connection to NUL



- Connection Points
- - - - - Proposed Transmission Line
- 5 Highway
- S Substation
- NUL Northland Utilities

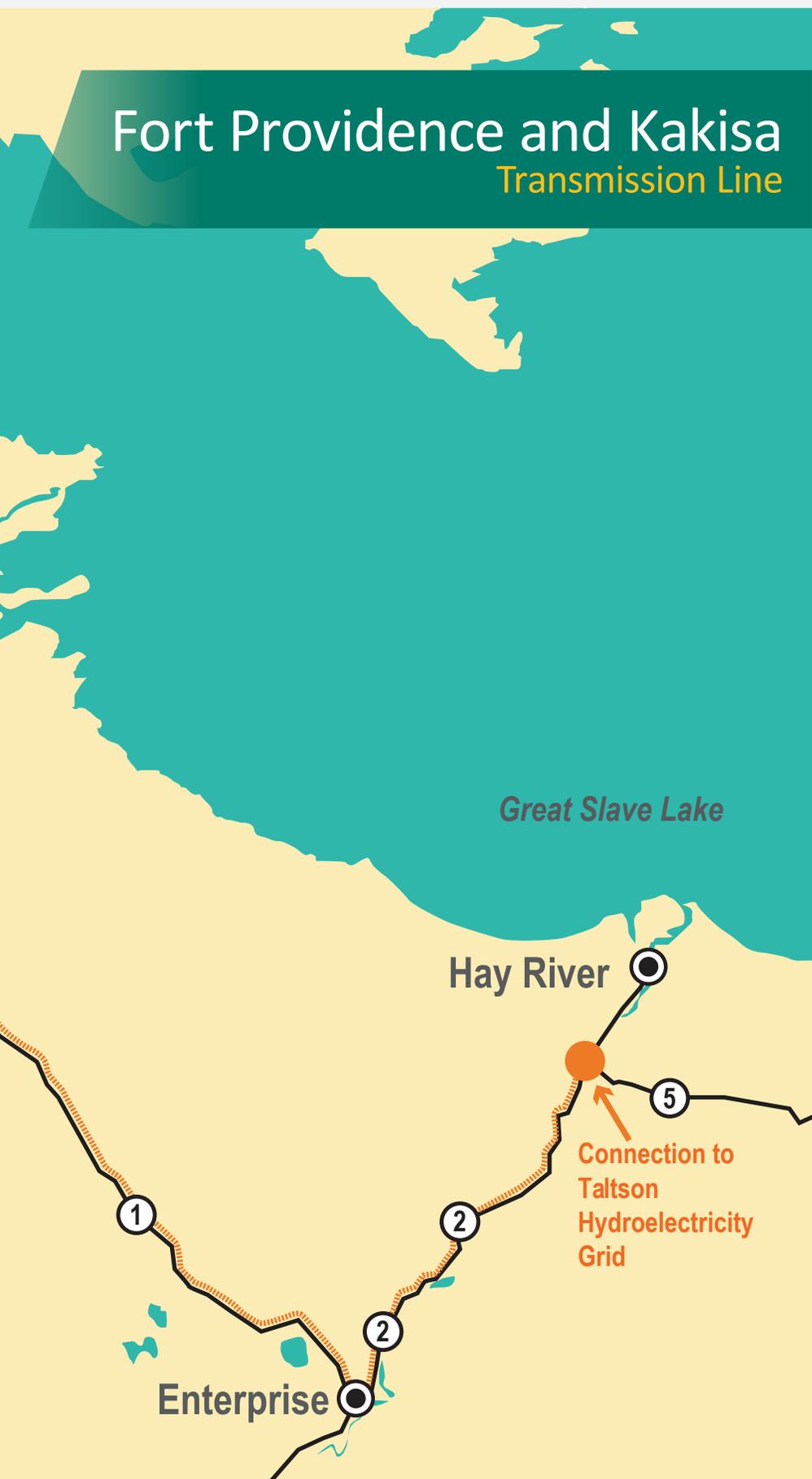
North

10 km



Example of the type of transmission pole to be used.

Fort Providence and Kakisa Transmission Line



OUR PREFERRED ROUTE

The GNWT is proposing to build the transmission line completely within the existing highway corridors to minimize any potential disturbances or impacts. The transmission line would connect to the Taltson hydroelectricity system south of Hay River (near the junction of Highways 2 and 5) and connect to Kakisa/Dory Point and Fort Providence (see map).

PROJECT FUNDING

Subject to federal support, the GNWT will cover 100% of the capital cost of the project, which means these communities will get reduced electricity rates. Once built, the transmission line will be operated and maintained by the NWT Power Corporation (NTPC).

WHO WILL SUPPLY MY POWER?

Fort Providence, Dory Point and Kakisa will continue to get electricity from the existing local utility. What will change is that this power will no longer come from diesel power plants. Power will now be provided by NTPC to the local utility, which in this case is Northland Utilities (NUL), for sale in the community. The diesel power plants will remain in place to serve as back-up power generation units in the event of a power outage on the new transmission line.

TENTATIVE TIMELINE FOR CONSTRUCTION

Construction of the proposed transmission line could start as early as 2022. However, before any construction begins, the GNWT will work together with NTPC and NUL, the communities of Fort Providence and Kakisa, all potentially affected Indigenous governments and organizations, regulatory agencies, and the Government of Canada.



WIND ENERGY

WIND ENERGY

Inuvik Wind Project

The Inuvik Wind Project is a key initiative under the 2030 Energy Strategy and the first project in the NWT approved for funding under the Investing in Canada Infrastructure Program (ICIP).

This project includes the installation of a single 3.5 megawatt wind turbine and a small battery storage system, a six-kilometer access road, and a distribution line connecting to existing lines near Inuvik's Mike Zubko Airport.

Wind could reduce diesel consumption in our largest off-grid community by 30-percent by offsetting approximately three million litres of diesel per year, and result in 3.4 million dollars in fuel savings. It would also reduce greenhouse gas emissions by 6,000 tonnes, which would help us meet our 25-percent reduction target for diesel from electricity. In 2019/20, the project was undergoing review by the Gwich'in Land and Water Board to secure project permits.

Sachs Harbour Wind Monitoring

In 2016/17, INF received funding from the federal Northern Responsible Energy Approach for Community Heat and Electricity (REACHE) program to investigate new sites for wind monitoring around the community. In 2017/18 a site was selected, and with funding from the GNWT and REACHE, a 30-metre wind monitoring tower was constructed in March 2018. The tower also houses research equipment for a University of Victoria research team. In conjunction with a new diesel-electric plant, the project is expected to displace about 100 tonnes of GHG emissions per year.

The data collected from a two-year monitoring campaign will be analysed and used for a wind energy integration study (in conjunction with the new diesel

plant currently being installed in Sachs Harbour) to determine the potential for a wind energy project. The wind energy integration study along with a community visit was initially planned for summer 2020.

Recent technical issues have prevented the collection of the final data packet from the wind monitoring equipment. The current NWT border closure due to COVID-19 prevents the contractor's technician from traveling to site for repairs. INF staff is exploring other means of having the wind monitoring unit repaired using local contractors. The community engagement plan—including a Sachs Harbour community visit by INF staff to provide an update on the results of the wind monitoring campaign—is currently on hold.

Norman Wells Wind Monitoring

A previous study from the Aurora Research Institute (ARI) concluded that wind speeds could be viable at eighty meters above ground level near the previous meteorological tower installed on the Key Scarp. A contract was awarded in September 2017 to Hatch Engineering to explore potential wind sites near the community and to perform integration modeling for turbine-sizing options and energy-storage systems that could be integrated into a new power plant investment in the community.

A site located near the town was identified and a field verified as the optimal site for the installation of a fifty-metre wind monitoring tower with heated sensors. In 2017/18, INF secured \$100,000 in federal funding to purchase and deliver

wind monitoring equipment to Norman Wells. In April 2019, the tower was successfully installed, marking the start of a two-year monitoring campaign.

Once the installation has two years of wind data, the data will be used to assess the wind

resource and determine the potential for a wind energy project. If the project is viable, an application will be prepared for federal ICIP funding to advance the renewable energy project.

Although the wind tower is currently operational, COVID-19

travel restrictions are limiting the preventative maintenance necessary for continued operation. ARI is working with local contractors to develop the capacity for this work.



DIESEL UPGRADES

DIESEL PLANT REPLACEMENTS AND EFFICIENCY IMPROVEMENTS

Sachs Harbour

This project involves the replacement of the existing diesel-electric plant which is at the end of its operating life. A modern plant will also facilitate the addition of renewable energy technologies to the local grid. In 2019/20, the project was approved by Infrastructure Canada—through the Arctic Energy Fund—and a contribution agreement was signed with NTPC. The total budget is \$8,900,000 (75% ICIP + 25% NTPC). The 75% federal funding means that NTPC saves \$6,675,000 from its capital plan, which avoids electricity rate increases.

The existing power plant is at the end of its life and has a fuel efficiency of 3.08 kWh/L, considered to be very low. Installation of a new high-efficiency diesel plant combined with the wind turbine will provide the community with a reliable and cleaner supply of electricity. The project is expected

to displace about 100 tonnes of GHG emissions per year.

The new plant and auxiliary equipment is scheduled to arrive in Sachs Harbour in the Fall of 2020. Although the project has moved into the construction phase, work at the site has been suspended due to the COVID-19 shutdown, and the construction start date pushed back to the Spring of 2021. NTPC is taking steps to ensure the existing plant can continue to operate until 2023.

