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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

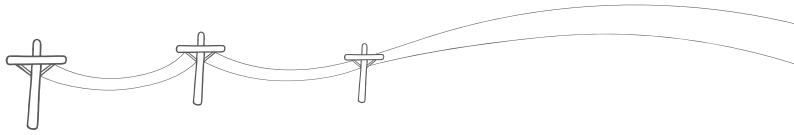
TERRITOIRES DU NORD-OUEST

2020-2021

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

Government of Northwest Territories
Gouvernement des Territoires du Nord-Ouest

# Table of Contents



# Minister's Message
## Energy for Challenging Times

**The Honourable Diane Archie**
*Minister of Infrastructure*

As we navigate the COVID-19 global pandemic and all the changes it has brought to our lives, the Government of the Northwest Territories (GNWT) continues to advance work that will positively impact our communities and residents. That work includes implementing its 2030 Energy Strategy. The GNWT and its partners spent 2020-2021 advancing projects and programs designed to ensure NWT communities, businesses and industry have access to secure, affordable and sustainable energy and that we make progress toward the Northwest Territories' 2030 greenhouse gas (GHG) emissions target. In 2020-2021, the GNWT invested $38 million to support the Energy Strategy, and reduced NWT emissions by 3.6 kilotonnes (kt) of carbon dioxide equivalent ($CO_2e$).

The GNWT's energy conservation and efficiency initiatives have direct positive impacts in the territory and more progress was made in this area in 2020-2021. The Capital Asset Retrofit Fund delivers energy efficiency projects for GNWT buildings that reduce GHGs, energy use and operations costs in NWT communities where these projects occur. In 2020-2021, approximately $3.8 million was allocated for energy retrofit projects.

Through the federal Low Carbon Economy Leadership Fund, the Arctic Energy Alliance was able to provide more and bigger rebates and new initiatives to help Northerners save energy, money and reduce their carbon footprints — resulting in real action at the community level. Despite the challenges brought by the pandemic, 1,000 more rebates were provided this fiscal year than in 2019-2020 and 1,900 megawatt-hours of electricity were saved and clients reduced their carbon emissions by 1,300 tonnes.

The GNWT's GHG Grant Program continues to be offered and it has been extended until 2024. Funding for the program — designed for larger GHG reduction initiatives that exceed the Arctic Energy Alliance's capacity — was originally supposed to expire in March of 2022. The program approved one government project this year and the stream for privately-owned buildings and industry projects is in its second year of accepting applications.

I'm pleased to report that in July of 2021, the GNWT and federal government announced $60 million in funding has been secured to build a transmission line from the Taltson hydroelectric system to bring surplus power to Fort Providence, Kakisa and Dory Point. The project will virtually eliminate diesel-generated electricity for these communities while also contributing to one of the six objectives of 2030 Energy Strategy — reduce GHGs from electricity generation in diesel communities by 25%. The GNWT is also advancing work, in partnership with the Tłı̨chǫ Government, for a similar transmission line from the Snare hydroelectric system to Whatì and is expecting to complete an updated pre-feasibility study on a mini-hydroelectricity facility for Gamètì in late 2021.

Ensuring existing energy infrastructure is operating as efficiently and effectively as possible is another way to ensure reliable and affordable energy is available to residents. Upgrades to the Snare hydro infrastructure were completed in 2021 and similar upgrades to the Taltson hydro infrastructure are in the construction phase. These projects will ensure renewable, green energy continues to be delivered to communities connected to the two systems for decades to come.

The Taltson Hydroelectricity Expansion Project has the potential to add 60 megawatts of renewable hydroelectricity capacity to the NWT system and establish an energy corridor to industry and eventually connect the NWT to the North American power grid. In 2020-2021, the GNWT worked towards a Memorandum of Understanding that will define the working relationship between the GNWT and Indigenous Government and Organization partners on this project. Technical work and development of a preliminary business case also took place.

Reducing emissions from transportation by 10% on a per-person basis is one of the six strategic objectives of the 2030 Energy Strategy. In 2020, Arctic Energy Alliance launched the Electric Vehicle Incentive Program, which provides a $5,000 rebate for new electric vehicles, and up to $500 for charging infrastructure in hydropower communities. The GNWT also commissioned a study to forecast electric vehicle adoption in the coming decade and examine how an electric vehicle charging corridor could be developed between Yellowknife and the Alberta border.

While the COVID-19 pandemic has significantly impacted the lives of all us, Northerners are resilient. The GNWT and its partners in 2020-2021 made significant achievements in advancing the 2030 Energy Strategy during another challenging year. Many lessons have been learned in the three years the Strategy has been implemented. More research and analysis will be done as the GNWT and its partners begin their review of the Energy Action Plan during the 2021-2022 fiscal year, and prepare for the eventual review of the Energy Strategy. We will continue this important work as we strive to meet our long-term vision to ensure secure, affordable and sustainable energy and transition to a lower carbon economy.

**Quyananni**
*The Honourable Diane Archie*
*Minister of Infrastructure*

# Message de la ministre
## De l'énergie pour passer à travers des temps difficiles

**Diane Archie**
*Ministre de l'Infrastructure*

En cette période de pandémie de COVID-19 et de changements qu'elle a apportés à nos vies, le gouvernement des Territoires du Nord-Ouest (GTNO) a poursuivi ses efforts pour améliorer la situation des collectivités et des Ténois. Parmi ces efforts figure la mise en œuvre de la Stratégie énergétique 2030. Au cours de la période 2020-2021, le GTNO et ses partenaires ont ainsi fait avancer des projets et des programmes qui feront en sorte que les collectivités, les entreprises et les industries des TNO auront accès à une énergie sûre, abordable et durable et que nous progresserons dans l'atteinte des objectifs de 2030 des Territoires du Nord-Ouest en matière d'émissions de gaz à effet de serre (GES). Qui plus est, le GTNO a investi 38 millions de dollars en 2020-2021 pour soutenir sa stratégie énergétique et a réduit les émissions territoriales de 3,6 kilotonnes (kt) d'équivalent dioxyde de carbone (éq. $CO_2$).

Les initiatives en matière de conservation de l'énergie et d'efficacité énergétique du GTNO ont des répercussions positives directes sur le territoire, et la période 2020-2021 a été marquée par d'autres progrès réalisés dans ce domaine. Le Fonds de modernisation des immobilisations permet la réalisation de projets d'amélioration de l'efficacité énergétique des bâtiments du GTNO qui réduisent les émissions de GES, la consommation d'énergie et les coûts d'exploitation dans les collectivités des TNO où ces projets ont lieu. Ainsi, en 2020-2021, environ 3,8 millions de dollars ont été alloués à des projets de modernisation énergétique.

Grâce au Fonds pour une économie à faibles émissions de carbone du gouvernement fédéral, l'Alliance énergétique de l'Arctique a pu offrir un plus grand nombre de remises plus généreuses et lancer de nouvelles initiatives pour aider les Ténois à économiser énergie et argent ainsi qu'à réduire leur empreinte carbone — ce qui s'est traduit par des mesures concrètes au niveau des collectivités. Ainsi, malgré les contraintes engendrées par la pandémie, 1 000 remises de plus ont été accordées au cours du présent exercice par rapport à l'exercice 2019-2020, 1 900 mégawattheures d'électricité ont été économisés, et les clients ont réduit leurs émissions de carbone de 1 300 tonnes.

Le Programme de subventions publiques pour la réduction des GES du GTNO est toujours offert et est prolongé jusqu'en 2024. Le financement de ce programme, conçu pour les initiatives de réduction des émissions de GES de plus grande envergure qui dépassent la capacité de l'Alliance énergétique de l'Arctique, devait initialement prendre fin en mars 2022. Un projet gouvernemental a été approuvé cette année dans le cadre du programme, et le volet destiné aux bâtiments privés et aux projets industriels en est à sa deuxième année d'acceptation de demandes.

J'ai le plaisir d'annoncer qu'en juillet 2021, le GTNO et le gouvernement fédéral ont annoncé qu'une enveloppe de 60 millions de dollars avait été réservée pour la construction d'une ligne de transmission à partir du réseau hydroélectrique de la rivière Taltson afin d'acheminer le surplus d'électricité vers Fort Providence, Kakisa et Dory Point. Le projet, qui permettra d'affranchir ces collectivités de pratiquement toute électricité produite par des génératrices diesel, contribuera également à atteindre l'un des six objectifs de la Stratégie énergétique 2030, à savoir réduire de 25 % les émissions de GES provenant de la production d'électricité dans les collectivités utilisant les génératrices diesel. En partenariat avec le gouvernement Tłı̨chǫ, le GTNO enregistre également des progrès en ce qui concerne l'installation d'une ligne de transmission similaire à partir du réseau hydroélectrique de la rivière Snare jusqu'à Whatì et prévoit achever une étude de préfaisabilité actualisée concernant une mini-installation hydroélectrique pour Gamètì à la fin de 2021.

Le fait de s'assurer que l'infrastructure énergétique actuelle fonctionne de manière aussi optimale que possible permet également de garantir que les Ténois disposent d'une énergie fiable et abordable. Les améliorations de l'infrastructure de la centrale hydroélectrique de la rivière Snare ont été achevées en 2021. Des améliorations similaires sont en train d'être apportées à l'infrastructure de la centrale hydroélectrique de la rivière Taltson. Grâce à ces projets, les collectivités reliées aux deux réseaux continueront de bénéficier d'une énergie verte et renouvelable pendant des décennies.

Le projet d'agrandissement de la centrale hydroélectrique de la rivière Taltson pourrait ajouter 60 mégawatts de capacité hydroélectrique renouvelable au réseau des TNO et établir un couloir énergétique vers les industries et, éventuellement, raccorder les TNO au réseau électrique nord-américain. En 2020-2021, le GTNO a travaillé à l'élaboration d'un protocole d'entente sur ce projet qui définira la relation de travail entre le GTNO et les partenaires des gouvernements et organisations autochtones. Des travaux techniques et une analyse de rentabilisation préliminaire ont également eu lieu.

La réduction des émissions liées aux transports de 10 % par personne est l'un des six objectifs stratégiques de la Stratégie énergétique 2030. En 2020, l'Alliance énergétique de l'Arctique a lancé un programme d'incitation à l'achat de véhicules électriques qui prévoit une remise de 5 000 $ pour les nouveaux véhicules électriques et jusqu'à 500 $ pour l'infrastructure de recharge dans les collectivités alimentées par le réseau hydroélectrique. Le GTNO a également commandé une étude pour prévoir les taux d'adoption des véhicules électriques au cours de la prochaine décennie et examiner comment un couloir de recharge des véhicules électriques pourrait être implanté entre Yellowknife et la frontière de l'Alberta.

Même si la pandémie de COVID-19 a eu des conséquences importantes sur la vie de chacun d'entre nous, les Ténois savent s'adapter. Malgré les difficultés vécues au cours de l'exercice 2020-2021, le GTNO et ses partenaires ont réalisé d'importants progrès dans l'avancement de la Stratégie énergétique 2030. De nombreuses leçons ont été tirées au cours des trois années de mise en œuvre de la stratégie. D'autres recherches et analyses seront effectuées lorsque le GTNO et ses partenaires commenceront leur examen du Plan d'action énergétique au cours de l'exercice 2021-2022 et prépareront un examen éventuel de la Stratégie énergétique. Nous poursuivrons ce travail important afin de concrétiser notre vision à long terme qui consiste à assurer un approvisionnement énergétique sûr, abordable et durable et à effectuer la transition vers une économie à faibles émissions de carbone.

**Quyananni,**
*Madame Diane Archie*
*Ministre de l'Infrastructure*

# Executive Summary

It has been three years since the GNWT launched its 2030 Energy Strategy (Strategy). In that time, the GNWT has invested in initiatives to build new transmission lines for hydropower, electrify transportation, and promote energy conservation and efficiency programs NWT-wide. We have also commissioned studies to explore innovative energy policy and emerging energy technologies.

The Strategy is our map of a lower-carbon energy future for the NWT. The Strategy's six strategic objectives mark our destination, while measured trade-offs to ensure reliability and affordability help us chart the course. The Energy Action Plan (Plan)— a multi-year slate of actions and initiatives undertaken by the GNWT and its partners — is our vehicle to take us there. A review and update of the Plan is scheduled to be conducted in the coming fiscal year.

Refined imported petroleum products are still the primary source of energy in the NWT. Industry remains the largest consumer of energy in the territory, with buildings a close second. After a spike in 2015, energy use has mainly gone down in all sectors. Most of the electricity used in the NWT comes from hydroelectric facilities. Communities not connected to one of the NWT's two hydroelectric grids use diesel generators or natural gas to produce electricity, with a small percentage of residential and community-scale solar electricity generation.

The NWT emitted 1,377 kilotonnes (kt) of carbon dioxide equivalent ($CO_2e$) of GHGs in 2019, produced almost entirely from fossil fuel combustion. The transportation sector accounted for 58% of territorial emissions, with the industry sector producing 24%. Electricity generation, building heating, and waste were responsible for five-percent, nine-percent and three-percent, respectively. There is a general downward trend in emissions, with the NWT's GHG emissions 16% lower than 2005 levels.

The GNWT made $38 million in energy-related investments (including federal funding support) during 2020-2021. Projects and initiatives deployed in the last fiscal year resulted in a reduction of 3.6 kt of $CO_2e$, bringing the amount of cumulative emissions reductions under the 2030 Energy Strategy to 11.0 kt of $CO_2e$. As more energy solutions are implemented across the NWT, a better understanding of their efficiency and cost will be gained. This will help optimize energy investments to reduce emissions while maintaining affordability and reliability.

The GHG Grant Program for Government approved $1.1 million in funding for the installation of wood pellet boilers in two Yellowknife school facilities — Mildred Hall School and Range Lake North School. The other stream of the GHG Grant Program for buildings and industry approved three projects in the last year. Principals and teachers across the NWT were encouraged to use educational materials developed by the Department of Infrastructure (Infrastructure). The Arctic Energy Alliance (AEA) completed

the first of a three-year project to develop community energy plans for two partner communities, and Infrastructure provided data and support to update a pre-feasibility study for a mini hydro project in Gamètì. In 2020-2021, the GNWT continued several initiatives to help reduce GHG emissions from diesel electricity, including the Fort Providence and Kakisa Transmission Line and the Inuvik Wind Project. Projects to replace power plants in Łutselk'e and Sachs Harbour were also approved in 2020-2021. In June 2020, the AEA launched the Electric Vehicle Incentive Program, which provides a $5,000 rebate for new electric vehicles, and up to $500 for charging infrastructure in hydropower communities. To better understand the potential for decarbonizing transportation, the GNWT commissioned studies to forecast electric vehicle (EV) adoption in the coming decade and examine how an EV charging corridor could be developed between Yellowknife and the Alberta border, and to explore the viability of liquid biofuels in the NWT.

Despite restrictions caused by the COVID-19 pandemic, the AEA gave out roughly 1,000 more rebates to Northerners who purchase energy efficient products than it did last year. Renewable energy-based programs also saw an increase in uptake. Almost $2 million worth of incentives were administered by the AEA, saving an estimated 1,900 megawatt-hours (MWh) of electricity and displacing an estimated 8,100 gigajoules (GJ) worth of fossil fuel and 1,300 tonnes of GHG emissions.

By the end of the 2020-2021 fiscal year, the GNWT's Capital Asset Retrofit Fund (CARF) program had cumulatively reduced GHG emissions by 16.9 kt, resulting in over $4.2 million in cost savings since 2007-2008. Most of the reductions and cost savings came from a switch to biomass for space heating. Projects completed in the last fiscal year decreased GNWT's GHG emissions by two kilotonnes. In 2020-2021, multi-year initiatives continued to refurbish components of both the Taltson and Snare hydroelectric generating facilities, which are approaching or have already exceeded their useful life. Almost $43 million in funding has been secured for these projects, which will ensure decades of clean hydroelectricity and help meet the NWT's annual electricity requirements.

The Taltson Hydroelectricity Expansion Project continued with the development of a Memorandum of Understanding (MOU) with Indigenous Government and Organization (IGO) partners, continued work towards developing a preliminary business case for the project, as well as potential transmission routing.

In 2020-2021, Infrastructure's Energy Division commissioned three independent studies to look at policy options — determining the limits of renewable energy in diesel community microgrids, generating revenue from excess hydropower, and containing rate inflation from net-metering. Findings from these studies will inform potential updates to NWT electricity policy in 2021-2022.

With approximately $8.6 million in funding available by 2024, both streams of the GHG Grant Program will continue to accept applications for energy projects until all funding is invested.