Łutsel K'e

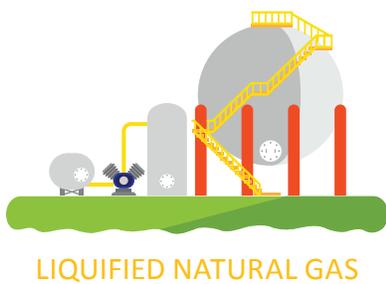
Like Sachs Harbour, the existing diesel-electric plant in Łutsel K'e is also at the end of its operating life. And similarly, a modern plant will facilitate the addition of renewable energy technologies to the community's grid. In 2019/20, the project was approved by Infrastructure Canada—through the Green Infrastructure Fund—

and a contribution agreement was signed with NTPC. A climate lens assessment was also completed. The total budget is \$11,700,000 (75% ICIP + 25% NTPC). The 75% federal funding means that NTPC saves \$8,775,000 from its capital plan, which avoids electricity rate increases.

At the request of the community, the new diesel plant will be relocated to a more appropriate site. The new diesel plant will provide the community with reliable power and will be able to more easily accommodate the

addition of renewable energy technologies to the local grid. The project is expected to reduce GHG emissions by 100 tonnes per year.

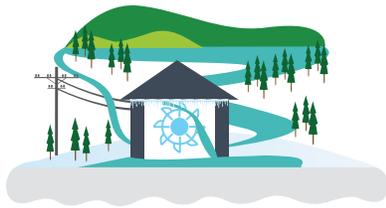
The project is now in the construction phase, with the accommodation trailer and some construction materials scheduled to be shipped to site in August 2020. The contractor will complete some initial site excavation and prepare a site plan and preliminary building layouts. The project is expected to be completed in 2021/22.



LIQUEFIED NATURAL GAS (LNG) Fort Simpson

In 2019/20, a feasibility report was completed for the design of a new modular gas generating plant and LNG storage and vaporization facility on a parcel of land outside of the downtown core in Fort Simpson. The project was approved by Infrastructure Canada through the Green Infrastructure Fund. The total project budget is \$15 million (75% ICIP + 25% NTPC). This is much higher than the LNG project in Inuvik because Fort Simpson is a greenfield project with no existing gas infrastructure. Although a fossil fuel, natural gas is a cost-effective alternative to diesel fuel for electricity, heating and transportation. It burns cleaner and produces 25% fewer GHG emissions per unit of energy produced than diesel. Natural gas is odourless, non-toxic, and can be liquefied (LNG) or compressed

(CNG), and safely and efficiently transported over long distances to locations not supplied by pipeline or a local resource. This project will consist of LNG storage, a re-gasification system, truck offload, on site generation, as well as a space for storage, and workspace. Other elements would include a distribution interconnect to the main electrical grid, communications and security. The site would be large enough to accommodate space needs for other generation should the downtown site not meet NTPC's future needs. Going to a more efficient and lower emissions source is expected to result in 85% diesel displacement with a reduction of 1,800 tonnes of GHG per year, representing a 27% reduction in GHG emissions.



MINI HYDRO

COMMUNITY HYDRO Gamètì Mini Hydro

As part of the 2030 Energy Strategy, there are funds available to support community-scale hydro projects in the NWT. This project involves the construction of a mini hydroelectric facility to displace diesel-generated power in Gamètì.

A pre-feasibility report was completed in 2015 by an independent engineer hired by the community. As there was no actual water flow monitoring, this work was based on modeled data derived from other regional data. To confirm there is a sufficient

water flow to support the proposed project, INF arranged for a water gauge to be installed to gather actual data at the right location. More than a year's worth of data is now available. INF is funding the completion of an update to the 2015 report (using actual measured water flow data) and the community of Gamètì applied for federal funding for the Phase 2 work (technical and environmental). This funding was approved but the work has been deferred to 2021 due to the COVID-19 situation.



2019/20 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 3 – TRANSPORTATION

REDUCE EMISSIONS FROM TRANSPORTATION BY 10% ON A PER PERSON BASIS

Distances and cold weather represent significant challenges in introducing viable options such as electric vehicles and biofuels. In 2019/20, the GNWT continued preliminary work to reduce transportation emissions in the NWT.



MTS Tug Jock McNiven



New engine to be installed.

GNWT FLEET MANAGEMENT

Jock McNiven

Through 2019/20, work continued to refit the GNWT Marine Transportation Services' (MTS) tug Jock McNiven. The "Jock" went into service for Northern Transportation Company Limited (NTCL) in the 1970s and stopped operating in the late 2000s. After ten years being laid up, it was purchased by MTS as part of the sale of NTCL's assets.

Using \$2.8 million in funding from the LCELF, work began to refit the midlife vessel with new

engines. This will give the Jock more horsepower, make it more fuel efficient and reduce its GHG emissions.

Work will continue through 2020, with the Jock expected to be operational by early 2021. Final alignment and sea trials will be completed in the spring of 2021. If the trials go well, the Jock will be in service for the 2021 barge season.

Fuel Saved

288,400 litres

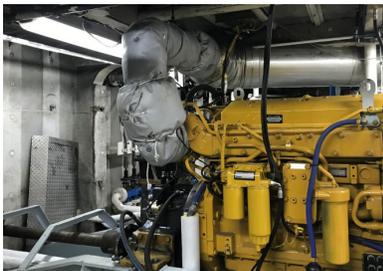
GHG Reductions

808 Tonnes





GNWT Ferry MV Lafferty



New marine diesel propulsion engine.

MV LAFFERTY

The MV Lafferty ferries passengers and vehicles across the Liard River near its confluence with the MacKenzie River. This service connects Fort Simpson to the Territorial Highway System. During the operating season, the vessel must be able to navigate in partially frozen waters, avoid a sandbar and dodge debris that could clog the propellers.

The goal of this project—funded by the LCELF—was to rebuild or replace the ferry’s two 10-year-old engines. The following factors about the existing engines were considered:

- No longer being manufactured
- Becoming difficult to repair
- Required an overhaul every 8000 hours
- Lengthy lead times on acquiring parts
- Increasingly difficult to source parts
- Parts increasingly expensive as supply decreased
- Current horsepower struggled to meet northern operating season requirements
- Had to run the engines at full throttle to manoeuvre properly, burning more fuel
- No longer met present-day emission standards

Benefits of the New Engines

- Superior fuel consumption, reduced exhaust emission, and increased power output for a comparably sized engine.
- Significant more horsepower, eliminating the need to run at full throttle to manoeuvre the vessel across the river.
- Ability to control the ferry in a faster current, avoiding shut downs during high water periods.
- Manufacturer’s recommended maintenance schedule of 34,000 hours.
- Superior accessibility to engine components required for maintenance.
- Ferry used approximately 25% less fuel in 3½ months of operations.

Replacement was the highest rated option. New John Deere marine diesel propulsion engines were selected to be installed, and arrived in January. The vessel’s hull had to be cut open to remove the old engines, and re-welded once the new engines were installed. The shafts/ engines/gearboxes were aligned and monitoring gauges installed in the wheelhouse and engineer deck compartment.

To minimize costs and provide the required level of oversight, the job was completed by a combination of GNWT and contracted workers. Work began in mid-November and was completed in time for the 2020 operating season.

This project has renewed the M.V. Lafferty’s main engines, extended the life of the ferry, and will yield over 150,000 litres in fuel savings and more than 420 tonnes of GHG reductions.



ELECTRIC VEHICLES

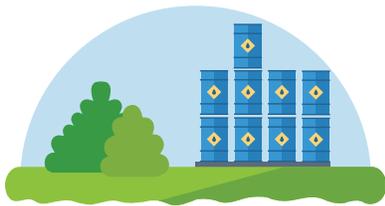
ELECTRIC VEHICLE PROMOTION AND SUPPORT

Since 2018, the Government of the Northwest Territories has been working with the AEA to develop a program that would provide a rebate for the purchase of new electric vehicles and for charging infrastructure in hydropower communities.

Work completed in 2019/20 will lead to the AEA's launch of the Electric Vehicle Rebate Program in 2020. The Program will provide a \$5,000 rebate for new electric vehicles, and up to \$500 for charging infrastructure in hydropower communities.

Switching to an electric vehicle in a community connected to the hydroelectric grid can help to reduce the amount of greenhouse gas emissions released to the atmosphere from motor vehicles, which supports the Strategy's goal of transitioning the Northwest Territories to a lower-carbon economy. It also increases the sale of electricity, which helps stabilize electricity rates.

New battery electric vehicles, plug-in hybrid electric vehicles, or charging infrastructure may be purchased locally or in a jurisdiction outside of the Northwest Territories.



LIQUID BIOFUELS

BIOFUELS STUDY

Liquid biofuels, such as renewable diesel, are being used in other parts of the world to reduce greenhouse gas emissions. There are concerns about using liquid biofuels in the NWT, including security of supply, extreme cold weather suitability, long-term cold-climate storage suitability, cost premium and other factors unique to our geography and climate. However, the GNWT does see potential promise in the use of liquid biofuels, and in 2019, engaged the Saskatchewan Research Council to conduct a study to assess the availability, pricing, and technical feasibility of transporting, storing and using biofuels in the NWT.

The study is being conducted in two parts. The first part has been completed and a draft report is expected in spring 2020. The second part of the study will begin soon after and is expected to be finished in early 2021.