As we head into the 2021-2022 fiscal year, lessons learned during the first three years of implementation — along with new research and careful analysis — will inform the revision and update of the Energy Action Plan, and help prepare for the eventual review of the Strategy.

# Sommaire

Il y a trois ans, le GTNO lançait sa Stratégie énergétique 2030. Depuis, le GTNO a investi dans des initiatives visant à construire de nouvelles lignes de transmission pour l'hydroélectricité, à électrifier les transports et à promouvoir les programmes de conservation de l'énergie et d'efficacité énergétique à l'échelle du territoire. Il a également commandé des études pour évaluer des politiques énergétiques novatrices et des technologies énergétiques émergentes.

La Stratégie est notre feuille de route vers un avenir à faibles émissions de carbone aux TNO. Les six objectifs stratégiques sont notre destination, tandis que des compromis bien évalués nous aideront à garder le cap en assurant un approvisionnement énergétique sûr et abordable. Le Plan d'action énergétique — un ensemble pluriannuel d'actions et d'initiatives entreprises par le GTNO et ses partenaires — est le moyen qui nous permettra d'atteindre ces objectifs. Un examen et une mise à jour du Plan sont prévus au cours du prochain exercice financier.

Les produits pétroliers raffinés importés restent la principale source d'énergie aux TNO. L'industrie est toujours le plus grand consommateur d'énergie du territoire, le secteur du bâtiment venant juste après. Après avoir connu un pic en 2015, la consommation d'énergie a globalement diminué dans tous les secteurs. La plupart de l'électricité utilisée aux TNO provient d'installations hydroélectriques. Les collectivités qui ne sont pas reliées à l'un des deux réseaux hydroélectriques des TNO utilisent des génératrices au diesel ou au gaz naturel pour produire de l'électricité, alors que l'énergie solaire est utilisée dans une faible proportion pour la production d'électricité à l'échelle résidentielle et communautaire.

Les TNO ont émis 1 377 kilotonnes (kt) d'équivalent dioxyde de carbone (éq. CO2) de GES en 2019, lesquelles ont été produites presque entièrement par l'utilisation de combustibles fossiles. Le secteur des transports a généré 58 % des émissions territoriales, le secteur de l'industrie en produisant 24 %. La production d'électricité, le chauffage des bâtiments et les déchets ont quant à eux été respectivement responsables de 5 %, 9 % et 3 % des émissions. On observe une tendance générale à la baisse des émissions, les émissions de GES des TNO étant de 16 % inférieures à celles de 2005. En 2020-2021, le GTNO a investi 38 millions de dollars dans le domaine de l'énergie (y compris le soutien financier fédéral). Les projets et initiatives déployés au cours du dernier exercice ont permis une réduction de 3,6 kt d'éq. CO2, ce qui porte à 11 kt d'éq. CO2 la quantité de réductions d'émissions cumulées dans le cadre de la Stratégie énergétique 2030. En mettant en œuvre davantage de solutions énergétiques dans l'ensemble des TNO, il sera possible de mieux comprendre leur efficacité et leur coût. Ainsi, on pourra optimiser les investissements dans ce domaine afin de réduire les émissions, tout en maintenant l'abordabilité et la fiabilité du service.

Une somme de 1,1 million de dollars a été approuvée pour l'installation de chaudières à granules de bois dans deux établissements scolaires de Yellowknife — l'école Mildred Hall et l'école Range Lake North dans le cadre du Programme de subventions publiques pour la réduction des émissions de gaz à effet de serre. L'autre volet du Programme de subventions publiques pour la réduction des GES pour les immeubles et l'industrie a approuvé trois projets l'année dernière. Les directeurs d'école et les enseignants de l'ensemble des TNO ont été invités à utiliser le matériel pédagogique élaboré par le ministère de l'Infrastructure. L'Alliance énergétique de l'Arctique a terminé le premier volet d'un projet de trois ans visant à élaborer des plans énergétiques communautaires pour deux collectivités partenaires, tandis que le ministère de l'Infrastructure a fourni des données et un soutien pour mettre à jour une étude de préfaisabilité pour un mini-projet

hydroélectrique à Gamètì. En 2020-2021, le GTNO a maintenu plusieurs initiatives de réduction des émissions de GES occasionnées par l'utilisation de génératrices diesel, notamment la ligne de transmission de Fort Providence et de Kakisa et le projet éolien d'Inuvik. Des projets visant à remplacer les centrales électriques de Łutselk'e et de Sachs Harbour ont également été approuvés en 2020-2021.

En juin 2020, l'Alliance énergétique de l'Arctique a lancé un programme d'incitation à l'achat de véhicules électriques qui prévoit une remise de 5 000 $ pour les nouveaux véhicules électriques et jusqu'à 500 $ pour l'infrastructure de recharge dans les collectivités alimentées par le réseau hydroélectrique. Afin de mieux comprendre le potentiel de décarbonisation des transports, le GTNO a commandé des études pour prévoir les taux d'adoption des véhicules électriques au cours de la prochaine décennie, pour examiner comment un couloir de recharge de ces véhicules pourrait être implanté entre Yellowknife et la frontière de l'Alberta, et pour analyser la viabilité de l'utilisation des biocarburants liquides.

Malgré les contraintes engendrées par la pandémie de COVID-19, l'Alliance énergétique de l'Arctique a accordé environ 1 000 remises de plus que l'an dernier aux Ténois qui achètent des produits à haut rendement énergétique. Les programmes axés sur les énergies renouvelables ont également connu une augmentation du nombre de participants. L'Alliance énergétique de l'Arctique a accordé des incitatifs d'une valeur de près de 2 millions de dollars, ce qui a permis d'économiser environ 1 900 mégawattheures (MWh) d'électricité, de remplacer environ 8 100 gigajoules (GJ) de combustibles fossiles et d'éviter l'émission de 1 300 tonnes de GES.

À la fin de l'exercice 2020-2021, le programme du Fonds de modernisation des immobilisations (FMI) du GTNO avait permis une réduction cumulative des émissions de GES de 16,9 kt, ce qui s'est traduit par des baisses de coûts de plus de 4,2 millions de dollars depuis 2007-2008. La plupart des réductions et des baisses de coûts sont attribuables à l'adoption de la biomasse comme source de chauffage. Les projets achevés au cours du dernier exercice financier ont permis de réduire les émissions de GES du GTNO de deux kilotonnes.

En 2020-2021, des initiatives pluriannuelles ont permis de poursuivre la remise à neuf de composants des centrales hydroélectriques des rivières Taltson et Snare, qui approchent ou ont déjà dépassé la fin de leur cycle de vie utile. Près de 43 millions de dollars ont été obtenus pour ces projets, qui garantiront des décennies d'hydroélectricité propre et aideront à répondre aux besoins annuels en électricité des TNO.

Le projet d'agrandissement de la centrale hydroélectrique de la rivière Taltson s'est poursuivi avec l'élaboration d'un protocole d'entente avec les partenaires du gouvernement et des organisations autochtones, ainsi que des travaux visant à élaborer une analyse de rentabilisation préliminaire pour le projet et de possibles infrastructures de transmission.

En 2020-2021, la Division de l'énergie du ministère de l'Infrastructure a commandé trois études indépendantes pour examiner les options stratégiques, à savoir déterminer les limites de l'énergie renouvelable dans les microréseaux communautaires utilisant des génératrices diesel, générer des revenus à partir de l'énergie hydroélectrique excédentaire et contenir l'inflation des tarifs de la facturation nette. Les résultats de ces études serviront de point de départ pour d'éventuelles mises à jour de la politique sur l'électricité des TNO en 2021-2022.

Avec environ 8,6 millions de dollars disponibles d'ici 2024, les demandes concernant des projets liés à l'énergie continueront d'être acceptées dans le cadre des deux volets du Programme de subventions pour la réduction des émissions de gaz à effet de serre, et ce, jusqu'à ce que tous les fonds soient investis.

À l'aube de l'exercice 2021-2022, les leçons tirées des trois premières années de mise en œuvre — ainsi que de nouvelles recherches et d'une analyse minutieuse — serviront de fondement à une révision du Plan d'action énergétique et mettront la table à un examen éventuel de la Stratégie.

# Introduction

The *2020-2021 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, programs and policies, and provides a high level review of the Northwest Territories' (NWT) current energy and GHG emissions situation.

Although the NWT is still reliant on fossil fuels for energy, significant investments have been made to lower GHG emissions and improve our energy infrastructure since implementing the Strategy three years ago. For example, plans for new transmission lines will allow some communities to switch from diesel-generated electricity to clean hydropower while stabilizing energy costs. Providing rebates for electric vehicles and charging infrastructure will reduce GHGs and create demand for excess hydropower.

Major investments have been made to overhaul the NWT's hydroelectric facilities to ensure continued decades of clean energy, as well as upgrading diesel power plants in remote communities so they run more efficiently and can integrate more renewable energy into their grids. Expansion of the Taltson Hydroelectric Facility is progressing with our IGO partners and promises to provide a clean energy source to the mining industry.

The GNWT continues to lead the way in energy conservation and efficiency initiatives through CARF. One standout success of the program has been the implementation of biomass energy for space heating, where the NWT has become a national leader. We've also increased support to our partners at the AEA, who provide residents, communities and businesses with funding and expertise to save energy and reduce GHGs.

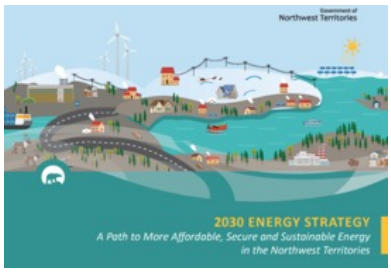
A suite of studies was conducted in 2020-2021 to gain insight into how energy policy can be adapted to improve the procurement, supply and use of energy in the North, and workshops have been planned for 2021-2022 to assess emerging energy technologies such as hydrogen.

As we continue our transition to a lower-carbon economy, we are also mindful of the energy needs of NWT residents and the unique challenges presented by our northern climate and geography. Lessons learned in the past three years have shown us that ensuring secure and affordable energy sometimes requires trade-offs when making decisions about potential energy projects.

Due to sparse population, the lack of an economy of scale and extreme temperatures, the NWT often faces much higher costs than Southern jurisdictions for the same technology. Also, low- and zero-carbon technologies from the South do not always transfer equally well in the North. They need to be tested, piloted and de-risked before we can invest in and implement them. All these considerations will inform the GNWT's coming review and update of the Plan.

## OUR MAP – *2030 ENERGY STRATEGY*

Released in 2018, **the Strategy** sets out the GNWT's long-term approach to supporting secure, affordable and sustainable energy in the NWT. This includes support for energy efficiency and conservation programs, local renewable and alternative energy solutions, and large-scale energy projects.



## KEY LINKAGES TO THE CLIMATE CHANGE STRATEGIC FRAMEWORK AND NWT CARBON TAX

The Strategy is being implemented together with the **Climate Change Strategic Framework** (CCSF) and the **NWT 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 — Transition to a Lower Carbon Economy.

# OUR DESTINATION – SIX STRATEGIC OBJECTIVES


The Strategy has six strategic objectives (4 and 5 are bundled together) to reach the overarching vision for 2030. The strategic objectives are designed to be achieved through actions and initiatives undertaken by the GNWT and its partners. Using an adaptive approach, these strategic objectives will be revisited and re-evaluated to ensure they represent what is achievable given new technology.

# OUR COMPASS – TRADE-OFF TRIANGLE

While transitioning to a lower carbon economy will reduce GHG emissions and help fight climate change, there will be different considerations and trade-offs that could affect energy costs and reliability. These trade-offs are particularly acute in the remote communities of the North. The Trade-off Triangle reminds us that we must keep a balance between these three components of our energy systems when charting our lower carbon trajectory.

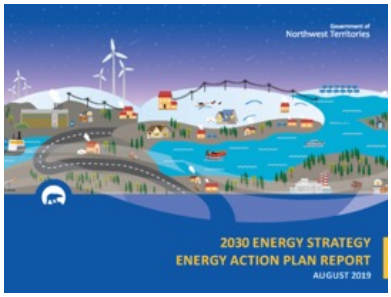

When making decisions about energy initiatives, the GNWT must also consider whether the initiative has community and Indigenous engagement, approval, and participation. Other factors that affect decision-making include stakeholder interest, project complexity, optimizing resources — including GHG reductions per dollar invested — and the capacity within a sector to achieve success. Finally, energy initiatives must be reflective of available federal funding opportunities.

# OUR VEHICLE – *ENERGY ACTION PLAN*

The **Energy Action Plan** encompasses multi-year government investments in actions and initiatives designed to achieve the strategic objectives in the Strategy.

These actions and initiatives are to be undertaken by the GNWT and its partners, including the federal government, NWT Housing Corporation (NTWHC), the AEA, and the NWT Power Corporation (NTPC) — as well as residents, businesses, communities, IGOs, and industry.

A review and update of the Plan will be started in the coming fiscal year, and the GNWT plans to release an updated action plan in 2022-2023.



# NWT Energy Snapshot

## NWT Energy Supply and Demand

The diagram pictured on these two pages is called a Sankey diagram. Sankey diagrams are used to show the energy flow; starting from its primary sources, to its conversion to fuels and electricity, and finally to how that fuel and electricity is used or unused. The key to interpreting a Sankey diagram is to remember that the width of each line shows the quantity of energy flowing. This diagram shows the NWT's energy sources and uses in 2019. You can see that refined petroleum products are still the primary source of energy in the NWT (86% of overall territorial energy supply).

### LOCAL VS. IMPORTED ENERGY

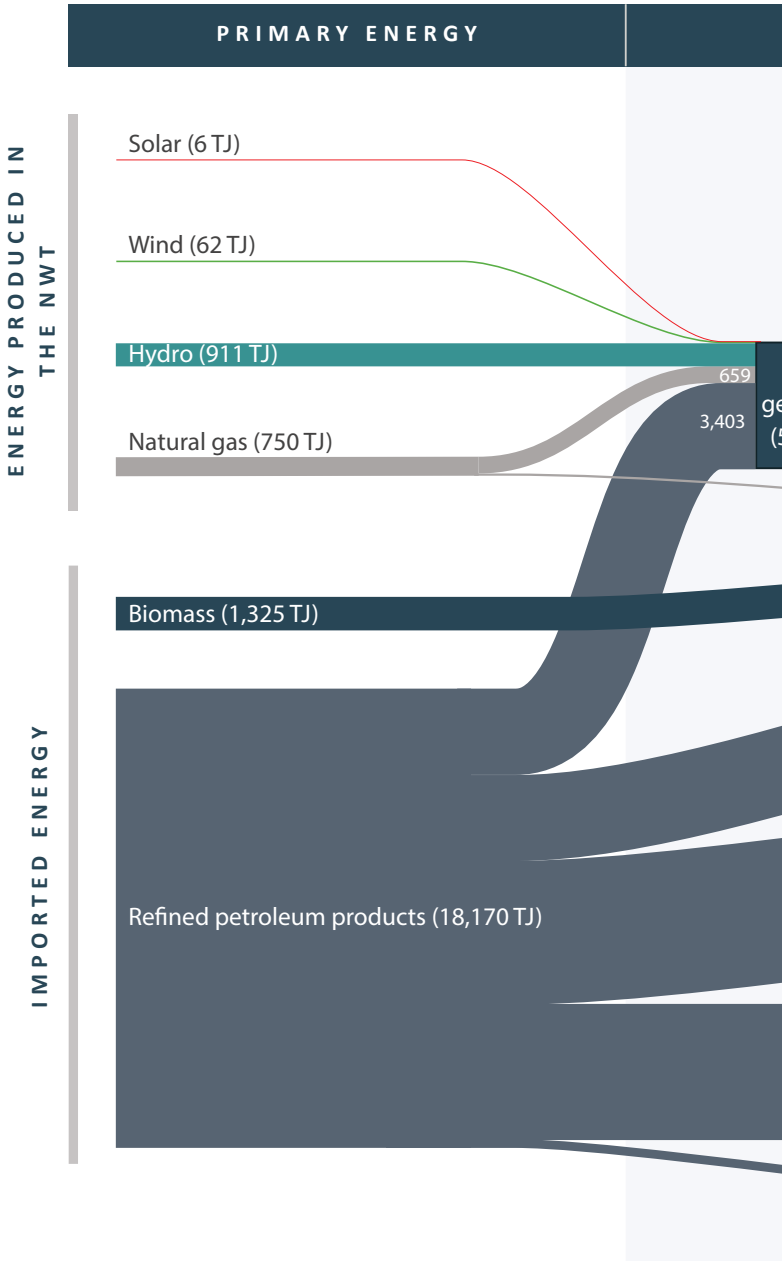
The left side of this diagram highlights the difference between local and imported energy in the NWT. Renewable energy projects like Inuvik Wind and Taltson Hydroelectricity Expansion — along with tapping into less carbon intensive fossil fuels like local natural gas — would reduce our dependence on imported energy, help stabilize energy costs, and greatly reduce GHG emissions.