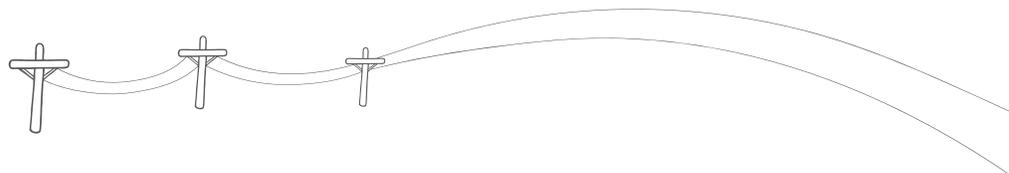


CLEAN FUEL STANDARD MONITORING

Since late 2016, the Government of Canada has been working to develop a Clean Fuel Standard (CFS) that would reduce Canada's greenhouse gas emissions through the use of lower carbon fuels, energy sources and technologies. The regulations for the Standard would be implemented in a phased approach with the first regulations for liquid fuels published in 2020 and the second regulations for solid and gaseous fuels in 2021.

The GNWT has concerns about the cost implications of the CFS, as the requirements of the CFS have the potential to impact both the cost of living for NWT residents, as well as the NWT's competitiveness to retain and attract business. There are also concerns regarding the long term storage stability of certain types of low-carbon intensity fuels in the Arctic context, specifically the need for liquid fuels that function properly in the extreme cold environment and have long-term storage stability.

In the summer of 2019, Canada announced an exemption to the CFS for remote communities, which would include all communities of the NWT. Despite this exemption, INF continues to monitor developments in respect of the CFS. Such monitoring is being carried out by INF's Energy Division and Fuel Services Division, which manages the purchase, transport and storage of bulk petroleum products for 16 NWT communities.



2019/20 ENERGY INITIATIVES

STRATEGIC OBJECTIVES 4 & 5 – HEAT & EFFICIENCY

ARCTIC ENERGY ALLIANCE PROGRAMS AND SERVICES

The AEA is a non-profit society that provides programs and services to reduce the costs and environmental impacts of energy and utility services in the NWT. These services are provided directly to communities through six regional offices. With the addition of new federal funding from the Low Carbon Economy Leadership Fund (LCELFF), the AEA nearly doubled the number of rebates it provided in 2019/20 compared to the previous year. These rebates totalled almost a million dollars—a 150 percent increase over 2018/19.

Energy Efficiency Incentive Program

Provides rebates on energy-efficient appliances and other products.

Energy Rating Services Support Program

Provides home energy evaluations and advice.

Deep Home Energy Retrofit Program

Provides rebates on major home energy-efficiency upgrades, such as exterior wall insulation, windows and heating equipment.

Commercial Energy Conservation

and Efficiency Program – Provides building energy audits and rebates to NWT businesses to make upgrades to conserve energy and improve their energy efficiency.

Community Government Building Energy Retrofit Program

– Provides building energy audits, rebates and project coordination to help community governments across the NWT better manage their energy use.

Non-Profit Energy Efficiency and Conservation

Program – Provides building energy audits and rebates to NWT non-profit organizations to make upgrades to conserve energy and improve their energy efficiency.

Specified Income Home Winterization Program

Provides homeowners with the supplies, knowledge and other resources to winterize their homes and reduce the consumption of electricity and water.

Alternative Energy Technologies Program

Provides incentives for NWT residents, businesses and community-based organizations to adopt renewable and alternative energy systems, such as solar, wind, wood and more.

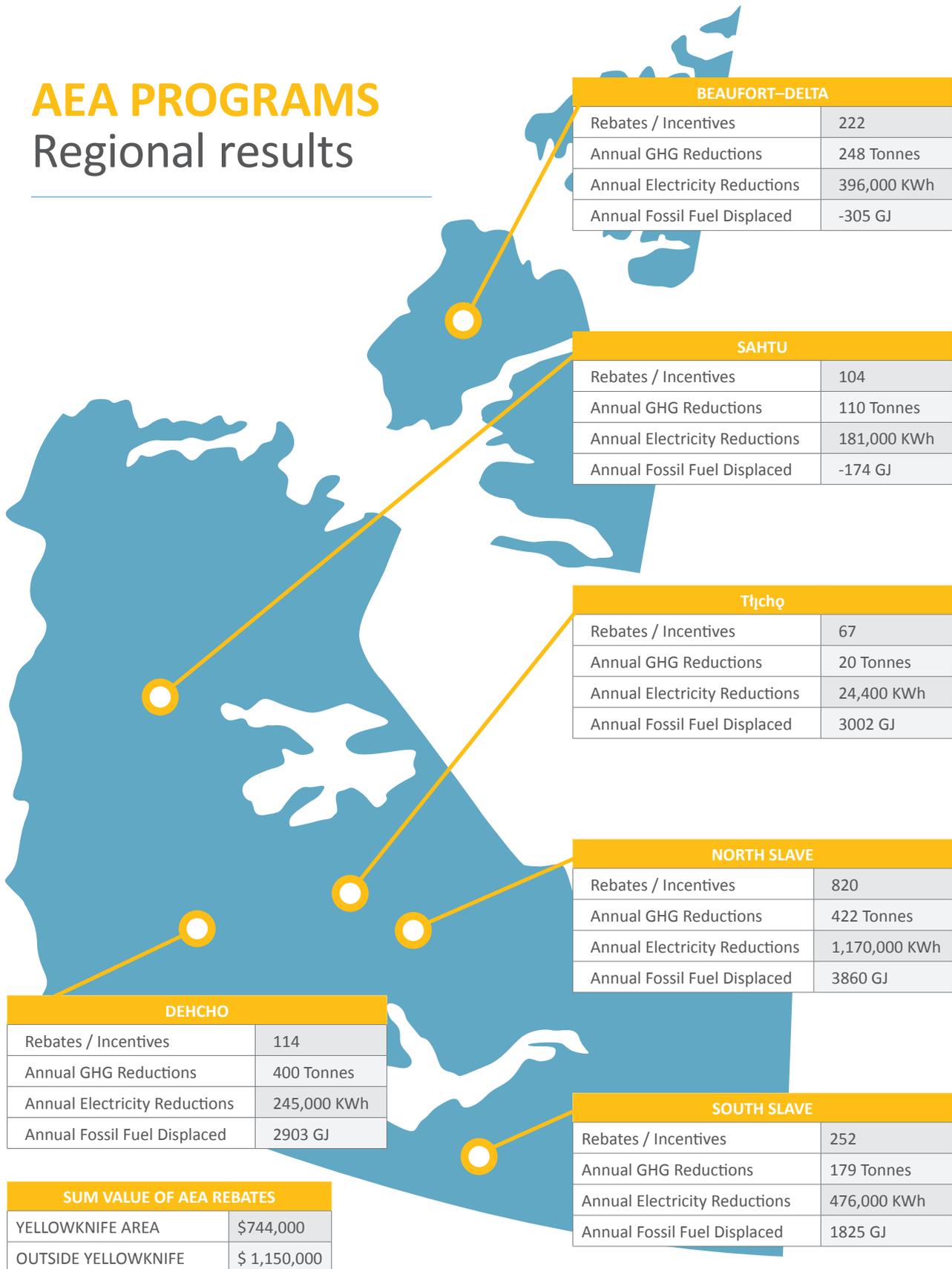
Biomass Energy Program – Provides Northerners with accessible technical advice on existing or potential biomass projects.

Community Wood Stove Program – Provides homeowners with new, efficient wood stoves through partnerships with community organizations.

Regional Offices Program – Operates offices in Fort Simpson, Hay River, Inuvik, Norman Wells, Whatì and Yellowknife to maintain a close connection to the communities throughout the territory.

AEA PROGRAMS

Regional results



2019/20 ARCTIC ENERGY ALLIANCE PROGRAM RESULTS

BIOMASS ENERGY PROGRAM

Started pre-feasibility analyses for six communities on district heating systems. Two of these have already been completed.



Helped a client apply for a rebate on a relatively large biomass heating system.

ENERGY EFFICIENCY INCENTIVE PROGRAM



1,266
Provided rebates.



LED lighting continues to be the most popular eligible product

385 **181** more
LED Rebates than last year.



Combined, the energy-efficient products purchased will save the NWT **700 tonnes** of greenhouse gases annually—more than any other AEA program this year.

DEEP HOME ENERGY RETROFIT PROGRAM

New program for 2019/20.



Completed **46** home energy evaluations, and provided seven final rebates worth **\$35,000**, plus an additional three interim rebates valued at **\$16,000**. The interim projects will be finalized in 2020/21.

Combined, the seven clients with completed projects are expected to save **140 GJ** of heating fuel a year—equivalent to bringing one of these homes to net zero (*offsetting all energy for heating, hot water and electricity*).



ENERGY RATING SERVICES SUPPORT PROGRAM



home energy evaluations Completed.

Performed evaluations on new homes. **107**

COMMERCIAL ENERGY CONSERVATION AND EFFICIENCY PROGRAM

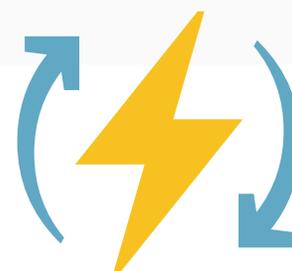


Provided **49** rebates (*up 58 percent over last year*).

The average client project will pay for itself through energy savings in less than two years.



Combined, annual electricity consumption avoided by all clients' projects is roughly the amount of annual electricity used in the community of Sachs Harbour.



Combined, all recommended upgrades on existing homes could save homeowners

\$34,000

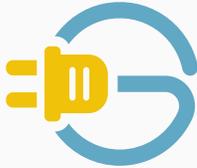
and **160 tonnes** of greenhouse gas emissions a year.

COMMUNITY GOVERNMENT BUILDING ENERGY RETROFIT PROGRAM

\$220,000

Distributed in rebates in five communities (up 290 percent over last year).

Completed 22 desktop “yardstick” building energy audits and 19 on-site “targeted” building energy audits in four communities.



Energy audits identified more than **\$340,000** in potential annual savings.

NON-PROFIT ENERGY EFFICIENCY AND CONSERVATION PROGRAM

New program for 2019/20.

\$130,000 Distributed 11 rebates valued at approximately

Combined, all client projects will avoid **190 kW** in power demand—equivalent to running **158** dishwashers at the same time.



COMMUNITY WOOD STOVE PROGRAM

Completed one two-year project that began in 2018/19, and began a new project.



Coordinated the installation of **54** stoves in four partner communities and arranged for **66** additional stoves to be delivered to five communities.

Combined, all installed stoves will save **2,400 kg** of particulate emissions (an 89% decrease) and **10 tonnes** of greenhouse gas emissions a year.



Savings from the fifty-four (54) wood stoves installed in 2019 – 20

Heating oil displaced in litres:
100,000

Annual GHG reductions:
265
Tonnes

Annual savings:
\$150,000

SPECIFIED INCOME HOME WINTERIZATION PROGRAM



Worked with six partner communities to hire and train local liaison workers.

Hosted educational workshops for lower-income homeowners in all six communities.



Distributed **120** energy efficiency kits to workshop participants.

ALTERNATIVE ENERGY TECHNOLOGIES PROGRAM

30 Rebates provided

The **30** systems that the AEA’s clients installed are expected to save roughly **260** tonnes of greenhouse gases a year.



The average system is expected to pay for itself in just over four years.

CAPITAL ASSET RETROFIT FUND (CARF)

Developed in 2007, the Capital Asset Retrofit Fund (CARF) program delivers energy efficiency projects for GNWT facilities to reduce GHG emissions, energy use and operation costs. Each year, approximately \$3.8 million is assigned to energy retrofit program projects. Savings resulting from projects completed in 2019/20 are estimated to average \$209,700 annually.



DID YOU KNOW?

Seventy-five percent (75%) of the Capital Asset Retrofit Fund's annual funding, or approximately \$2.8 million, will be funded by the 2020/21 fiscal year's operation savings in utilities.

2019 – 20 CARF PROJECT HIGHLIGHTS

(see Appendix B for a full list of CARF projects)



INUVIK HOSPITAL LIGHTING

A complete lighting retrofit of the Inuvik Regional Hospital was completed to upgrade all fixtures to LED equivalent using roughly half of the electricity overall.

Annual
Electricity
Reductions

307,397 kWh

Natural
Gas Displaced

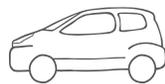
84,000 Cubic Metres

Annual GHG
Reductions

159 Tonnes

Annual Savings

\$233,622





PAULATUK SCHOOL

A LED lighting retrofit of the Angik School in Paulatuk was completed to reduce electrical consumption. The project was delivered combining an upgrade of the Direct Digital Controls (DDC) system and installation of Electrically Commutated Motors (ECM) driven pumps to reduce overall energy use of the mechanical systems. During the upgrade, commissioning of the new system led to an overall more efficient heating and ventilation system.

Annual Electricity Reductions

30,000 kWh

Annual GHG Reductions

159 Tonnes

Diesel Displaced

6,300 Litres

Annual Savings

\$40,500



STANTON LEGACY

CARF funded the procurement and installation of a large-scale biomass system at the Stanton Legacy Building in Yellowknife. The system includes a total redesign of the building's heating system with the main source of heat coming from two 1,250 kW KOB Viessman wood pellet boilers.

Wood Pellets Burned

1,000 Tonnes

Heating Oil Displaced

22,300 Litres

Annual Savings:

\$551,000

Propane Displaced

820,000 Litres

Annual GHG Reductions

1,300 Tonnes



HAY RIVER SCHOOLS LIGHTING

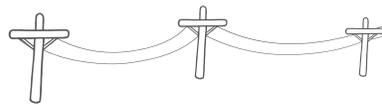
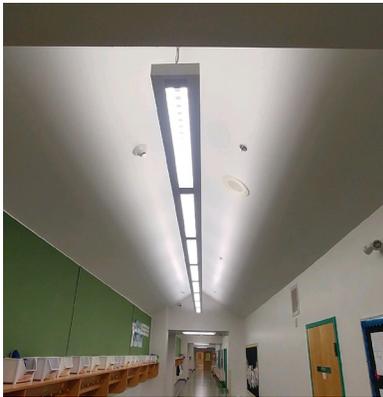
This lighting project, funded by CARF, involves upgrading to LED lighting in 4 Hay River Schools: Princess Alexandra, Ecole Boreale, Harry Camsell, Diamond Jenness. Although Hay River is powered by hydroelectricity, the project reduces energy use and electrical costs.

Annual
Electricity
Reductions

293,000 kWh

Annual Savings

\$65,000



CARF PERFORMANCE INDICATORS

The infographic below shows how the CARF program has reduced GHG emissions by almost 15,000 tonnes since its inception, and in 2019/20 resulted in cost savings of almost \$4 million.

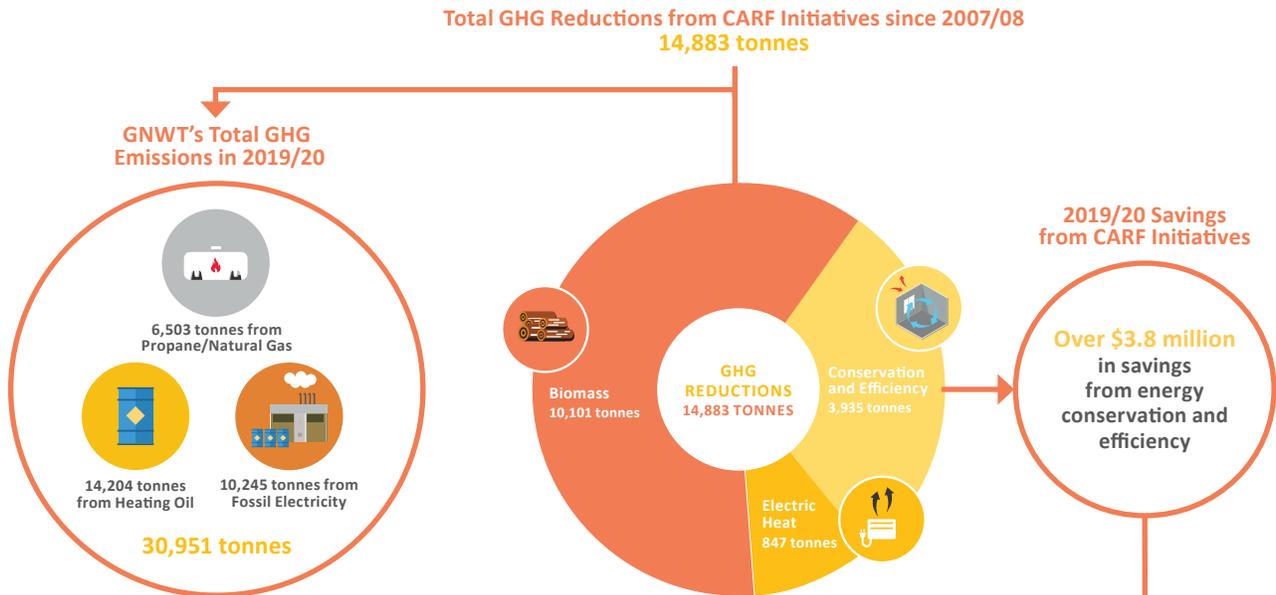
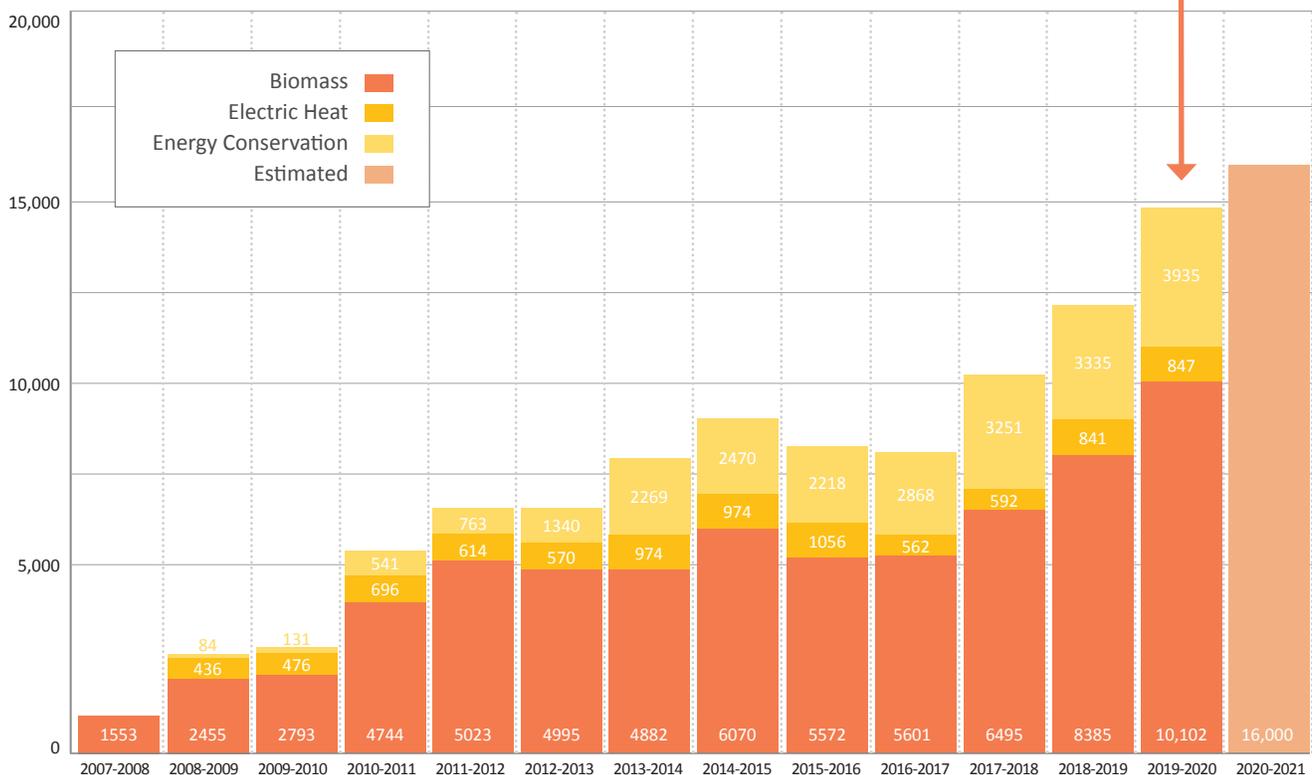