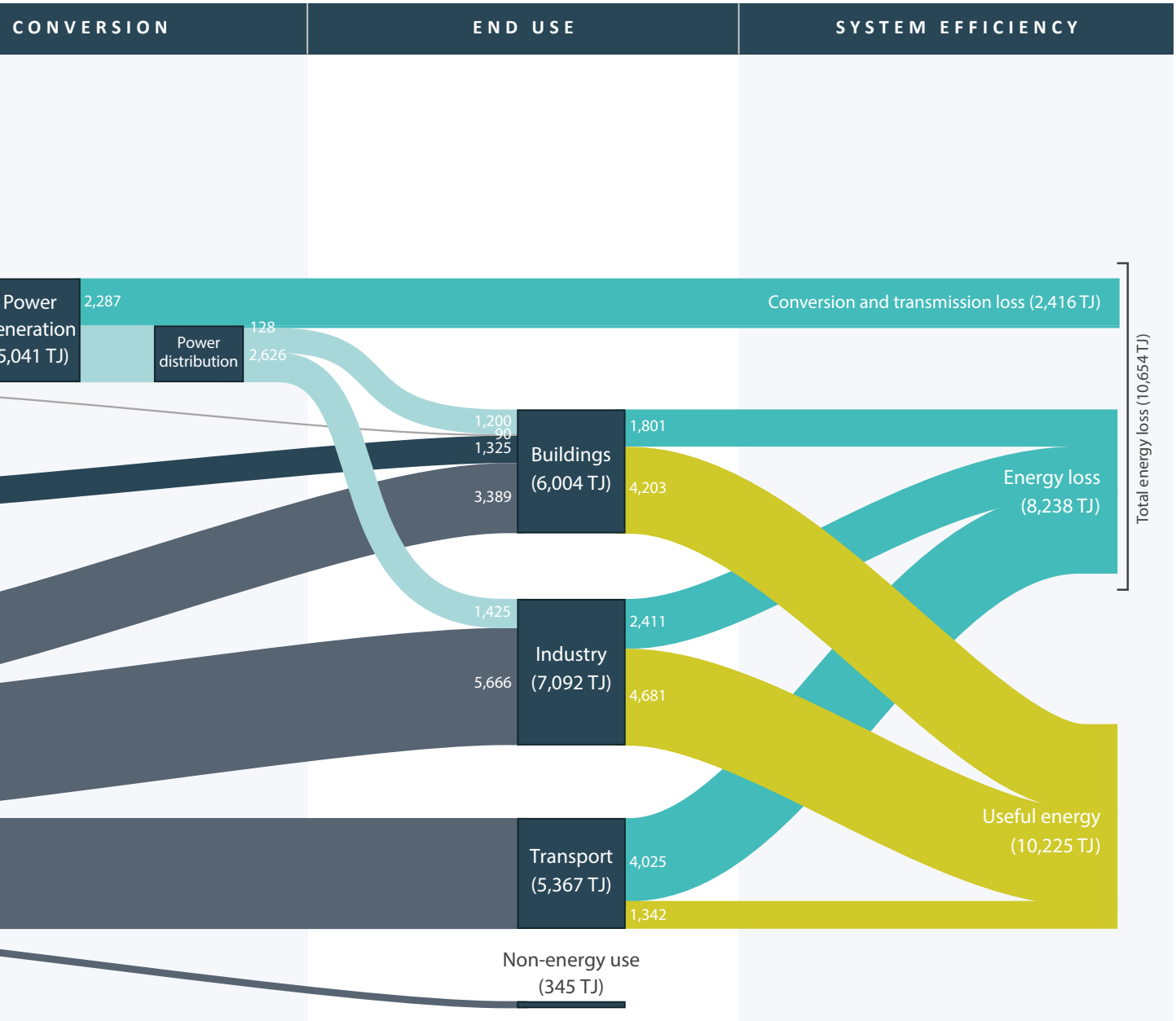
### OPPORTUNITIES FOR GHG REDUCTIONS

On the right side of this diagram (under System Efficiency) you can see where energy is most efficiently used (buildings and industry) and where it is mainly lost (power generation and transportation).

A decade ago, most buildings in the NWT were less energy efficient, and energy conservation and efficiency initiatives — like the GNWT's Capital Asset Retrofit Fund and the Arctic Energy Alliance's programs — resulted in big initial energy and GHG savings. Today, there are opportunities for large GHG emissions reductions by using excess hydroelectricity and electrifying transportation.

**Figure 1. Energy flows in the NWT in 2019**





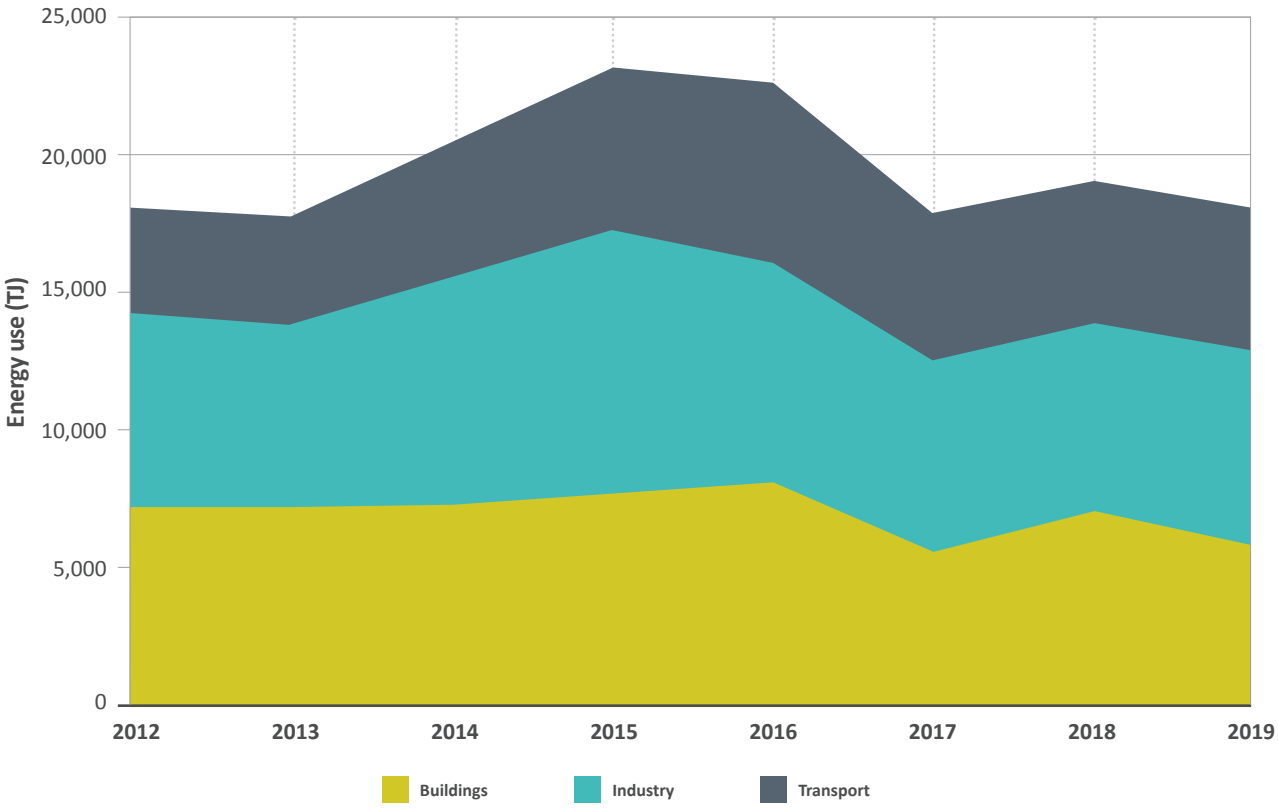

***Source:*** *Statistics Canada, GNWT, NTPC, Northland Utilities*

***Notes:*** *Power generation in the industrial sector is estimated using data from Statistics Canada. Energy loss from the end use is estimated using average conversion efficiency of technologies for a given sector in North America.*

## NWT ENERGY USE

After a spike in 2015, NWT energy use for each sector (Figure 2) has mainly gone down. Industry remains the largest user of energy in the territory, representing 7,092 TJ or 38% of NWT final energy demand. With 6,004 TJ (33% of final demand), buildings are close behind. These sectors present the greatest opportunities for large GHG emissions reductions.

**Figure 2. Total energy use by sector between 2012 and 2019**




***Sources:*** *Statistics Canada, GNWT, NTPC, Northland Utilities*

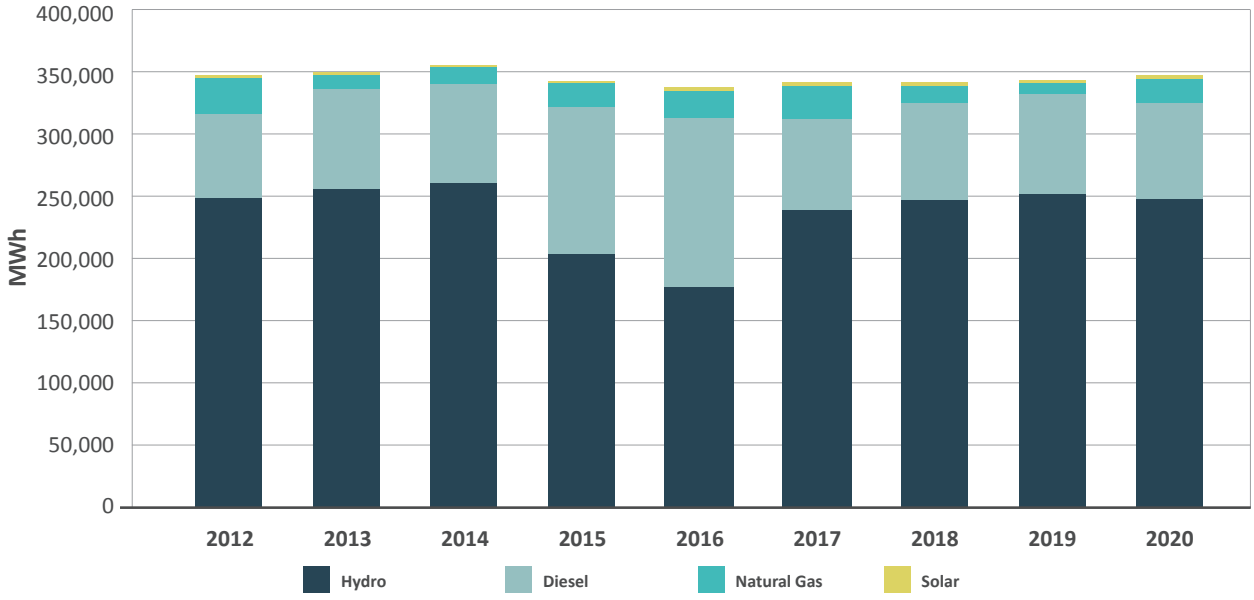
***Note:*** *Energy use includes primary energy (e.g., refined petroleum products, hydroelectricity) and secondary energy (e.g., electricity produced from diesel generators).*

## POWER GENERATION

Unlike most of Canada, the NWT is not connected to the North American electrical grid. This means each community must have its own sources of electricity generation and backup. Figure 3 shows the energy sources that were used to generate power for NWT communities between 2012 and 2020.

Almost 80% of the electricity generated in the NWT comes from hydroelectric facilities, where the energy of flowing rivers is transformed into electricity. Communities not connected to one of the NWT's two hydroelectric grids — the Snare System in North Slave and the Taltson System in South Slave — use diesel generators or natural gas to produce electricity. Most NWT communities have also deployed residential and community scale solar electricity generation, although it is a small overall percentage.

**Figure 3. Utility power generation by source between 2012 and 2020**




***Note:*** *While utilities provide most NWT communities with electricity, industrial sites in the territory — such as mines — generate their own electricity on-site, primarily from diesel generators. Power generation from industry is excluded from this chart.*

## GREENHOUSE GAS EMISSIONS

Under Goal #1 of the CCSF, the NWT is committed to reducing GHG emissions by 30% below 2005 levels by 2030.

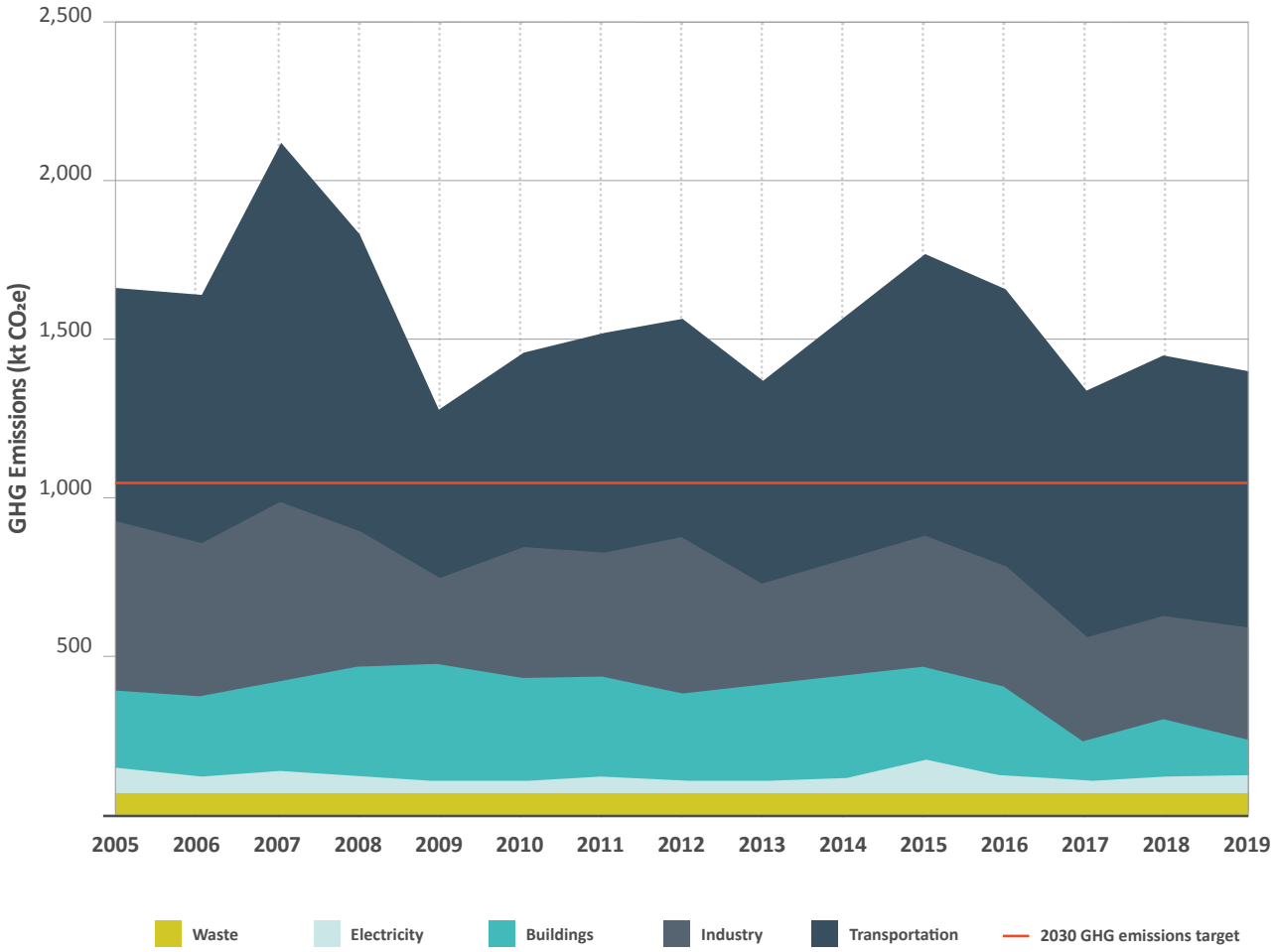
Figure 4 shows the NWT's historical total annual GHG emissions. In 2019 — the most recent year for which data is available — the NWT's total annual emissions were 1,377 kt $CO_2e$. Virtually all NWT GHG emissions are produced from fossil fuel combustion to transport people and goods, keep buildings warm and powered, and fuel industry operations.

In 2019, NWT's GHG emissions were dominated by the transportation sector. Primarily driven by demand from remote industrial sites, transportation accounted for 58% of territorial emissions. The industry sector was second, producing 24% of the NWT's GHG emissions. Electricity

generation, building heating, and waste were responsible for five-percent, nine-percent and three-percent of overall carbon emissions respectively.

In 2019, the NWT's GHG emissions were 16% lower than 2005 levels. However, territorial emissions fluctuate each year depending on economic activity, climate conditions and investments in low-carbon technologies — all of which affect the total demand for fossil fuels. There is a general downward trend in emissions.

**Figure 4. NWT Greenhouse Gas Emissions between 2005 and 2019**




***Source:*** *Environment and Climate Change Canada*

***Note:*** *Emissions from agriculture are included with industry. Data for 2019 is preliminary. The NWT's GHG emissions target for 2030 is 1,094 kt*

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

# ENERGY TRANSITION INVESTMENTS

## PAST INVESTMENTS

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

Table 1 provides a breakdown of $38 million in energy-related investments the GNWT made during 2020-2021 (including federal funding support) by strategic objective.

**Table 1. GNWT Energy-Related Investments by Strategic Objective**

| STRATEGIC OBJECTIVE | 2019-2020 | 2020-2021 |
|---|---|---|
| 1. Working Together | $103,000 | $807,000 |
| 2. Electricity | $12,444,000 | $21,480,000 |
| 3. Transportation | $421,000 | $530,000 |
| 4 & 5. Energy Efficiency and Space Heating | $9,379,000 | $10,368,000 |
| 6. Long Term Vision | $3,492,000 | $4,872,000 |
| **Total** | **$25,837,000** | **$38,007,000** |

Table 2 provides a breakdown of $38 million in energy-related investments the GNWT made during 2020-2021 by funding stream.

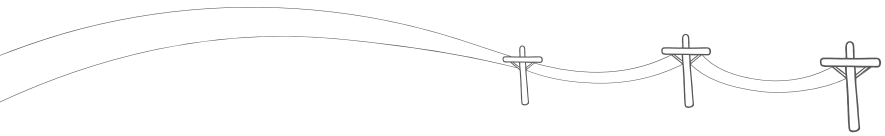
**Table 2. GNWT Energy-Related Investments by Funding Stream**

| FUNDING STREAM | 2019-2020 | 2020-2021 |
|---|---|---|
| GHG Grant Programs | $159,000 | $331,000 |
| Arctic Energy Alliance (Core Funding and LCELF Funding) | $4,990,000 | $5,191,000 |
| Federal Low Carbon Economy Leadership Fund Portfolios (excluding AEA supplement) | $449,000 | $ 1,239,000 |
| Federal Investing in Canada Infrastructure Program Projects | $11,814,000 | $20,469,000 |
| Crown-Indigenous Relations and Northern Affairs Canada (Taltson Expansion) | $2,288,000 | $3,995,000 |
| Energy Core Funding | $843,000 | $1,146,000 |
| Capital Asset Retrofit Fund | $3,800,000 | $3,800,000 |
| Salaries and Administrative Expenses | $1,494,000 | $1,836,000 |
| **Total** | **$25,837,000** | **$38,007,000** |

The Infrastructure Canada funding is being provided through a 10-year Integrated Bilateral Agreement established between Infrastructure Canada and the GNWT in 2018. In total, $339 million of federal-territorial funding is available from 2018 to 2027 to support projects that reduce reliance on diesel fuel and reduce GHG emissions. This level of investment in the NWT's electricity system will also help improve system reliability and stabilize electricity costs in future.

## THE COST OF THE ENERGY TRANSITION

Remote communities, sparse population, and the extreme northern climate make the transition to cleaner energy more challenging in the NWT than in southern jurisdictions. Combined, these factors make it much more expensive to deploy the low carbon technologies we need to reduce our GHG emissions. As the GNWT implements more energy solutions across the NWT it will gain a better understanding of what types of projects and programs work best and at what cost. We will use this understanding to develop the estimated costs of reducing one tonne of GHGs. This will help us optimize where we put our energy investments to reduce emissions while at the same time maintaining affordability and reliability.



# ORGANIZATIONAL ROLES

The GNWT leads the implementation of the Strategy by carrying out actions and initiatives in conjunction with its partners, including the NTPC and the AEA. All three organizations work with NWT communities, IGOs and private sector partners on shared objectives that advance the Strategy.

## GOVERNMENT OF THE NORTHWEST TERRITORIES

The GNWT's Department of Infrastructure (Infrastructure) — led by the Energy Division — develops energy policy, secures federal funding for energy initiatives, and administers application-based funding programs that support NWT communities, northern businesses, and industry to reduce their energy use and GHG emissions.

The Energy Division works with other Infrastructure divisions to support internal energy initiatives — such as the CARF and Marine fleet retrofits — as well as other GNWT departments and agencies to support energy initiatives such as public housing upgrades, community energy planning, and emissions mitigation projects.

The Energy Division also works closely with the federal government and IGOs to facilitate consultation, partnership opportunities and funding for energy projects throughout the territory.

## NORTHWEST TERRITORIES POWER CORPORATION

NTPC is a GNWT Crown Corporation that owns and operates the NWT's hydroelectric facilities and most of the territory's diesel power plants. Through its capital plan — and in partnership with NWT communities and other utilities — NTPC leads conventional, alternative and renewable electricity solutions to maintain a reliable and affordable electricity system while working to reduce GHG emissions from diesel-generated electricity.

## ARCTIC ENERGY ALLIANCE

The AEA is a non-profit society that helps NWT residents, businesses and communities improve their own energy efficiency by providing hands-on energy conservation and efficiency programs and services on behalf of the GNWT. Almost entirely funded by the GNWT and operating through six regional offices, the AEA is the GNWT's primary delivery agent for services such as energy audits and household appliance rebates, biomass boilers and woodstoves that increase the use of renewable energy for heating, and electric vehicle rebates that reduce transportation emissions.

# 2020-2021 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 communities.

## OUTREACH & ENERGY LITERACY

In 2019, Infrastructure created ready-to-use lesson plans for teachers that highlight topics surrounding energy and energy systems in the NWT. Each lesson aligns with the learning outcomes from NWT's Experiential Science curriculum.

In 2020, the Department of Education, Culture and Employment — in partnership with Infrastructure — uploaded the lessons and supporting materials to its website and sent letters to school principals throughout the territory, encouraging them to make teachers aware of this timely and northern-specific resource. It is hoped that Energy Division and/or AEA staff will eventually be able to visit schools and provide guest classes to promote teacher uptake. The lessons and supporting materials can be accessed **online.**

## GHG GRANT PROGRAM FOR GOVERNMENT

The GNWT's **GHG Grant Program for Government** is an application-based, non-repayable grant program designed to support GHG emissions reduction projects and initiatives for NWT community governments, municipalities, GNWT departments, and IGOs (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 AEA. **Contact AEA** for more details on smaller grant initiatives.

In 2020-2021, the GHG Grant Program for Government received one application from the Yellowknife Education District No. 1 (YK1) school board, which was subsequently approved for funding and was awarded $1.1 million. The project includes the installation of wood pellet boilers in two Yellowknife school facilities — Mildred Hall School and Range Lake North School. These installations are expected to reduce up to 578 tonnes of GHG emissions annually and be completed by the fall of 2021.

## COMMUNITY ENERGY PLANNING

Community energy planning is about identifying and finding ways to implement local solutions to improve energy supply and reduce energy use. It also aims to build local capacity and increase energy understanding.

The GNWT encourages communities to develop a community energy plan. In 2020-2021, the AEA completed the first full year of a three-year project to work with two partner communities to develop community energy plans. This project is being funded by Natural Resources Canada, through its Clean Energy for Rural and Remote Communities Capacity Building Stream.

As part of this community energy plan project, in 2020-2021, the AEA entered into partnership agreements with the Hamlet of Tuktoyaktuk and the Deline Got'ine Government. Each organization hired a community energy champion to help with planning activities. These champions are key to the success of the project. In addition to guiding the community engagement process, they ensure the project is grounded in Indigenous community traditions, and that local governance and protocols are respected.

Additional information on community energy planning can be found on the **AEA website**, including a community energy planning approach, available community energy planning resources and community energy plans, and energy profiles for each NWT community.

## GAMÈTÌ MINI-HYDRO

As part of the 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 water flow monitoring, this work was based on modeled data derived from other regional data. To confirm there is sufficient water flow to support the proposed project, Infrastructure arranged for a water gauge to be installed to gather data at the right location.

In 2020-2021, Infrastructure provided water gauge data to the community, along with financial support to update the 2015 pre-feasibility study. The updated study is expected to be complete in 2021. Assuming the updated study confirms the technical viability of the project, additional engineering and preliminary environmental studies are planned in 2021.

## COMMUNITY PROJECTS

The GNWT recognizes that Indigenous and community governments are increasingly interested in having direct involvement in, or control of, local energy planning and projects. Federal departments — such as Natural Resources Canada (NRCan) and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) — are supporting this approach by providing funding directly to communities for energy efficiency and renewable energy projects. The GNWT is also working to support community-led energy projects and initiatives.

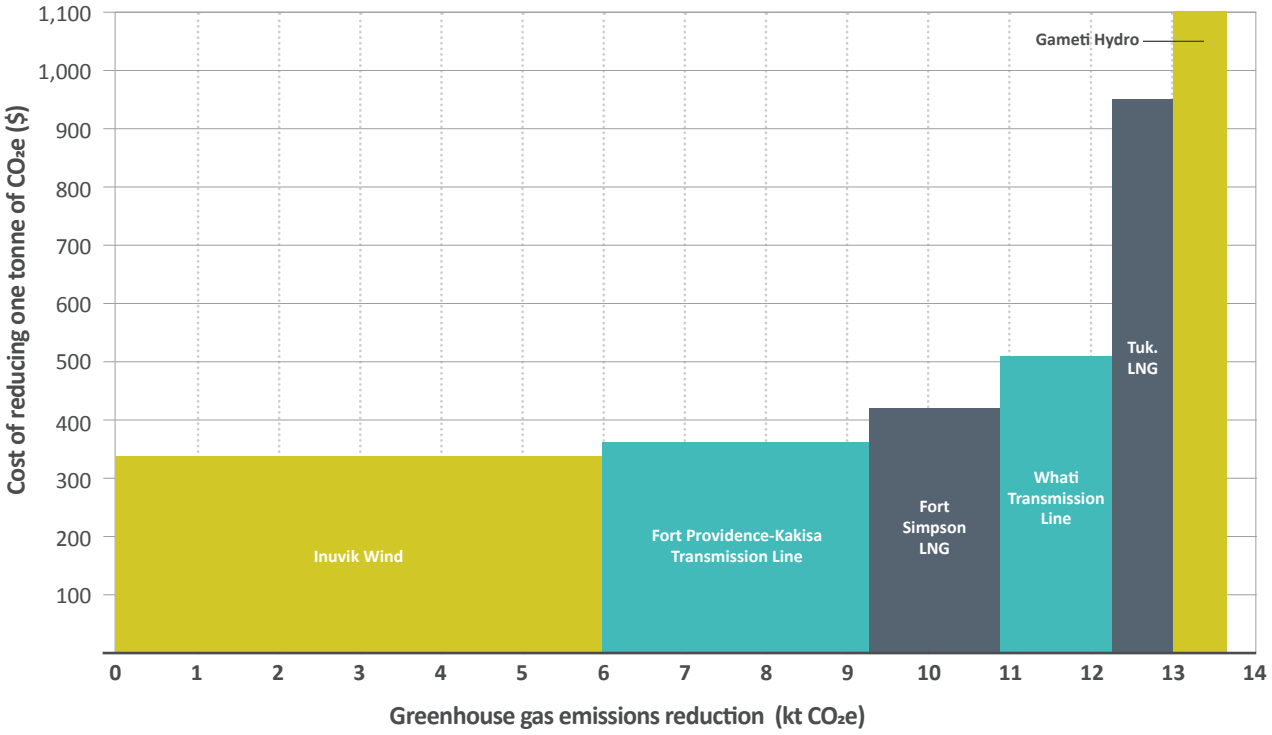
# 2020-2021 ENERGY INITIATIVES
## STRATEGIC OBJECTIVE 2 – REDUCE DIESEL

### 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 its partners are working to implement renewable and alternative energy solutions appropriate to each community and region. These initiatives are intended to help reduce GHG emissions from diesel electricity by 25%, or 18 kt, below average historical levels by 2030.

Figure 5 estimates what it will cost for each of the main projects under Strategic Objective 2 to reduce one tonne of GHG emissions over their respective lifetime.

**Figure 5. Estimated per-tonne cost of reducing emissions for upcoming projects in diesel communities**



# TRANSMISSION LINES

## FORT PROVIDENCE AND KAKISA TRANSMISSION LINE

As part of its commitment to reduce GHG emissions 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, Kakisa and Dory Point. These communities are accessible by road and relatively close to the Taltson system, which has a surplus of hydropower available. In 2019-2020, Infrastructure selected the highway routing and updated previous technical and costing studies, initiated formal consultations with affected Indigenous governments and organizations and conducted engagement activities with project stakeholders.

In 2020-2021, Infrastructure continued consultation and engagement activities, applied for and received federal funding support for the project and completed preparations for environmental desktop studies and an environmental field program to gather baseline information.

This project will reduce diesel fuel consumption for power generation by approximately one million litres and reduce GHG emissions by 3,000 tonnes per year. Replacing diesel electricity with hydroelectricity should also help stabilize the cost of power in these communities in future years.

### OUR PREFERRED ROUTE

The GNWT is proposing to build the transmission line completely within 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), follow Highway 1 to connect to Kakisa and follow Highway 3 to connect to Dory Point and Fort Providence.

### PROJECT FUNDING

Funding has been approved for this project. The overall project cost is estimated at $60 million, of which $45 million will be covered by the federal government under ICIP and the remaining 25% or $15 million will be covered by the GNWT. Once built, the transmission line will be operated and maintained by NTPC.

### WHO WILL SUPPLY THE 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 be provided by NTPC to the local utility — currently Northland Utilities — 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 is tentatively planned for 2023, subject to the project obtaining a land use permit and other authorizations.

## WHATÌ TRANSMISSION LINE

This proposed project involves the construction of a 60-km transmission line to connect Whatì to the Snare electricity system, primarily served by hydro. By displacing diesel generation, the project has the potential to annually displace 500,000 litres of diesel, reduce GHG emissions by 1,400 tonnes and reduce costs by $600,000. The budget for this project is currently estimated to be $33 million.

The project is located almost entirely on Tłı̨chǫ lands. The GNWT has started consultations with the Tłı̨chǫ Government and has committed to working in partnership with the Tłı̨chǫ Government to advance the project. The next step is to update previous technical studies to identify an acceptable routing corridor and determine a revised capital cost estimate for the project.

*The town of Inuvik, and its famous Igloo church, gets its electricity from fossil fuel generation. The Inuvik Wind Project will reduce diesel consumption in the town by 30%.*

# 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 federal government's Investing in Canada Plan (ICIP). This project includes the installation of a single 3.5 megawatt wind turbine and a small battery storage system, a six-kilometre access road, and a distribution line connecting to existing lines near Inuvik's Mike Zubko Airport.

Wind could offset approximately three million litres of diesel per year in Inuvik (our largest off-grid community) reducing diesel consumption by 30% and gain $3.4 million in fuel savings. It would also reduce GHG emissions by 6,000 tonnes, which would help us meet our 25% reduction target for diesel from electricity. In 2020-2021, the project completed the permitting phase and moved into final design, with construction tentatively slated to start in 2021-2022.

## SACHS HARBOUR WIND MONITORING

In 2016-2017, Infrastructure received funding from the federal Northern Responsible Energy Approach for Community Heat and Electricity (REACHE) program to investigate new sites for wind monitoring around Sachs Harbour. In 2017-2018 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.

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 study and a community visit were initially planned for summer 2020, but ongoing technical challenges with the wind monitoring equipment and COVID-19 restrictions prevented Infrastructure from obtaining a full 24 months of wind monitoring data or visiting the community during 2020-2021. Infrastructure is continuing to work with the hamlet and NTPC to resolve the technical issues and determine if the project is viable.

## NORMAN WELLS WIND MONITORING

A previous study from the Aurora Research Institute concluded that wind speeds could be viable at 80 metres 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 50-metre wind monitoring tower with heated sensors. In 2017-2018, Infrastructure 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 (by summer 2021), 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.