Figure 9: GHG Reductions Trends from CARF Initiatives



Government of
Northwest Territories

BUILD YOUR GHG SOLUTION

**Have an idea?
Let's talk.**

**GHGgrant@gov.nt.ca
(867) 767-9021**



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GHG GRANT PROGRAM FOR GOVERNMENT

The GNWT's GHG Grant Program for Government is an application based non-repayable grant program designed to support greenhouse gas (GHG) emissions reduction projects and initiatives for NWT community governments, municipalities, GNWT departments, and Indigenous governments (which includes band or tribal councils, land-claim organizations, development corporations and self-governments). Funding and resources for this program have been provided jointly by the GNWT in support of the GNWT's 2030 Energy Strategy, and by Environment and Climate Change Canada (ECCC) under the Low Carbon Economy Leadership Fund (LCELf), in support of the Pan-Canadian Framework on Clean Growth and Climate Change.

Designed to fill a gap in funding for larger GHG reduction initiatives, there is a minimum grant size to be eligible for these funds. The GNWT provides smaller grants through the Arctic Energy Alliance (AEA). Contact AEA for more details on smaller grant initiatives (aea.nt.ca). In 2019/20, the GHG Grant Program for Government received applications for two projects that were approved for funding.

Fort Smith Electric Heat Project

The Town of Fort Smith was approved for \$360,000 in early 2020. The project proposal included conducting energy efficient and heating upgrades in three municipal buildings: a water treatment plant, animal shelter and public works garage. The water treatment plant and public works garage will switch to electric heat, taking advantage of the electric heating rate incentive in that region. This project is expected to reduce up to 510 tonnes of GHG emissions annually and reduce operational costs by up to \$67,000 per year. Construction is expected to begin in Spring 2020 and be completed by Fall 2020.

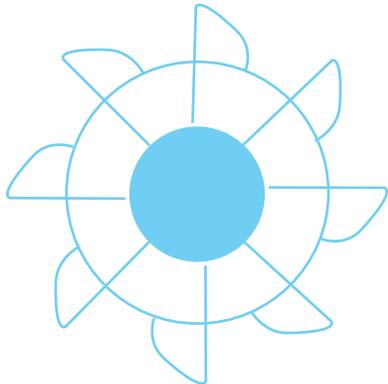
YK1 Pellet Boiler Installations for Mildred Hall and Range Lake Schools

Yellowknife Education District No. 1 (YK1) was approved for \$1,050,000. The project includes the installation of wood pellet boilers in two Yellowknife school facilities. Both installations are expected to reduce up to 578 tonnes of GHG emissions annually and reduce operational costs by up to \$97,000 per year. Design is expected to occur over the winter of 2020, with construction expected to start by Spring/Summer 2021 and completion by September 2021.

2019/20 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 6 – LONG-TERM

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



HYDRO UPGRADES



Main generating unit at Taltson

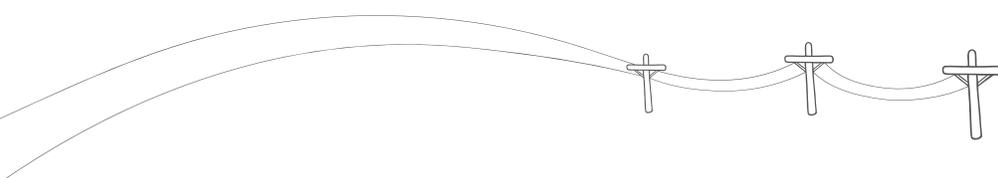
HYDROELECTRIC SYSTEMS UPGRADES

Taltson Hydro Overhaul Project

Components of the existing Taltson hydroelectric generating facility are approaching or have exceeded their useful life. This project is a multi-year initiative to refurbish the existing facility and extend its operating life. \$23,760,000 in funding has been secured, of which 75% is funded by Infrastructure Canada and the remaining 25% is being provided by NTPC.

This project is in the construction phase. The turbine and generator were being manufactured during 2019/20 but delays were anticipated due to Covid-19 lockdowns in Spain and Italy where the manufacturing facilities are located. As a result of the expected delays, the schedule for completion of the project was being reviewed. These collective impacts may delay the project construction schedule by one year (i.e. from 2021 to 2022).

Once completed, this project will ensure forty to sixty more years of clean hydroelectricity from the 18-MW Taltson facility. It will also avoid any potential GHG emissions related to burning diesel due to an unexpected shutdown and will slightly increase the percentage of hydroelectricity being supplied to meet the NWT's annual electricity requirements.





Snare Forks generating facility site



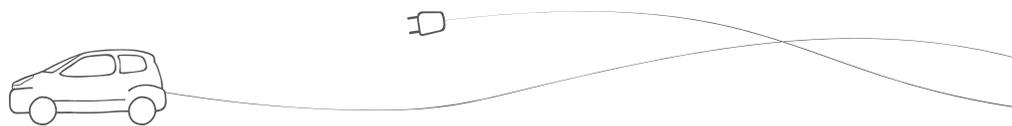
G1 turbine housing being overhauled.

Snare Forks G1 & G2 Overhaul Project

Components of the existing Snare Forks hydroelectric generating facility are approaching or have exceeded their useful life. This project is a multi-year initiative to upgrade the G1 and G2 generating units and extend the operating life. \$18,880,000 in funding has been secured, of which 75% is funded by Infrastructure Canada and the remaining 25% is being provided by NTPC.

This project is in the construction phase. Work on the G1 unit progressed well during 2019/20 but Covid-19 delays were expected to delay the completion of the G1 component of the project to fall 2020. Work on the G2 unit is scheduled to begin in 2021 (once the G1 unit is completed) and be completed in 2021.

When finished, this project will ensure the continued reliability of the electricity supply from the 10 MW Snare Forks facility, avoid any potential GHG emissions related to burning diesel due to an unexpected shutdown of the facility and will slightly increase the percentage of hydroelectricity being supplied to meet the NWT's annual electricity requirements.



GHG GRANT PROGRAM FOR BUILDINGS AND INDUSTRY

Like its sister stream for Government, the GHG Grant Program for Buildings and Industry is an application based non-repayable grant program designed to support greenhouse gas (GHG) emissions reduction projects and initiatives for NWT businesses, industry and non-profit organizations.

Businesses and industry applicants may receive up to 25% of eligible project costs. Non-profit applicants may receive up to 40% of eligible project costs. Just like the program stream for government, there is no maximum grant request per applicant, and a single applicant may seek the entire yearly allocation (see Program Guide for grant amount available). However, there may be other competitive applicants requesting funding and the GNWT may choose to support multiple projects over just one. There were no applicants and no approved projects under this program in 2019/20.



VERY SMALL NUCLEAR

SMALL MODULAR NUCLEAR REACTOR (SMR)

In July 2019, Natural Resources Canada (NRCan), in partnership with the provinces, territories, and power utilities in Canada, developed and released the Canadian Small Modular Reactor Roadmap for Canada (Roadmap). The GNWT is part of the SMR working group under the Energy and Mines Ministers Conference (EMMC) and contributed to the development of the Roadmap.

Smaller than conventional reactors, SMR technology can be manufactured at a plant and brought to a site fully constructed. Ranging from under one (1) megawatt (MW) up to 300 MW in size, SMRs have potential application in off-grid remote communities and industrial sites.

The GNWT does not currently have a position on nuclear power except for mention of very small nuclear as being an emerging technology that the GNWT will monitor during the implementation of the *2030 Energy Strategy*. The GNWT will engage the public on the issue in the future as required.



Current Taltson hydro facility

TALTSON HYDRO EXPANSION

The GNWT has a long-term vision of developing its hydropower resources by establishing an energy corridor that would provide clean energy to industry and eventually connect the NWT to the North American grid. Expansion of the Taltson Hydroelectricity site is key to unlocking the territory's renewable resource potential and associated environmental and economic benefits. The energy corridor would also provide important clean growth economic diversification of the NWT and opportunities for Indigenous government partnership, all of which support the GNWT's goals and commitments under the Pan-Canadian Framework on Clean Growth and Climate Change (PCF).

The GNWT's working relationship with Indigenous Government (IG) partners for the development of the Taltson Hydro Expansion Project is being defined through the development of a Memorandum of Understanding (MOU).

Technical work is underway is on transmission routing that minimizes impacts and costs to the project, including bathymetry work to map a portion of the lake bottom (see following pages) and scoping of a major engineering contract to develop the remaining design feasibility. The preliminary business case for the project is expected to be completed in 2020.

In August 2019, the Canada Infrastructure Bank (CIB) announced it would provide advisory services on the Taltson Project. CIB is mandated to use \$35 billion in federal funding to attract private sector and institutional investments to new revenue generating infrastructure projects. Engagement with the CIB and IG partners is ongoing. When both hydro systems are connected and mines have access, this project could reduce GHG emissions by 227 kilotonnes.



GREAT SLAVE LAKE (GSL) BATHYMETRY PROGRAM PHASE I

Connecting the NWT's two hydroelectricity systems via a submarine transmission cable across GSL is one of two routing options being studied for the Taltson Hydroelectricity Expansion project.

In 2019, the Arctic Research Foundation (ARF) successfully delivered a 22-day field program as part of a phase I bathymetry program and results report on GSL, at a cost of \$650,000. The GNWT's MV Nahidik was leased by ARF for the expedition. Phase I provided detailed mapping information of the

lakebed along two potential routes. The preferred route, direct to Yellowknife from Taltson Bay, would require roughly 140 km of submarine cable and a shorter submarine cable crossing of approximately 70 km across to Gros Cap at the north end of GSL.

The final report from this work highlighted additional survey work that is required in unmapped areas of the alignment and potential landing areas that will need to incorporate local use and traditional knowledge of the area in order to optimize the design.



It may look low in the water, but the Rigid-hulled Inflatable Boat (RHIB) supporting the Nahidik is virtually unsinkable.



NORTHERN STUDENTS EXPLORE LAKEBED

In October 2019, in partnership with Nature United and the Arctic Research Foundation, Northern Youth Leadership piloted a new camp for NWT youth - the Youth Science Expedition.

Five NWT youth between the ages of 13 and 19 from Ndilo, Dettah, Yellowknife, and Łutselk'e spent five days aboard the research vessel Nahidik.

During the expedition, participants worked with the ship's crew and scientists on two projects – a bathymetric survey of Great Slave Lake and installing a mooring in Christie Bay. Participants helped construct the mooring, deploy equipment, and learn one-on-one with the hydrographers and chief scientist. In addition, youth also shadowed the ship's captain and engineer to learn about bridge operations, safety and emergency duties, charting and navigation, and marine mechanics.

The expedition was a really positive experience for everyone involved, and set the stage for future Youth Science Expeditions.



NYL participants with chief scientist, Eddy Carmack

Northern Youth Leadership student watching the lake bed being mapped in real-time.



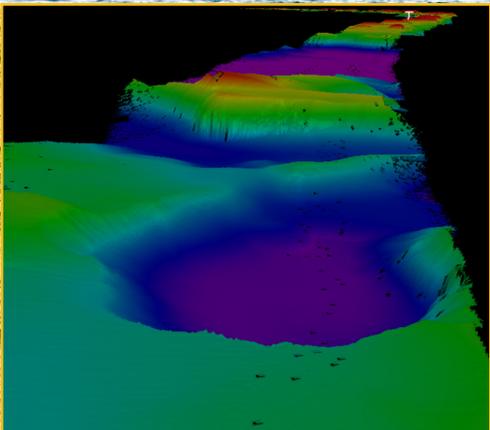
The MV Nahidik originally operated in the Beaufort Sea as a navigational aid vessel for the Canadian Coast Guard. After being surplused, it was acquired by the GNWT in 2016. The Nahidik was re-launched in 2019 after major overhauls funded by the Arctic Research Foundation. With its large deck and cargo hold—and five foot draft—the Nahidik is ideal for shallow water surveying as well as deep water bathymetry work.



NOT YOUR AVERAGE FISHFINDER

To map the lakebed, the ARF uses multibeam systems (multibeam echosounders or MBES) that emit sound waves in a fan shape beneath the ship's hull. Multibeam bathymetry data—the delay between sending the signal and receiving it back—determines the water depth. The strength of that signal

(backscatter data) determines the hardness of the lakebed. A third acoustic measurement is performed by a sub bottom profiler (SBP), which determines physical properties of the lakebed and geological information. In Great Slave Lake, the SBP has been able to identify bedrock located up to 100m beneath the lakebed sediment.



A LOOK AHEAD

Moving into the post-COVID era, we will continue to lay the groundwork to ensure more secure and affordable energy while reducing GHG emissions.



Drummers at the Tłıchq All-Season Road groundbreaking ceremony in Whatı.

FORT PROVIDENCE TRANSMISSION LINE

In 2020/21, work will continue on several key aspects of the project. The GNWT will initiate formal consultation and engagement meetings to introduce the proposed project, identify concerns and build support for the project. An application to secure the federal 75% funding support for the project

will be prepared and submitted to Infrastructure Canada. Preliminary environmental scoping work will be completed to develop a comprehensive environmental baseline and impacts program that can be conducted during the 2021 field season.

WHATı TRANSMISSION LINE

The GNWT is proposing the construction of a 60-km transmission line to connect Whatı to surplus hydroelectricity from the Snare system. This project has the potential to displace up to 500,000 litres of diesel fuel, reduce GHG emissions by 1,400 tonnes and save approximately \$600,000 in electricity costs annually. Consultations with the Tłıchq Government will be initiated to confirm support for the project and discuss/determine an acceptable route for the transmission line. Once the routing has been determined, and depending on available funding, work in 2020/21 is expected to include:

- Preliminary environmental scoping
- Completion of the climate lens
- Preliminary engineering and design, including an updated capital cost



Remote wind monitoring system's operating light shines on the Arctic expanse in Sachs Harbour.

Gamètì Mini Hydro

The community of Gamètì is interested in developing a nearby community-scale hydropower project. A hydrology monitoring station was installed on the Camsell River near Gamètì in October 2018, and hydrology data from the gauge will help determine if the hydro resource is sufficient to support further development. Hydrological monitoring was completed in 2019/20. Preparations are currently being made to update a previous study. This will allow initiation of further technical work and preliminary environmental scoping.

Sachs Harbour Wind

Wind monitoring campaigns over the last two decades in Sachs Harbour have demonstrated it to be one of the strongest wind regimes located near an NWT community. Long-term wind data from the airport along with three

different wind measurement towers indicate that average yearly wind speeds of six meters per second exist 30 meters above the ground level. This wind speed is considered sufficient for wind turbine integration. Indeed Sachs Harbour had a wind turbine in the 1990s. However, immature technology and some bad luck resulted in its failure. Since then, advancements in cold weather wind turbine technology have led to an increase in their use to offset the diesel used to generate power in remote communities and mine sites.

In 2021 the Northwest Territories Power Corporation is scheduled to install a new diesel plant in Sachs Harbour. A wind integration study will determine the optimal turbine size and amount of renewable energy to be imported into the local grid. Adding a wind turbine to a diesel micro-grid requires advanced systems that may include battery storage, power conditioning and advanced

switchgear. The deployment of a new diesel plant with wind energy considered into its design provides the NWT with a unique opportunity to demonstrate our first operational wind/diesel hybrid system.

Phase II Bathymetry Program

The Arctic Research Foundation's proposed 2020 Phase II field program involves 55 days on the water with three phases of work and a number of crew shift changes to include a cross section of northern and Indigenous groups.

Phase II will provide a more intensive hydrographic survey program that will include more detailed mapping, soil sampling and lake-bottom profiling. A specialist in laying submarine cable has also been added to the team.

The data collected from this program will be critical to understanding the constructability and costs for the Taltson Project submarine cable alignment. It will also provide additional benefits, including an opportunity to build relationships with Indigenous partners and youth, community leaders and scientists involved in the project, and a wealth of hydrographic data that will advance northern science.

POLICY

Electric Vehicle Charging Infrastructure

The GNWT participated in the federal-provincial-territorial Zero Emissions Vehicle (ZEV) Working Group which is developing a strategy to promote the uptake of ZEV in Canada. Building on this, the GNWT also began drafting a scope of work for a study on the promotion of electric vehicles and the design, construction and deployment of a charging station network in the NWT. The study will be initiated in the 2020-21 fiscal year.

Net Metering / Self Generation

Net Metering is a program that allows utility customers to produce renewable energy for the electrical grid and receive a kilowatt hour (kWh) credit for their future consumption. Since the current rate structure uses kWh consumption to “subsidize” some of the fixed

costs of the utility, every kWh that is generated through the Net Metering program leads to a reduction of revenues and earnings for the utility. Ultimately, this extra cost is carried by other ratepayers unable to afford alternative electricity generation system. In other words, it increases electricity rates.

In its decision 7-2016, the NWT Public Utilities Board (PUB) set a cost threshold of 1% for the Net Metering program. Above this threshold, utilities are asked to come forward to the PUB for further direction.

A scope of work has been developed for a review of the Net Metering Policy. It is anticipated the work will be initiated in Fall 2020.

PROGRAMS

GHG Grant Program

Both streams of the GHG Grant Program will continue to accept applications as long as funding is available. There is approximate \$14 million funding available for both streams by 2024. In 2020/21 the GHG Grant Program will be supporting the already approved Fort Smith Electric Heat Project and YK1 Pellet Boiler Installations for Mildred Hall and Range Lake Schools.



Electric Vehicle charging station at the AEA's Yellowknife office.