*The foundation for a new diesel generating plant being installed in Łutselk'e. The new plant will have high efficiency generators and is located outside of the centre of the community, moving fuel storage away from Great Slave Lake as well as reducing noise and GHG emissions.*

***Photo:*** *James Malone*

*The replacement of the Sachs Harbour diesel power plant is set to start in the spring of 2022. The new high efficiency diesel plant is expected to displace about 100 tonnes of GHG emissions per year.*

# 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 2019-2020, the project was approved by Infrastructure Canada — through the Arctic Energy Fund — and a contribution agreement was signed with NTPC. The total budget is $8.9 million (75% ICIP + 25% NTPC). The 75% federal funding means that NTPC saves $6.7 million from its capital plan, which reduces the pressure on electricity rates.

The existing power plant is at the end of its life and has a fuel efficiency of 3.1 kWh/L, considered to be very low. Installation of a new high-efficiency diesel plant 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.

A new plant and auxiliary equipment were shipped to Sachs Harbour in the fall of 2020, but NTPC was forced to defer the construction phase of the project due to COVID-19 challenges. The construction start date has been pushed out to the spring of 2022. NTPC is taking steps to ensure the existing plant can continue to operate until 2023.

## ŁUTSELK'E

Like Sachs Harbour, the existing diesel electric plant in Łutselk'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 2019-2020, the project was approved by Infrastructure Canada — through the Arctic Energy Fund — and a contribution agreement was signed with NTPC. The total budget is $11.7 million (75% ICIP + 25% NTPC). The 75% federal funding means that NTPC saves $8.8 million from its capital plan, which reduces the pressure on electricity rates.

At Łutselk'e's request, the new diesel plant will be constructed in a more appropriate site on the outskirts of the community. The new diesel plant will provide the community with reliable power and will be able to accommodate the addition of renewable energy technologies more easily to the local grid. The project is expected to reduce GHG emissions by 100 tonnes per year.

During 2020-2021, NTPC initiated design, procurement and site preparation activities. Shipment of material and equipment to the site and construction of the plant is scheduled for 2021-2022.

# LIQUEFIED NATURAL GAS (LNG)

## FORT SIMPSON

In 2019-2020, 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.

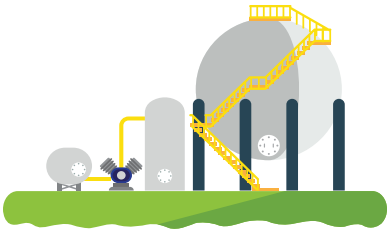
Going to a more efficient and lower emissions source is expected to result in 85% diesel displacement with a reduction of 1,800 tonnes of GHG per year, representing a 27% reduction in GHG emissions.

During 2020-2021, NTPC considered several options for the design of the gas generating plant and prepared to procure generation and electrical equipment. In March 2021, NTPC put the project on hold pending the completion of a climate adaptation study of the potential relocation of the existing diesel power plant to the new site identified for the LNG plant, due to concerns about risks of flooding.

## TUKTOYAKTUK

Similar to the Fort Simpson LNG project, the intent is to install gas-fired generation units in Tuktoyaktuk to displace diesel, thus reducing generating costs as well as GHG emissions. The project is currently in the feasibility stage with a notional budget of $11 million (75% ICIP + 25% NTPC). If this project proceeds, it could potentially be supplied with LNG from the proposed M-18 well that the Inuvialuit Petroleum Corporation is developing just outside of Tuktoyaktuk.

During 2020-2021, Infrastructure initiated a feasibility study that identified and evaluated different options on how to best integrate gas-fired generation units into the existing diesel plant. To proceed into the second phase of the



LIQUIFIED NATURAL GAS

feasibility study, Infrastructure and NTPC were reviewing the available options to determine the best potential solution(s). The preferred solution(s) will be further studied and modeled in 2021-2022 to determine the estimated capital cost and the expected operational performance and GHG emissions reduction potential.

Construction of the NTPC LNG storage and gas generation project could start as early as 2023, with commissioning expected before the end of 2025.

# LOOKING AHEAD

In addition to the projects already underway, the GNWT has identified other projects that are planned for future years using Infrastructure Canada funding. These projects, whose scope will be further developed in 2021-2022, include:

- Upgrades to other NTPC hydroelectric generating facilities
- Community renewable energy projects

# 2020-2021 ENERGY INITIATIVES
## STRATEGIC OBJECTIVE 3 – TRANSPORTATION

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

Vast distances and extreme cold weather represent significant challenges in shifting to new technologies and fuels for transportation needs in the NWT. In 2020-2021, the GNWT continued preliminary work to reduce transportation emissions as more options become viable.

***Photo:*** *Arctic Energy Alliance*

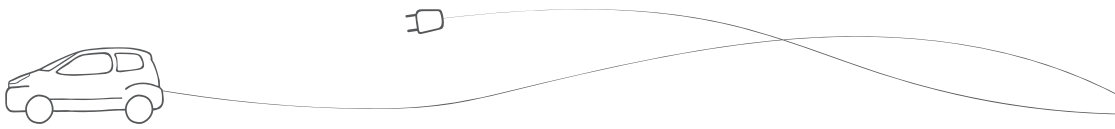
*Members of the Yellowknife Fire Department inspect an electric vehicle during the Drive Electric event. The AEA provides rebates to NWT residents to reduce the cost of buying and using electric vehicles, which will help reduce emissions from road vehicles.*

### ELECTRIC VEHICLE PROMOTION AND SUPPORT

Since 2018, the GNWT has been working with the AEA to develop a program to provide rebates for the purchase of new electric vehicles and chargers in hydropower communities.

In June 2020, the AEA launched the Electric Vehicle Incentive Program, which provides a $5,000 rebate for new electric vehicles, and up to $500 for charging infrastructure in hydropower communities. New battery electric vehicles, plug-in hybrid electric vehicles, or charging infrastructure may be purchased locally or in a jurisdiction outside of the NWT. Five rebates for new electric vehicles were issued in 2020-2021. Six applications for charger rebates were also received.

Switching to an electric vehicle in a community connected to the hydroelectric grid reduces the amount of GHG emissions released into the atmosphere from motor vehicles, which supports the Strategy's goal of transitioning the NWT to a lower carbon economy. It also increases the sale of electricity, which helps stabilize electricity rates. It is estimated that each electric vehicle reduces GHG emissions by two tonnes per year and therefore these five vehicles represent a reduction of 10 tonnes per year.

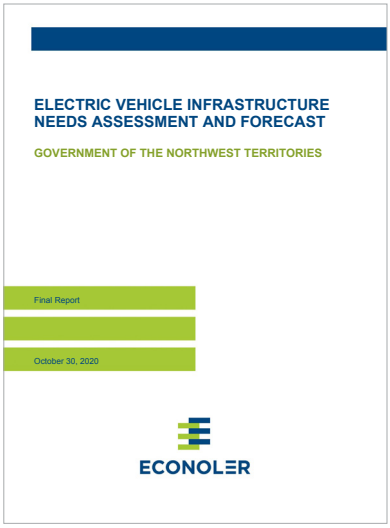


## ASSESSING ELECTRIC VEHICLE NEEDS

In 2020, the GNWT commissioned a study to forecast electric vehicle adoption rates in the coming decade and examine how an electric vehicle charging corridor could be developed between Yellowknife and the Alberta border. The report — completed in October 2020 — includes a scan of promotional and developmental activities from jurisdictions across Canada, the U.S. and Europe. It also outlines the economic and environmental benefits and costs of developing an electric vehicle charging corridor and providing new electric vehicle purchase incentives.

The study forecasts that electric vehicles will represent between 2.9% and 11.3% of the total light duty vehicle fleet in the NWT by 2030. It also found that an electric vehicle charging corridor could be developed along Highways 1 and 3 between Yellowknife and the Alberta border. According to the study, the highest need locations for charging would be at Behchokǫ̀, Birch Lake, Fort Providence, Kakisa River, Enterprise and 60th Parallel Park. Access to hydroelectricity will be a deciding factor on where the electric vehicle charging stations would be located. In the southern section, charging stations could be developed at the intersection of Highways 5 and 6, Wood Buffalo National Park and then subsequently at Fort Smith before heading into Alberta.

The study also recommends a variety of potential initiatives, programs and policies that could help to promote the adoption of electric vehicles in the NWT, and will be used to guide the GNWT's future planning for electric vehicle fleets and charging infrastructure. The study is available **online**.

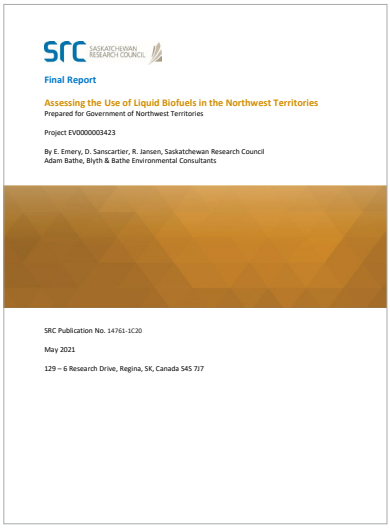



## ASSESSING LIQUID BIOFUELS

Some jurisdictions around the world are using liquid biofuels — such as renewable diesel — to reduce their GHG emissions. Liquid biofuels come from more sustainable sources such as plants and can be used to reduce GHG emissions by replacing fossil fuels like diesel. The GNWT acknowledges the potential for reducing GHGs by switching to liquid biofuels, but there are concerns about their use in the NWT. Security of supply, performance in extreme cold weather, long-term cold-climate storage suitability, and cost premium are just some of the factors that are unique to our geography and climate.

To explore the viability of using liquid biofuels, the GNWT engaged the Saskatchewan Research Council to conduct a study assessing the availability, pricing, and technical feasibility of transporting, storing and using biofuels in the NWT. The first phase looked at potential liquid biofuel supplies, specifications and production options. The second phase investigated the economic and GHG emission

(continued on page 31)

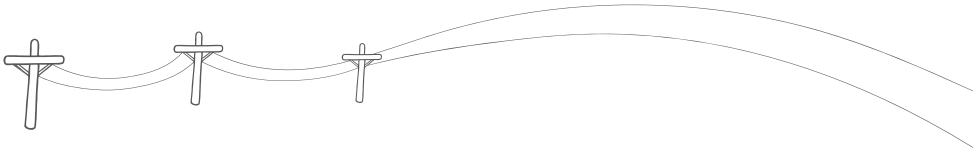


impacts of importing liquid biofuels into the NWT. The third phase studied the possibility of a pilot demonstration of renewable diesel in the NWT. The study concluded that due to low availability, long transport distances, and concerns over equipment compatibility, modest emissions reductions results were likely, and that the NWT should conduct a low-risk pilot demonstration during the summer months in a community where fuel is readily accessible. The upcoming federal Clean Fuel Regulations, expanding biofuels production, and additional research on biofuels in the northern context promise to make this a more viable option in the future. The study is available **online**.

## MONITORING CLEAN FUEL REGULATIONS

The Government of Canada has been working since 2016 to develop a Clean Fuel Standard (CFS) that would reduce Canada's GHG emissions through the use of lower carbon fuels and the deployment of low carbon technologies. 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, Infrastructure continues to monitor developments in respect of the standard.

In December 2020, Canada released draft regulations targeted at liquid fuels, with final regulations scheduled to come into force in 2022. The GNWT reviewed and submitted comments to clarify the exemption for remote communities and enhance the regulations in a way that could benefit the NWT. The GNWT will continue to monitor this file as it develops.



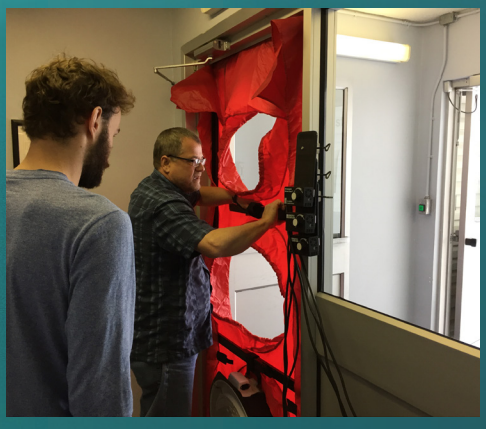
ARCTIC ENERGY ALLIANCE

*Rebates on energy efficient appliances*

*Home winterizing kits*

*Electric vehicle rebates*

*Incentives to adopt renewable energy systems*



*Building energy audits*

*Home energy evaluations and advice*

*New, efficient wood stoves*

*Photos: Arctic Energy Alliance*

# 2020-2021 ENERGY INITIATIVES

## STRATEGIC OBJECTIVES 4 & 5 – HEAT & EFFICIENCY

### ARCTIC ENERGY ALLIANCE PROGRAMS AND SERVICES

The AEA is a non-profit society dedicated to helping reduce energy costs and environmental impacts in the NWT.

Funded by the GNWT and the federal Low Carbon Economy Leadership Fund (LCELF), the AEA is a GNWT delivery agent for energy initiatives and one of our most important partners.

The AEA maintains close connections with all NWT communities and delivers energy programs and services (see opposite page) through its six regional offices: Fort Simpson, Hay River, Inuvik, Norman Wells, Whatì and Yellowknife.

Results from the AEA's 2020-2021 programs are summarized in the following pages. To learn more about individual programs and how to apply, visit **aea.nt.ca**.

*Photo: Arctic Energy Alliance*

*Home energy evaluations done by AEA help Northerners learn more about options to save energy in their homes. These evaluations can help our residents reduce GHG emissions and save them money.*

# 2020-2021 ARCTIC ENERGY ALLIANCE PROGRAM RESULTS

## BIOMASS ENERGY PROGRAM

Worked with community governments of Behchokǫ̀ and Gamètì to discuss options for installing new district heating systems

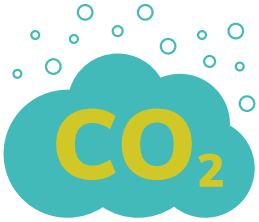
Worked with the Community Government of Whatì to expand existing heating system.

## ENERGY EFFICIENCY INCENTIVE PROGRAM

**2,382**
Provided rebates.

LED lighting continues to be the most popular eligible product

**958** **573** more than last year.
LED Rebates




Combined, the energy efficient products purchased will save the NWT **810 tonnes** of greenhouse gases annually — more than any other AEA program this year.

## DEEP HOME ENERGY RETROFIT PROGRAM

Completed **32** home energy evaluations, and provided five final rebates worth **$37,000**, plus an additional six interim rebates valued at **$26,000**.
Five post-retrofit evaluations were also conducted under the program.

Combined, the seven clients with completed projects are expected to save **250 GJ** of heating fuel a year — equivalent to the energy contained in 500 propane cylinders for home barbecues.

## ENERGY RATING SERVICES SUPPORT PROGRAM

**68** home energy evaluations completed.

Performed evaluations on new homes. **98**

Combined, all recommended upgrades on existing homes could save homeowners

**$100,000**

and **200 tonnes** of greenhouse gas emissions a year.

## COMMERCIAL ENERGY CONSERVATION AND EFFICIENCY PROGRAM

Provided **29** rebates

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 Kakisa.

## COMMUNITY GOVERNMENT BUILDING ENERGY RETROFIT PROGRAM

**$53,000**

Distributed in rebates in two communities

Completed **22** desktop ***"yardstick"*** building energy audits and **1** on-site ***"targeted"*** building energy audit in four communities.

Energy audits identified more than

**$35,000**

in potential annual savings.

## NON-PROFIT ENERGY EFFICIENCY AND CONSERVATION PROGRAM

Distributed **10** rebates valued at approximately **$100,000**

Combined, all client projects will avoid **13,000 kW** in power demand — equivalent to running **26,000** vacuum cleaners for an hour.

## COMMUNITY WOOD STOVE PROGRAM

Completed a two-year project that began in 2019-2020 and began a new project.

Coordinated the installation of **92** stoves in six partner communities and arranged for **30** additional stoves to be delivered to four communities.

Combined, all installed stoves will save **4,400 kg** of particulate emissions *(a 90% decrease)* and **25 tonnes** of greenhouse gas emissions a year.

Savings from the **92** wood stoves installed in 2020-2021
*if all were to replace an oil furnace*

**Heating oil displaced in litres:**
**170,000**

**Annual GHG reductions:**
**458**
Tonnes

**Annual savings:**
**$240,000**

## 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 four communities.

Distributed **98** energy efficiency kits to workshop participants.

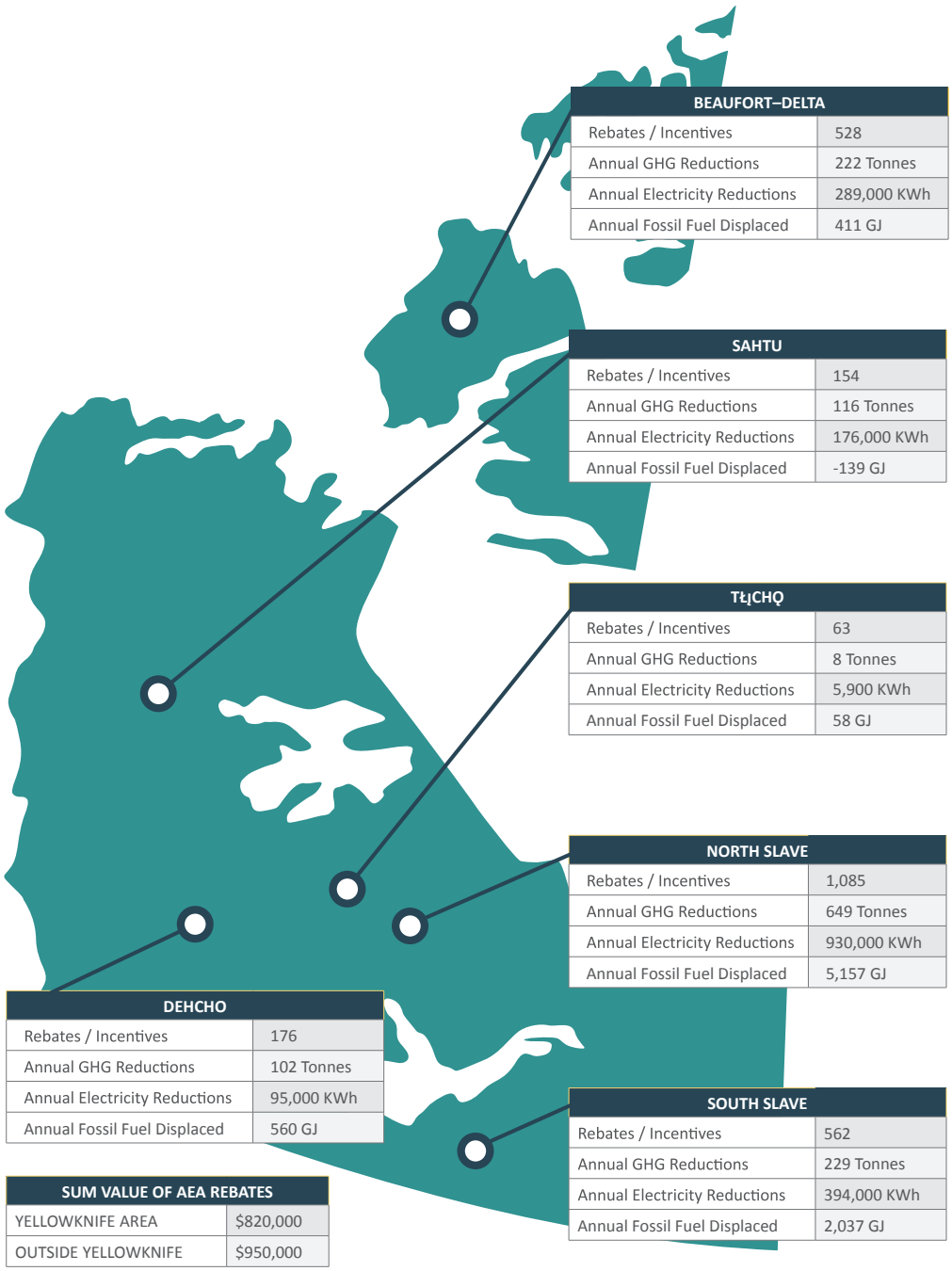
## ALTERNATIVE ENERGY TECHNOLOGIES PROGRAM

**41** Rebates provided

The **41** systems that the AEA's clients installed are expected to save roughly **240** tonnes of greenhouse gases a year.

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

## Figure 6. AEA programs' regional results




***Note:*** *A negative amount of displaced fossil fuel indicates the program resulted in additional fossil fuel consumption. Such increases occur when certain energy efficiency measures are deployed. For example, converting a building's lighting to LEDs will use less electricity but will also produce less heat, meaning that the heating system will have to make up for the difference. If the heating system runs on fossil fuels, then this leads to an increase in heating oil or propane consumption.*

# CAPITAL ASSET RETROFIT FUND

Developed in 2007, the CARF program delivers energy efficiency projects for GNWT facilities to reduce GHG emissions, energy use and operation costs. In 2020-2021, approximately $3.8 million was assigned to energy retrofit projects, resulting in an estimated $459,000 of annual savings. CARF projects deployed in the last fiscal year reduced GHG emissions by 2,013 tonnes.

## 2020-2021 CARF PROJECT HIGHLIGHTS

A few of the CARF projects implemented in 2020-2021 are showcased below. To see all CARF projects funded last fiscal year, see Appendix B. All biomass boiler replacement projects completed under CARF are listed in Appendix C.

### ANNUAL RESULTS

Heating Oil Displaced:
68,000 litres

GHG Reductions:
118 tonnes

## GNWT WAREHOUSE TIE-IN

With funding from CARF, the oil-fired heating system of the GNWT Central Warehouse in Yellowknife was tied into the wood pellet district heating system of a private contracting business (J&R Mechanical).

The heat exchanger and associated heat piping is sized to provide the warehouse with 100% of its overall heating requirements. The GNWT now purchases heat through a heat sales agreement with the company. The GNWT is just one of J&R's clients, and the company plans to expand its district heating system to multiple customers on Woolgar Avenue in Yellowknife.

## CHIEF SUNRISE BIOMASS

In the South Slave Region, CARF funded the procurement and installation of a biomass heating system at the Chief Sunrise School on the Kátł'odeeche Reserve. The system is comprised of two 56 kW MES Okofen wood pellet boilers. The boiler plant is sized for 100% of the peak heating load with thermal storage capacity (see pages 40-42 for information on thermal storage). The biomass plant is the first in the community and will burn approximately 54 tonnes of wood pellets annually.

### ANNUAL RESULTS

Heating Oil Displaced:
26,000 litres

GHG Reductions:
69 tonnes

Savings: $22,000

## FORT SIMPSON AND WRIGLEY HEALTH CENTRE LIGHTING UPGRADES

CARF funded a complete LED lighting upgrade at the Fort Simpson Health Centre and Long-Term Care Home, as well as the Wrigley Health Centre. The project involved a full retrofit of all lighting fixtures from conventional to efficient LEDs. Not only does this save electricity and money, but because electricity is diesel-generated in both Fort Simpson and Wrigley, GHG emissions will also be reduced.

### ANNUAL RESULTS

Reduced electricity use: 151,000 kWh

GHG Reductions: 108 tonnes

Savings: $138,000

*North Slave Correctional Facility*

# LEADING THE WAY IN BIOMASS HEATING

In 2006, the GNWT installed the first containerized external biomass (wood pellet) space heating system in North America — at the North Slave Correctional Facility in Yellowknife. The boilers were installed in shipping containers, placed adjacent to the facility, and tied into the existing heating system by buried mains via a heat exchanger.

Since then, the GNWT has installed more than 40 more biomass boiler systems. Wood pellets have surpassed propane and now account for 36% of the GNWT's overall heating fuel supply. The goal is to make biomass the main heating source for GNWT buildings.

## FEASIBILITY FORMULA

To determine the size of a wood pellet boiler for new builds and most retrofits, the GNWT uses the building's existing fuel consumption to calculate what size boiler would meet 50% of the building's peak heating demand and 80-90% of the overall heating load.

## HOW A BIOMASS HEATING SYSTEM WORKS

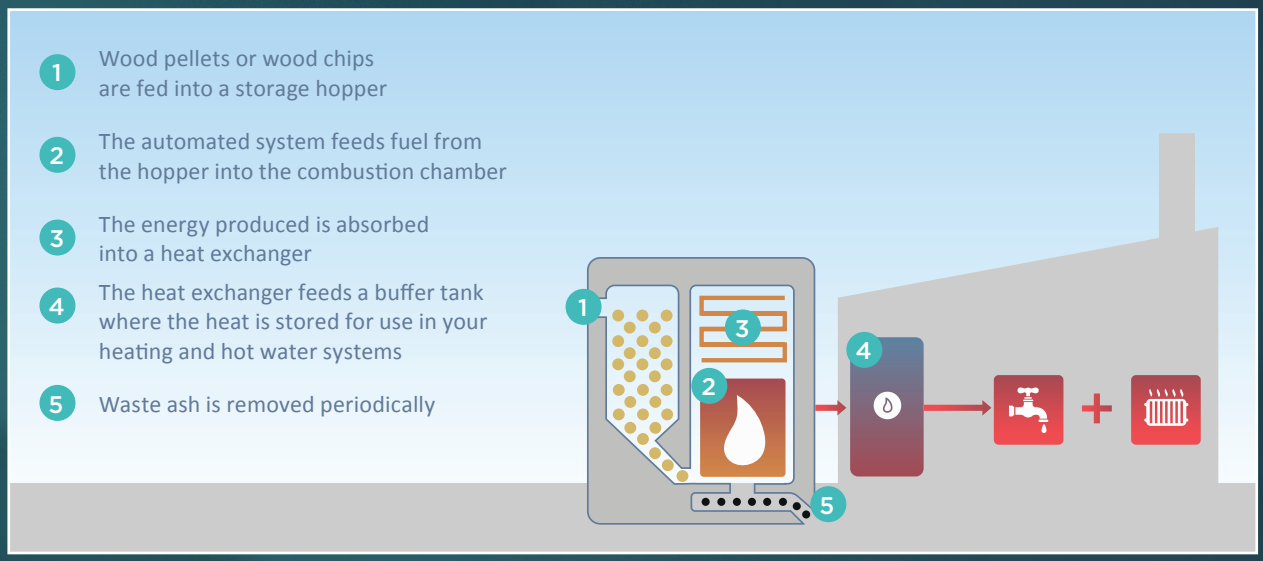
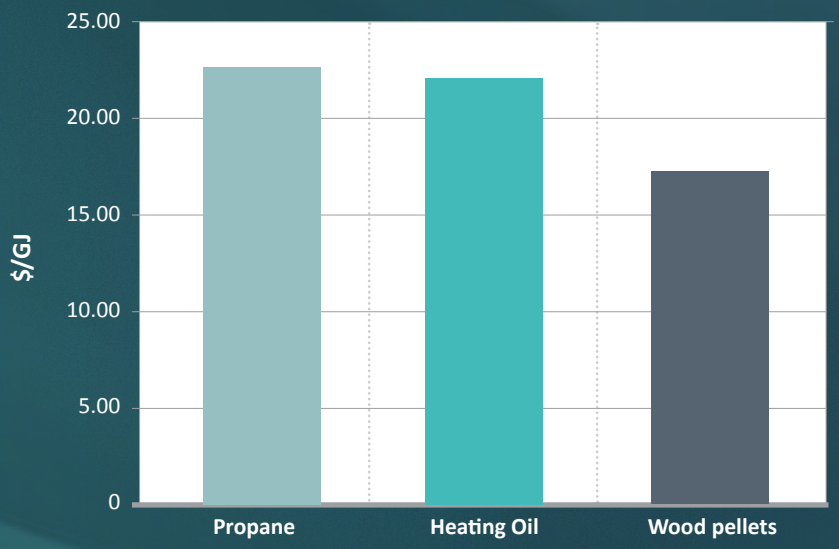



**Figure 7. Comparison of heating cost for commercial buildings in Yellowknife in 2020**




**Source:** AEA

### ECONOMICAL AND ENVIRONMENTALLY FRIENDLY

Wood waste, the primary feedstock to make wood pellets, is plentiful and cheap. Using it reduces heating utility costs, saving taxpayers money. In fact, wood pellets were 24% cheaper per unit of energy than heating oil for commercial buildings in Yellowknife in 2020 (Figure 7). Wood pellets also burn much more cleanly than oil, or even ordinary wood. In 2020-2021, the GNWT offset nearly 12,000 tonnes of GHGs from using biomass heating.

*Wood pellet boiler at Yellowknife Airport's combined services building.*

## LEARNING FROM EXPERIENCE

When the GNWT began planning to expand the use of biomass heating, design specifications were set to keep the capital costs as low as possible. The technology was new and expensive, and it was determined that thermal storage tanks and fuel gas cyclones — which some manufacturers had recommended — were not necessary for GNWT buildings.

Thermal storage tanks are used as a buffer between the wood pellet boiler and the heating load. The tank stores excess heat when the system is satisfied and demand drops. Stored heat provides a cushion when heating demand increases significantly — like cold winter mornings — and gives the wood pellet boiler time to respond to the demand. The GNWT's initial thoughts were that our heating demand is so great that we would not need these tanks.

In 2015, the GNWT installed a wood pellet boiler at the Yellowknife air terminal building, with a buffer tank included in the design. The additional space and components cost nearly $100,000. Tracking utilization against historical data showed that expected efficiency was still not fully realized. It was then determined that a heat exchanger between the boiler and the building heating system — installed because the pressure rating (PSI) of the propane boiler and the pellet boiler was different — was causing the inefficiency. After the PSI between boilers was equalized and the heat exchanger removed, the air terminal plant building became one the GNWT's most efficient heating systems.

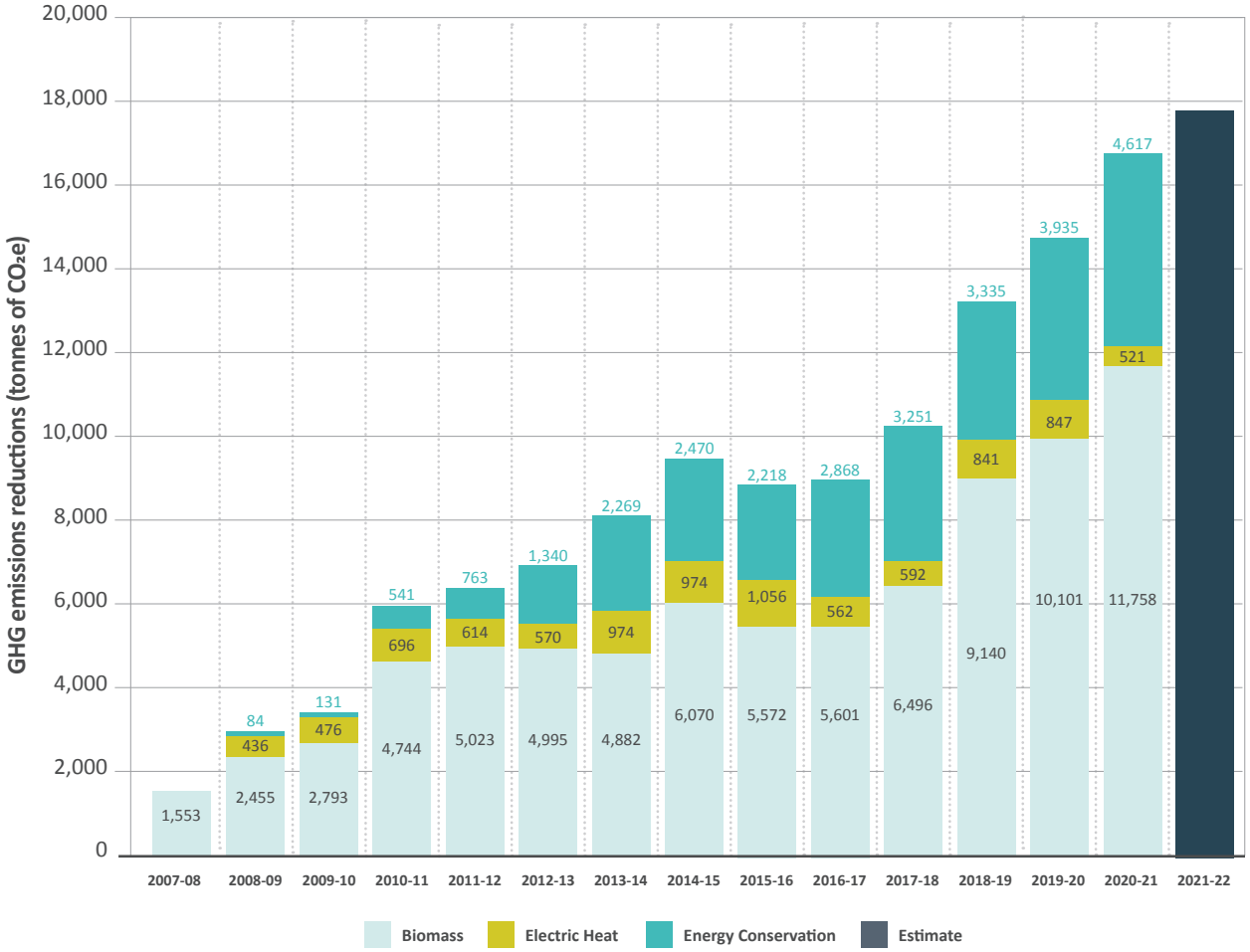
This is one example of some of the important lessons learned from our initial biomass projects. The trade-off for more efficiency was a longer pay-back schedule. When it comes to biomass heating systems, each building, site and design is different. The GNWT now evaluates each project individually before blazing ahead with a templated format. Every aspect of the project is carefully evaluated before it can proceed.