PHOTOS ON RIGHT: 2019/20 ARCTIC ENERGY ALLIANCE PROGRAMS AND SERVICES

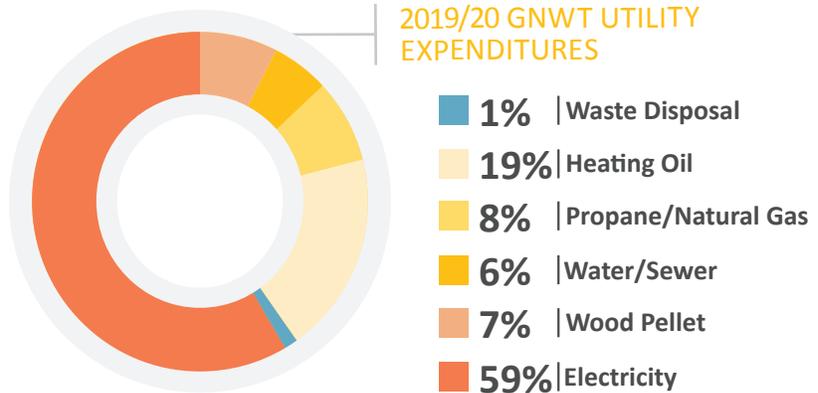


APPENDIX A: GNWT ENERGY USE AND UTILITY COSTS

GNWT ENERGY EXPENDITURES

In 2019/20, the cost of heat and power for GNWT facilities totaled \$35.9 million. Figure 10 below shows that electricity is the largest energy cost for the GNWT, followed by heating. It should be noted that wood pellet expenditures increased in 2019/20 versus the previous year, due to a 10% increase in biomass heating.

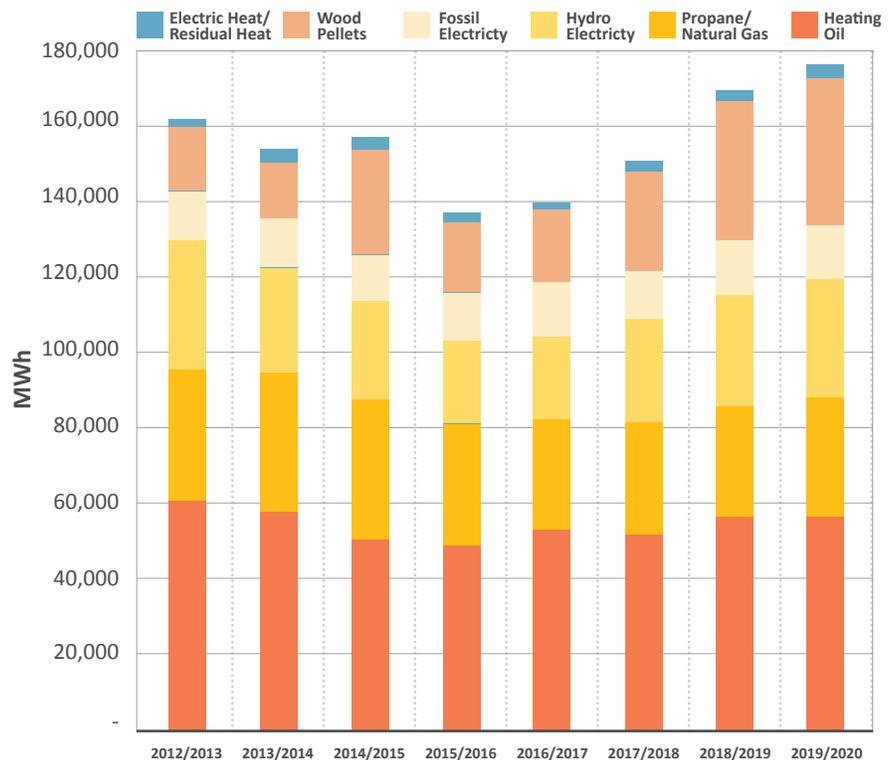
Figure 10: GNWT Utility Expenditures, 2019/20



GNWT ENERGY USE

Figure 11 below outlines the trend in the GNWT's total annual energy use by type. Compared with the previous year, the GNWT's energy use increased by about 4% due to new facilities being added to the GNWT's assets.

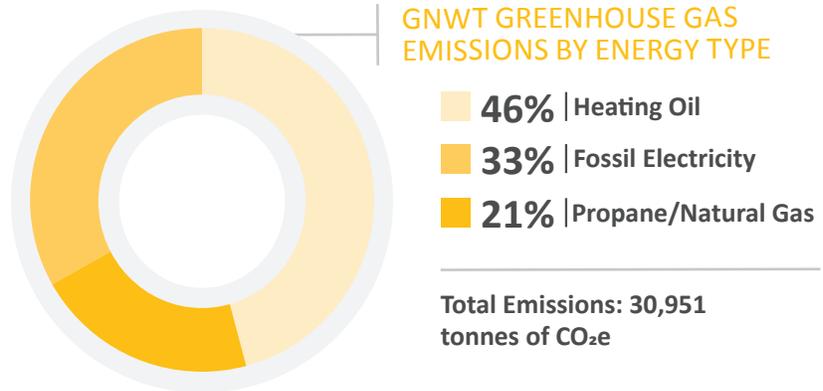
Figure 11: GNWT Energy Use by Comparison



GNWT GHG EMISSIONS

In 2019/20, GNWT buildings were responsible for about 30,950 tonnes of GHG emissions due to fossil fuel used for heating and by using electricity generated from fossil fuels (see Figure 12). This is almost identical to the GNWT's GHG emissions in the previous year.

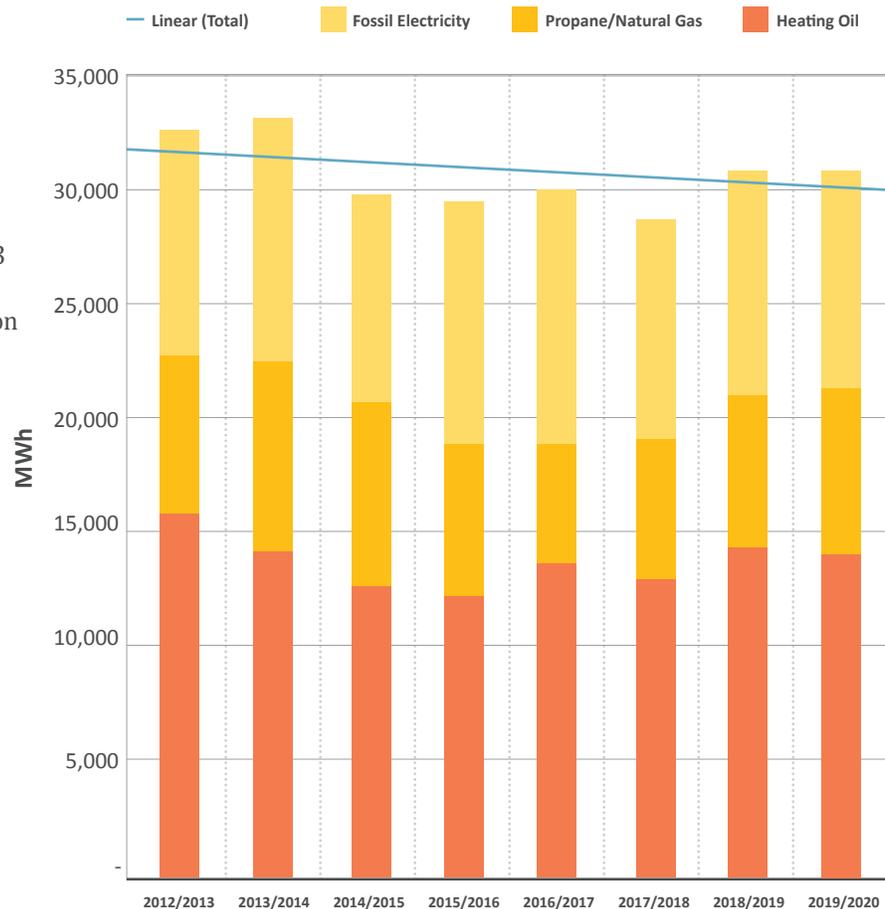
Figure 12: GNWT Greenhouse Gas Emissions by Energy Type



GNWT GHG EMISSIONS REDUCTIONS

As a result of GNWT efforts to improve energy efficiency and increase the use of biomass heating in its facilities, the GNWT has been able to reduce emissions slightly from 2012/13 to 2019/20 despite an increase in its overall energy consumption in recent years (see Figure 13).

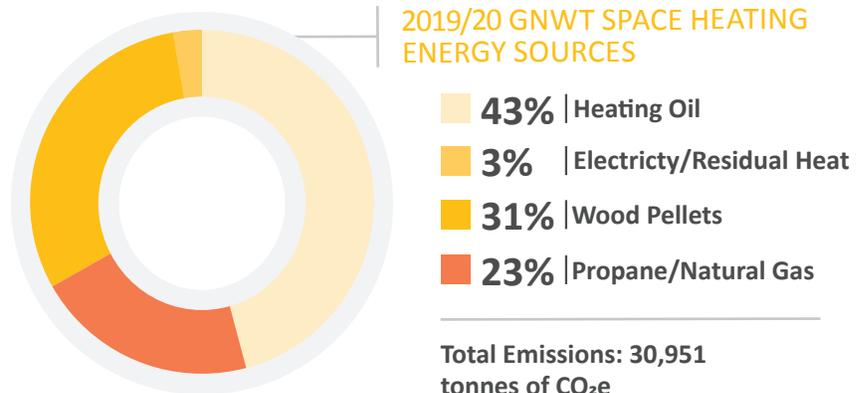
Figure 13: GNWT GHG Emissions Reduction Trend



GNWT SPACE HEATING BY FUEL TYPE

In 2019/20, space heating for GNWT facilities totaled 131,177 MWh. As shown in Figure 14, 34% of this total was provided by renewable electric heat and biomass energy. This is a 2% improvement from the previous year.

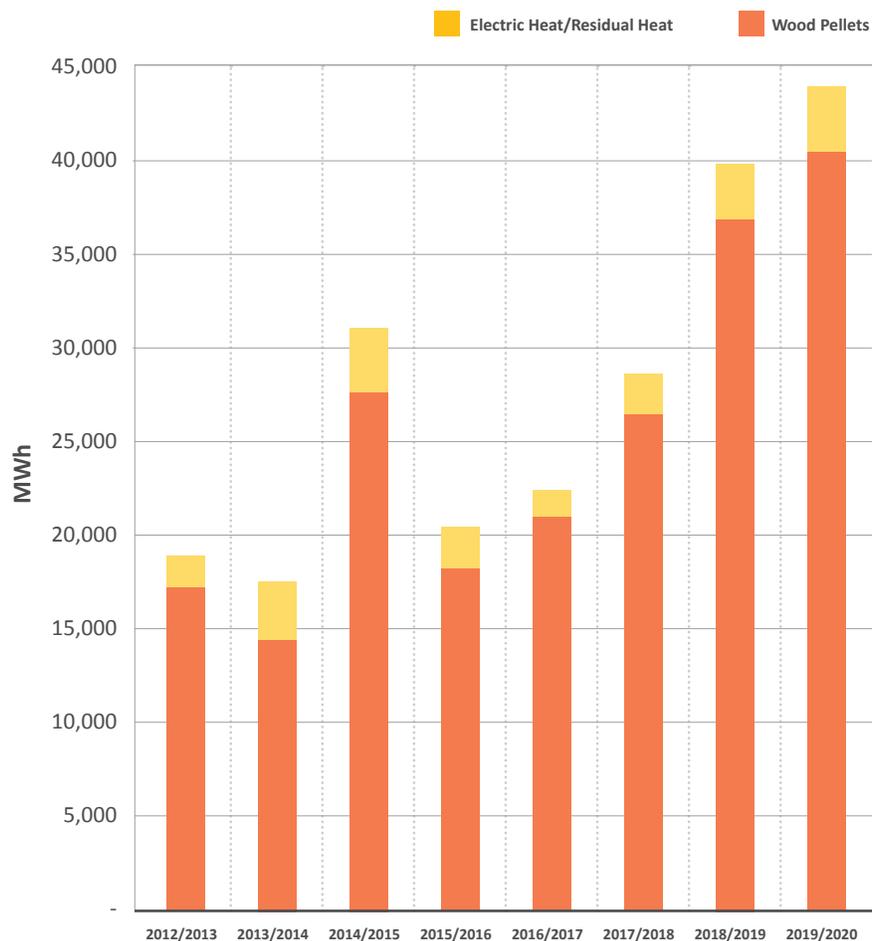
Figure 14: GNWT Space Heating Energy Sources, 2019/20



GNWT GHG EMISSIONS REDUCTIONS FROM RENEWABLE HEATING

Figure 15 shows the trend in renewable heating for GNWT facilities. The amount of electric heating was virtually unchanged from the previous year but wood pellet heating increased by 11% compared to 2018/19.

Figure 15: GNWT Renewable Heating Energy Trend



APPENDIX B: CAPITAL ASSET RETROFIT FUND PROJECTS

FACILITY	LOCATION	DETAILS
North Slave Region		
Kalemi Dene School	Ndilo	Installation of two 30kW Viessmann Boilers and controls upgrade.
Stanton Legacy	Yellowknife	Installation of two 1250kW Viessmann KOB biomass boilers.
South Slave Region		
Princess Alexandra, Diamond Jenness, Ecole Boreale and Harry Camsell Schools	Hay River	LED lighting upgrade.
Chief Sunrise School	Katlodeeche	Design and installation of two 56kW Okofen Boilers. Multi-year project to be complete Fall 2020.
Beaufort Delta Region		
Moose Kerr School	Aklavik	Installation of 300kW biomass boiler. Multiyear project to be completed 2021.
Inuvik Regional Hospital	Inuvik	LED Lighting upgrade.
Angik School	Paulatuk	LED Lighting, Digital Controls, HVAC upgrades.
Sahtu Region		
Chief Ts'elehye School	Ft. Good Hope	Building LED Lighting retrofit.
Chief Ts'elehye School and Chief Albert Wright School	Ft. Good Hope and Tulita	Recommissioning project to improve operability and reduce utilities. (Partnership with NRCAN).
Deh Cho Region		
Health Centre and Long Term Care Centre	Wrigley and Ft. Simpson	LED lighting Upgrade.

APPENDIX C: COMPLETED BIOMASS PROJECTS

FACILITY	LOCATION	DATE COMPLETED	SIZE (KW)
Stanton Legacy (Two 1250kW Viessman KOB Boilers)	Yellowknife	July 2020	2500
Kalemi Dene School (Two 30kW Viessmann Boilers)	Ndilo	March 2020	60
Inuvik Hospital (KOB Pyrot boiler)	Inuvik	May 2019	1250
Inuviital	Inuvik	May 2019	1250
ENR Lab/Warehouse	Fort Simpson	March 2019	40
Ecole Alain St. Cyr	Yellowknife	October 2018	540
School	Tulita	March 2017	150
School	Fort Good Hope	March 2017	200
Prince of Wales Northern Heritage Centre	Yellowknife	March 2016	300
Airport Terminal Building	Yellowknife	November 2015	400
Health Centre	Hay River	November 2015	1200
Deninu School	Fort Resolution	October 2015	212
Health Centre	Fort Providence	July 2015	75
GNWT Office Building	Yellowknife	December 2014	650
Combined Services Building	Norman Wells	October 2014	212
Mackenzie Mountain School	Norman Wells	October 2014	212
Airport Terminal Building	Norman Wells	October 2014	159
*Health Centre	Fort McPherson	September 2014	
*Behchokò Longterm Care Facility	Behchokò	March 2013	540
Deh Gah School	Fort Providence	March 2013	300
Combined Services Building	Yellowknife	October 2012	540
Central Heating Plant	Fort Simpson	October 2012	823
Elizabeth Mackenzie School	Behchokò	October 2012	540
St. Josephs Secondary School	Yellowknife	November 2011	540
Health Centre	Fort Smith	November 2011	750
Central Heating Plant	Hay River	November 2010	900
Thebacha College	Fort Smith	November 2010	750
Legislative Assembly Building	Yellowknife	October 2010	300
Highways Maintenance Garage	Hay River	October 2010	300
Paul William Kaeser School & Recreation Complex	Fort Smith	October 2010	750
Chief Jimmy Bruneau	Behchokò	October 2009	750
Kalemi Dene School	N'Dilo	September 2009	69
*North Slave Correctional Facility	Yellowknife	November 2006	1,500
*Sir John Franklin	Yellowknife	June 2005	750

(*) Purchased biomass heat for these facilities from a third party.

APPENDIX D: GHG EMISSIONS REDUCTIONS FORECAST

The chart on page 16 (Figure 6) shows the NWT's historical greenhouse gas emissions from 1999 to 2018. This information comes from Environment and Climate Change Canada (ECCC). In 2018, the most recent year for which data are available, the NWT's total annual emissions were 1,260 kt CO₂e. By 2030, the NWT is striving to reduce its annual GHG emissions to 1,094 kt CO₂e.

2019/20 represents the second year of implementation for the 2030 Energy Strategy. \$25.84 million was spent by the GNWT on various energy projects and initiatives but much of this work focused on re-building existing hydro-electric and diesel-electric assets and planning for other large capital projects such as transmission lines.

In the next several years, the GNWT and its partners will continue to make significant investments to improve the reliability of the NWT's energy system, reduce energy costs and reduce GHG emissions. The table below provides an initial forecast of the GHG reductions expected to occur from various energy actions and projects (up to 2025). Annual GHG emissions reductions results are expected to continually improve up to 2030. This forecast will be updated each year as new actions are implemented.

2030 ENERGY STRATEGY - FORECAST ANNUAL GHG EMISSIONS REDUCTION (kt CO ₂ e)								
Strategic Objective	Energy Initiative	2019 (Actual)	2020 (Forecast)	2021 (Forecast)	2022 (Forecast)	2023 (Forecast)	2023 (Forecast)	2023 (Forecast)
1	Community Projects	0	0	2	4	6	8	10
2	Diesel Plant Replacements	0	0	0	0	0.1	0.1	0.1
	Transmission Lines	0	0	0	0	0	4.6	4.6
	Liquefied Natural Gas	0	0	0	6	6	6	6
	Community Hydro	0	0	0	0	0	2	2
3	Electric Vehicles	0	0	0.15	0.15	0.15	0.15	0.15
	Clean Fuel Standards	0	0	0	0	12	12	12
	Biofuels	0	0	0	0	0	TBD	TBD
4&5	AEA Programs	1.4	2	2	2	2	2	2
	Capital Asset Retrofit Fund	3.8	4	4	4	4	4	4
	GHG Grant Program (Gov't)	0.5	1	3	3	3	3	3
6	Hydro Upgrades	0	0	0	0	0.7	0.7	0.7
	GHG Grant Program (Bldgs & Industry)	0	2	4	8	0	0	0
	Taltson Hydro Expansion	0	0	0	0	0	0	0
TOTAL		6	9	15	29	36	44	47