For more details about lessons learned, check out the **GNWT's Good Building Practice for Northern Facilities design guide**.

## CARF CONTRIBUTION TO EMISSIONS REDUCTIONS

Since 2007-2008, the CARF program cumulatively reduced GHG emissions by 16.9 kt and resulted in cost saving of over $4.2 million. Figure 8 shows how most of the GHG emissions reductions and resultant costs savings came from a switch to biomass for space heating. Projects completed in the last fiscal year decreased GNWT's GHG emissions by two kilotonnes.

**Figure 8. GHG Reductions from CARF Initiatives since 2007-2008**




***Note:*** *GHG emissions reductions from biomass projects include all biomass projects funded by the GNWT across the NWT.*

Appendix A contains an inventory of GNWT buildings' energy use and GHG emissions.

## GHG GRANT PROGRAM FOR BUILDINGS & INDUSTRY

Like its corresponding stream for government, the GHG Grant Program for Buildings and Industry is an application-based non-repayable grant program designed to support 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 the program guide for the grant amount available). However, there may be other competitive applicants requesting funding and the GNWT may choose to support multiple projects over just one.

In 2020-2021, the GHG Grant Program for Buildings and Industry received three applications, which were all approved for funding. One project involved the installation of a 390-kilowatt wood pellet boiler district heating system in Yellowknife by J&R Mechanical. The installation will supply heat to the GNWT Central Warehouse on Byrne Road, with the potential for future connections to other private commercial buildings. This project is expected to be completed by the summer of 2021, and once connected to additional buildings, would reduce emissions by up to 193 tonnes annually.

Another project involved an off-grid solar panel installation at the Snowshoe Inn site in Fort Providence, which will service its connected commercial and residential buildings. The installation was completed in the fall of 2020 and is expected to reduce up to 55 tonnes of GHG emissions annually.

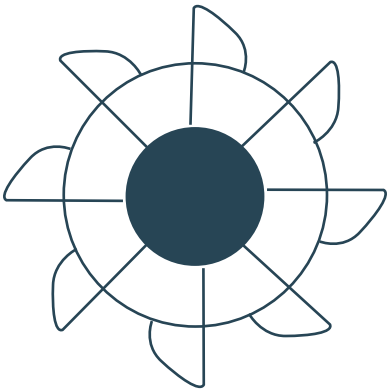
## NWT HOUSING CORPORATION

### Sissons Court Public Housing Biomass Project

Using $3.2 million of funding from the Low Carbon Economy Leadership Fund (LCELF), the NWT Housing Corporation is moving to remove several existing oil-fired heating systems in a Yellowknife housing complex and to supply the heat to these units from a central biomass heating system. There are 45 existing units (in nine buildings) and each unit has an oil-forced furnace, chimney, and exterior fuel storage tank. A new eight-unit building, currently in the design phase, will also be heated by this new heating plant expected to deliver 293 tonnes of GHG emissions reduction every year. Although this project was delayed, work has begun and expected to be fully completed in 2022.

# 2020-2021 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

*Upgrades to the Taltson facility will ensure up to 60 years of clean energy.*

## HYDROELECTRIC SYSTEMS UPGRADES

### TALTSON HYDRO OVERHAUL PROJECT

As components of the existing Taltson hydroelectric generating facility approach or have already exceeded their useful life, this project is a multi-year initiative to refurbish the turbine and generator components of the existing facility and extend its operating life. $23.8 million in funding has been secured, of which 75% is funded by Infrastructure Canada and the remaining 25% being provided by NTPC.

This project is in the construction phase. The turbine and generator were being manufactured during 2019-2020 but delays were experienced due to COVID-19 lockdowns in Spain and Italy, where the manufacturing facilities are located. Manufacturing is anticipated to be completed in the summer of 2021. A reassesment of the approach to the project delayed the project an additional year, which means shipment to site for the major components will occur during the 2023 winter road season. As a result, construction is now scheduled to begin in spring/ summer of 2023.

Once completed, this project will ensure 40 to 60 more years of clean hydroelectricity from the Taltson facility. It will also reduce potential GHG emissions related to burning diesel due to an unexpected shutdown, and will create opportunities to increase the use of hydroelectricity to meet the NWT's annual electricity requirements for new business ventures.

*Upgrades to Unit 1 of the Snare facility were completed in the summer of 2021.*

## SNARE FORKS UNIT 1 & UNIT 2 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 Unit 1 and Unit 2 generating units and extend the operating life. $18.9 million 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 Unit 1 is complete, it has been operating since November 2020, and final deficiencies will be corrected in the summer 2021. For Unit 2, prefeasibility work is complete. Based on newly installed asset monitoring systems and the prefeasibility assessment, NTPC has identified several options and timelines to complete the work which will help avoid substantial Covid-19 related costs. A decision on how to proceed with Unit 2 will be determined during 2021-2022.

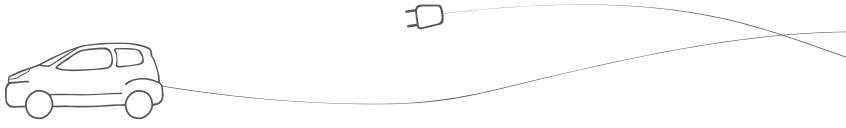
When finished, this project will ensure the continued reliability of the electricity supply from the 9.2 MW Snare Forks facility, avoid potential GHG emissions related to burning diesel due to an unexpected shutdown of the facility and will slightly increase the percentage of hydroelectricity being supplied to meet the NWT's annual electricity requirements.

## TALTSON HYDROELECTRICITY EXPANSION PROJECT

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*.

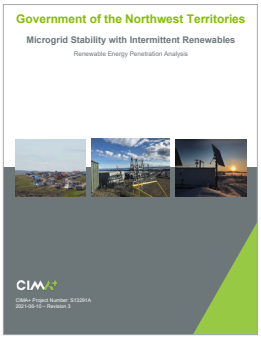
The GNWT's working relationship with IGO partners for the development of the Taltson Hydroelectricity Expansion Project is being defined through the development of a Memorandum of Understanding. Technical work is underway on transmission routing that minimizes impacts and costs to the project, including continuation of bathymetry work to map a portion of the lake bottom and scoping of a major engineering contract to develop the remaining design feasibility. Work to develop the preliminary business case for the project continued, and is expected to be completed in 2021. Technical studies on alignments around the west side of Great Slave Lake and crossing the Simpson Islands were completed, and will help determine the transmission route. Other work completed included an analysis of the revenue potential from the mining industry.

In August 2019, the Canada Infrastructure Bank (CIB) announced it would provide advisory services on the Taltson Hydroelectricity Expansion 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 IGO partners is ongoing. When both hydro systems are connected and mines have access, this project could reduce GHG emissions by 227 kilotonnes.



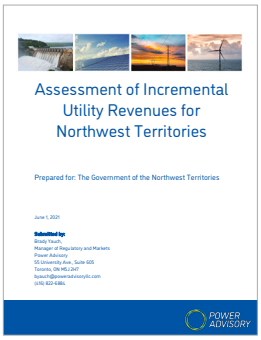
# ELECTRICITY POLICY FOR A CLEANER, MORE SECURE AND AFFORDABLE GRID

In 2020-2021, Infrastructure's Energy Division commissioned three independent studies to look at policy options to develop more renewable power and further decarbonize the NWT's energy systems, while lowering electricity rates and ensuring grid reliability. Findings from these studies will inform important updates to NWT electricity policy in 2021-2022.




## Limits of Renewable Energy in Diesel Community Microgrids

This study assessed the impact of different levels of intermittent renewable electricity penetration on select remote communities' electricity systems to determine whether the current recommended limit of 20% could be increased. Among the findings was the determination that remote off-grid communities in the NWT can likely accept up to 45% intermittent renewable energy into their electricity grids without comprising grid stability, but this could result in increased electricity rates.




## Generating Revenue from Excess Hydropower

This study examined the NWT's surplus hydroelectricity capacity to find ways to support fuel-switching investments and other rate designs that could increase consumption without incurring system-wide costs. The study discovered potential opportunities that could help reduce or mitigate rate increases for all users, promote business investment in the territory, and reduce GHG emissions by switching to electric heating.


## Containing Rate Inflation from Net-Metering

This study reviewed the NWT's existing net-metering and community generation policies to recommend changes that could help maximize the use of renewable electricity, reduce GHG emissions, and minimize costs to electricity ratepayers. Potential solutions for regulating net-metering/self-generation need to ensure affordable power while preserving the possibility of Northerners to generate their own renewable energy.

## ELECTRIC VEHICLE CHARGING INFRASTRUCTURE

In 2020-2021, the GNWT continued to participate in the federal-provincial-territorial Zero Emission Vehicle (ZEV) Working Group. This group is working to find ways to understand the barriers to the adoption of ZEVs and to promote the uptake of ZEVs in Canada.

The GNWT also completed a study that forecasts electric vehicle adoption in the NWT and is considering the implementation of a charging network (see page 30). Specifically, the GNWT is looking at deployment of publicly accessible fast chargers to the NWT as part of a ZEV corridor. The charging stations are expected to be a mix of level 2 and level 3 chargers, meaning different amounts of time are required to fully charge a battery. Level 2 chargers take a few hours to charge a battery, while level 3 fast chargers can do so in as little as 30 minutes.

## PROGRAMS

### GHG GRANT PROGRAM

Both streams of the GHG Grant Program will continue to accept applications as long as funding is available. There is approximately $8.6 million in funding available for both streams until 2024. In 2021-2022 the GHG Grant Program will support the approved Yellowknife Catholic Schools Pellet Boiler Installation at Weledeh and St. Patrick High School and the Gwich'in Tribal Council Biomass Furnace Project at its multi-use camp.

## HEADING TO ACTION PLAN REVIEW

As we head into the 2021-2022 fiscal year, lessons learned during the first three years of implementing the *2030 Energy Strategy* — combined with new research and analysis — will be instrumental to inform the revision of the Energy Action Plan and prepare for the eventual review of the Strategy.

Emerging emissions-reducing technologies (e.g., hydrogen) and fuels (e.g., biofuels) will continue to be monitored for potential application in northern settings. In the beginning of 2022, the GNWT will host a workshop to engage with stakeholders about the potential role for hydrogen in NWT's energy system.

While we study and test new potential energy solutions, we must continue to invest in initiatives that have proven to be effective, such as biomass heating. We will need to adapt energy policies to reflect current realities, while continuing to encourage individual and organizational action to reduce our reliance on fossil fuels. It is a balancing act that will involve trade-offs.

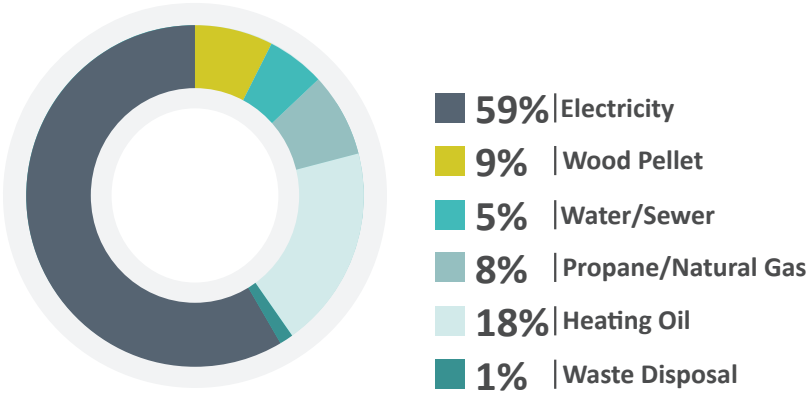
Though it will take thoughtful planning and hard work, the good news is that there are opportunities to reduce GHG emissions without sacrificing energy affordability or reliability. Efficient access to local energy sources (e.g., hydro, wind, solar, natural gas), and a compounding adoption of electrified transportation, can help us make big gains toward achieving the objectives of the Strategy, and do our part to fight climate change.

# **APPENDIX A:** GNWT BUILDINGS' ENERGY USE AND GHG EMISSIONS

## GNWT BUILDINGS' ENERGY EXPENDITURES

In 2020-2021, the cost of heat and power for GNWT facilities totaled $34.4 million. Figure 9 shows that electricity is the largest energy cost for the GNWT, followed by heating. Wood pellet expenditures increased again in 2020-2021 when compared to previous years, due the continued deployment of biomass projects, ultimately reducing heating costs for the GNWT.

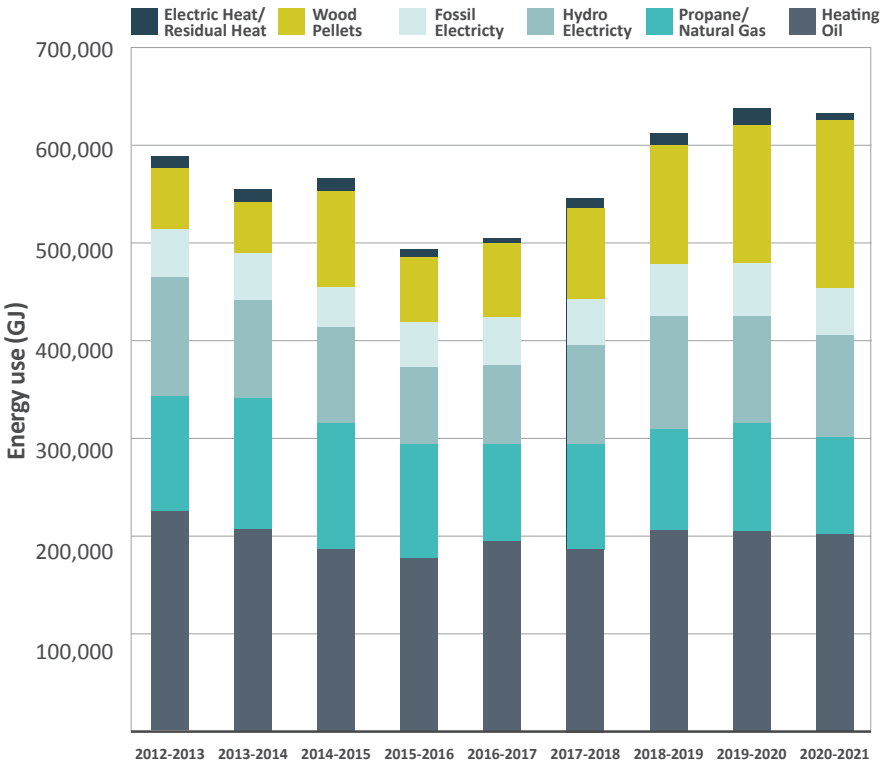
**Figure 9. GNWT Utility Expenditures in 2020-2021**




## GNWT ENERGY USE

Figure 10 outlines the breakdown of the GNWT's total annual energy use by fuel type. Compared with the previous year, consumption decreased in 2020-2021 for all fuels (except wood pellets), primarily due to shutdowns and reduced activity related to the COVID-19 outbreak.

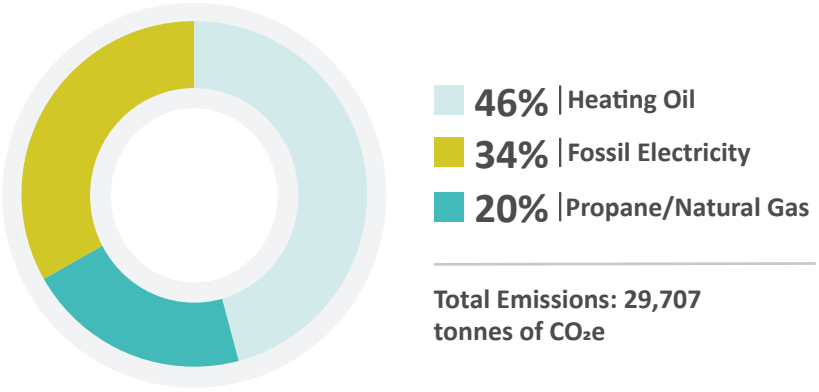
**Figure 10. GNWT Energy Use by Fuel Type in 2020-2021**



## GNWT BUILDINGS' GHG EMISSIONS

In 2020-2021, GNWT buildings were responsible for about 29,707 tonnes of GHG emissions due to fossil fuels used for heating and by using electricity generated from fossil fuels (see Figure 10). This corresponds to a 4% decrease in GHG emissions compared to the previous year.

**Figure 11. GNWT Greenhouse Gas Emissions by Fuel Type**

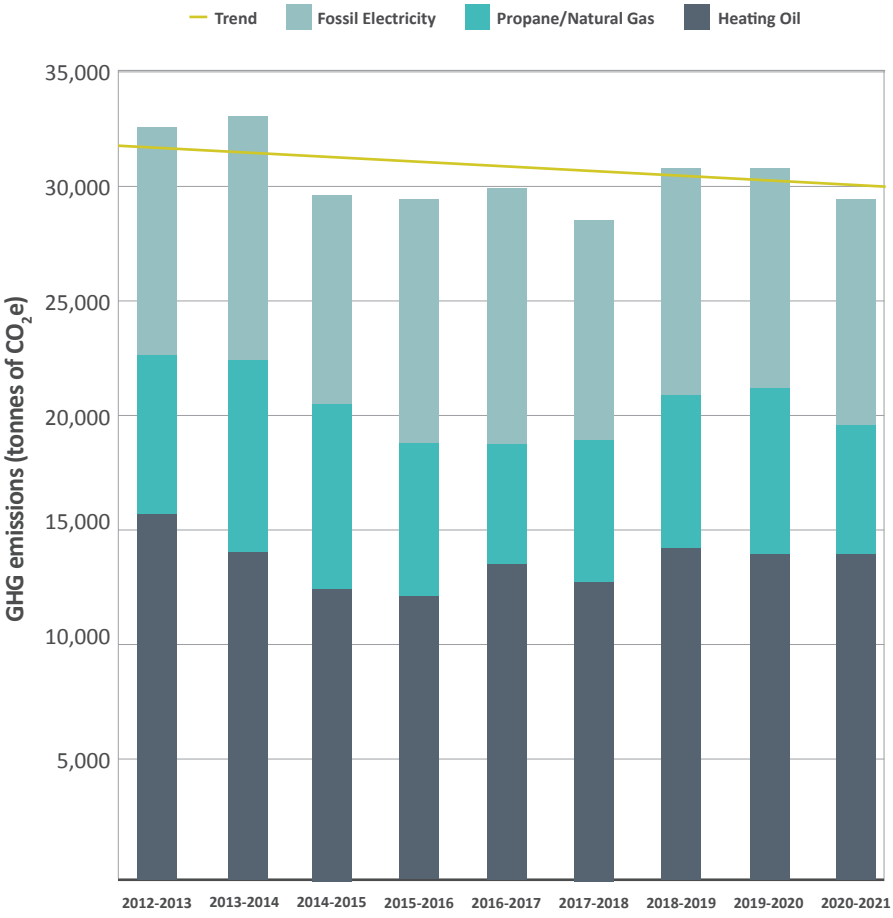



***Note:*** *Emissions from biomass are not accounted for because biomass is a renewable source of energy.*

## GHG EMISSIONS REDUCTIONS

As a result of efforts to improve energy efficiency and increase the use of biomass heating in its facilities, the GNWT has been able to continuously reduce GHG emissions from its buildings between 2012-2013 and 2020-2021 (Figure 12), despite an increase in overall energy consumption in recent years (Figure 10).

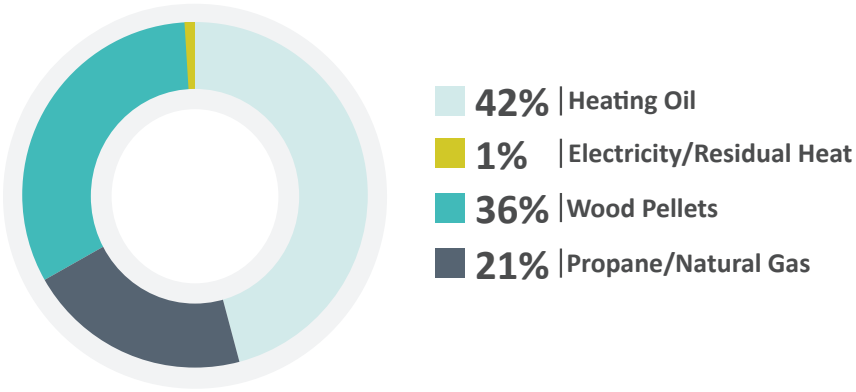
**Figure 12. GNWT GHG Emissions Reduction Trend**



## SPACE HEATING BY FUEL TYPE

In 2020-2021, space heating for GNWT facilities totaled 474,000 GJ. Thirty-seven per cent of this total was provided by renewable electric heat and biomass energy. In 2020-2021 GHG emissions associated with space heating dropped to 19,594 kt $CO_2e$, a 5% decrease from the previous year.

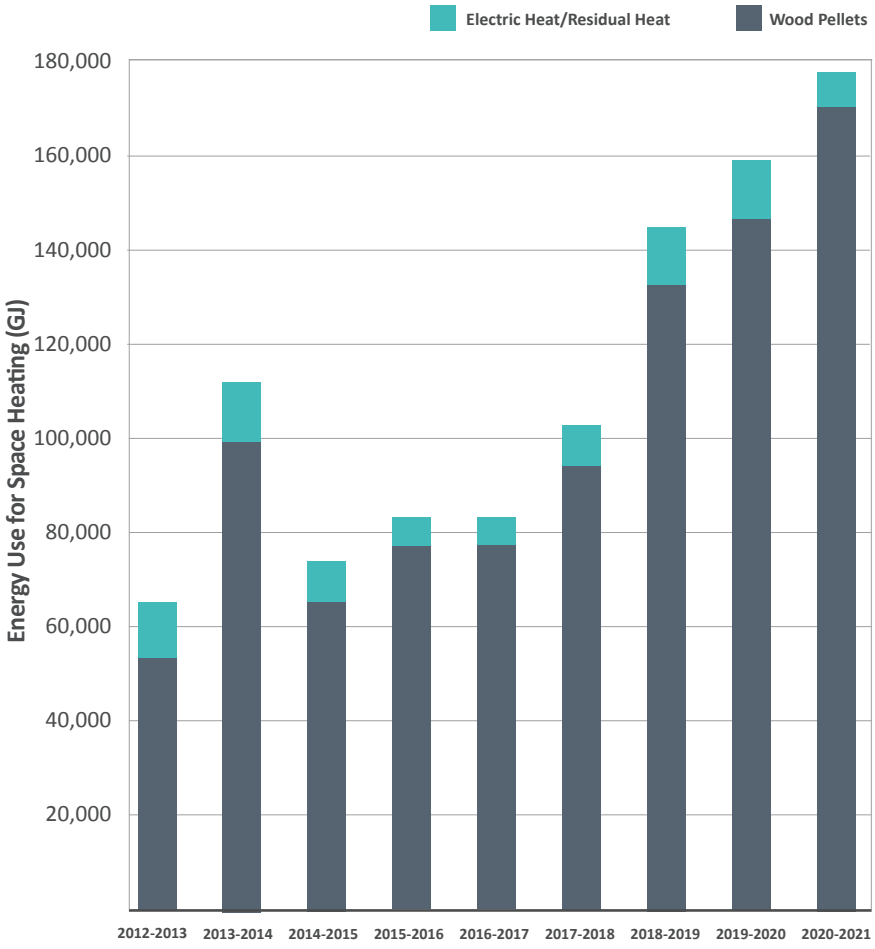
**Figure 13. GNWT Space Heating Energy Sources in 2020-2021**




## RENEWABLE HEATING

Figure 14 shows the trend in heating supplied by renewable energy for GNWT buildings. The slight decrease in electric heating combined with a 16% increase in wood pellet use led to a 12% increase in renewable energy use in 2020-2021 compared to 2019-2020.

**Figure 14. Space Heating Provided by Renewable Energy**



# APPENDIX B:
# 2020-2021 CAPITAL ASSET RETROFIT FUND PROJECTS

| FACILITY | LOCATION | DETAILS |
|---|---|---|
| **North Slave Region** | | |
| GNWT Warehouse | Yellowknife | Tie-in of the GNWT Warehouse heating system to a privately-owned biomass district heating plant. |
| Laing Building | Yellowknife | LED lighting and ventilation system upgrade. Multi-year project to be completed summer 2021. |
| **South Slave Region** | | |
| Chief Sunrise School | Kátł'odeeche | Design and installation of two 56 kW biomass boilers. Multi-year project to be completed in May 2021. |
| **Beaufort Delta Region** | | |
| Moose Kerr School | Aklavik | Installation of 300 kW biomass boiler. Multi-year project to be completed fall 2021. |
| Aurora College building and residence | Inuvik | LED lighting and direct digital control system upgrade. Multi-year project to be completed in March 2022. |
| **Sahtu Region** | | |
| Chief T'Selehye School | Fort Good Hope | Building LED lighting retrofit completed fall 2020. |
| Chief T'Selehye School and Chief Albert Wright School | Fort Good Hope and Tulita | Recommissioning project to improve operability and reduce utilities. Project on hold, expected completion date, March 2021. |
| **Deh Cho Region** | | |
| Health Centre and Long-term Care Centre | Wrigley and Fort Simpson | LED lighting upgrade |

# **APPENDIX C:** COMPLETED BIOMASS PROJECTS SINCE 2007-2008

| FACILITY | LOCATION | COMPLETION YEAR | SIZE (kW) |
|---|---|---|---|
| Chief Sunrise School | Kátł'odeeche (Hay River) | 2020 | 150 |
| ENR Lab/ Warehouse | Fort Simpson | 2019 | 40 |
| Woman's Territorial Corrections Centre | Fort Smith | 2019 | 300 |
| Inuvik Territorial Hospital | Inuvik | 2019 | 1250 |
| Ecole Alain St. Cyr | Yellowknife | 2019 | 540 |
| Construction Mining Institute Training (CMIT) | Fort Smith | 2018 | 300 |
| Inuvik School Biomass | Inuvik | 2018 | 950 |
| Stanton Territorial Hospital | Yellowknife | 2018 | 2500 |
| Behchokǫ̀ Long Term Care Facility* | Behchokǫ̀ | 2017 | 100 |
| Fort McPherson Health Centre* | Fort McPherson | 2017 | 40 |
| Health Centre | Fort Resolution | 2017 | 100 |
| Health Centre/ Long term care facility | Norman Wells | 2017 | 400 |
| Infrastructure Maintenance Shop | Norman Wells | 2017 | 100 |
| ENR Workshop/Office | Tulita | 2017 | 58 |
| Whatì Health Centre (heat purchase) | Whatì | 2017 | 30 |
| Chief T'Selehye School | Fort Good Hope | 2016 | 150 |
| Chief Albert Wright School | Tulita | 2016 | 200 |
| Prince of Wales Northern Heritage Centre | Yellowknife | 2016 | 400 |
| New Health Centre | Fort Providence | 2015 | 75 |
| Deninoo School | Fort Resolution | 2015 | 200 |
| New Health Centre | Hay River | 2015 | 950 |
| Airport Terminal Building | Yellowknife | 2015 | 400 |
| South Mackenzie Correctional Centre | Hay River | 2014 | 224 |
| Airport Combined Services Building | Norman Wells | 2014 | 224 |
| Airport Terminal Building | Norman Wells | 2014 | 168 |
| Mackenzie Mountain School | Norman Wells | 2014 | 224 |
| New Office Building | Yellowknife | 2014 | 650 |
| Deh Gah School | Fort Providence | 2013 | 300 |
| Elizabeth MacKenzie Elementary School | Behchokǫ̀ (Rae) | 2012 | 540 |
| Central Heating Plant (CHP) | Fort Simpson | 2012 | 980 |
| Fort Smith Health Centre | Fort Smith | 2012 | 750 |
| Combined Service Building (Department of Transportation) | Yellowknife | 2012 | 540 |
| P.W. Kaeser High School & Recreation Centre | Fort Smith | 2010 | 750 |
| Thebacha College (GNWT) | Fort Smith | 2010 | 720 |

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

| | | | |
|---|---|---|---|
| Highways Maintenance Garage | Hay River | 2010 | 300 |
| Central Heating Plant (for 4 Hay River Schools) | Hay River | 2010 | 1000 |
| Legislative Assembly Building | Yellowknife | 2010 | 300 |
| Chief Jimmy Bruneau School | Behchokǫ̀ (Edzo) | 2009 | 720 |
| K'alemi Dene School | Ndilǫ | 2009 | 60 |
| Ecole St. Joseph School (Gov't NWT/ Public School) | Yellowknife | 2009 | 540 |
| Sir John Franklin High School* | Yellowknife | 2008 | 750 |
| North Slave Correctional Facility* | Yellowknife | 2006 | 1500 |

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

# APPENDIX D:
# GHG EMISSIONS REDUCTIONS FORECAST

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, stabilize 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). This table does not include an estimate of the emission reductions resulting from the carbon tax. 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.

Under the 2030 Energy Strategy, the NWT must reduce its GHG emissions by 224 kt by 2030 to meet its 30% emissions reductions target. This does not include potential emissions reductions from the Taltson Hydroelectricity Expansion Project or the Carbon Tax. Projects from the 2019-2022 Energy Action Plan currently being developed will result in a 46 kt reduction by 2025. This is a conservative estimate as this projection does not account for projects whose scope is still being refined, and for which funding is available through ICIP as well as the GHG Grant Program. The GNWT will continue to look for more innovative and effective ways to reduce our GHG emissions as new technologies and opportunities arise.

**Table 3. Cumulative emissions reductions from the 2030 Energy Strategy (in kt $CO_2e$)**

| STRATEGIC OBJECTIVE | ENERGY INITIATIVE | 2018 (Actual) | 2019 (Actual) | 2020 (Actual) | 2021 (Forecast) | 2022 (Forecast) | 2023 (Forecast) | 2024 (Forecast) | 2025 (Forecast) |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Community projects: Heating | - | - | - | TBD | TBD | TBD | TBD | TBD |
| | Community projects: Renewables | 0.1 | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 |
| 2 | Diesel plant replacement | - | - | - | - | 0.1 | 0.1 | 0.1 | 0.1 |
| | Inuvik Wind Project | - | - | - | - | - | 6.0 | 6.0 | 6.0 |
| | Transmission lines | - | - | - | - | - | - | 4.6 | 4.6 |
| | Liquefied natural gas | - | - | - | - | - | 1.8 | 1.8 | 2.4 |
| | Community hydro | - | - | - | - | - | - | - | - |
| | Net-metering program | 0.1 | 0.2 | 0.3 | 0.4 | 0.4 | 0.5 | 0.6 | 0.7 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 3 | Electric vehicles | - | - | - | 0.0 | 0.1 | 0.1 | 0.2 | 0.2 |
| | Marine vessels upgrades | - | 0.4 | 0.4 | 0.4 | 1.2 | 1.2 | 1.2 | 1.2 |
| 4&5 | AEA Programs (excludes EV rebates) | 0.6 | 2.0 | 3.3 | 4.6 | 6.0 | 7.3 | 8.7 | 10.0 |
| | Capital Asset Retrofit Fund | 3.0 | 4.6 | 6.6 | 8.8 | 11.0 | 13.2 | 15.4 | 17.6 |
| | GHG Grant Program: Governments | - | 0.1 | 0.1 | 1.7 | 1.7 | 1.7 | 1.7 | 1.7 |
| | NWT Housing Corp | - | - | - | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 |
| 6 | Hydro upgrades | - | - | - | - | - | - | - | - |
| | GHG Grant Program: Buildings and Industry | - | - | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 |
| | Biofuels | - | - | - | - | - | - | TBD | TBD |
| | Taltson Hydro-electricity Expansion Project | - | - | - | - | - | - | - | - |
| **TOTAL** | | **3.8** | **7.4** | **11.0** | **16.8** | **21.6** | **33.1** | **41.3** | **45.6** |

**Note:** *Emissions reductions are cumulative (that is, capture emissions reductions from previous years) and calculated above 2018 levels, the year the Energy Strategy was launched.*