



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

2021-2022

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

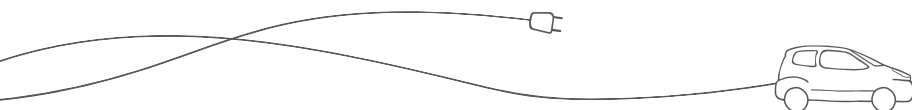
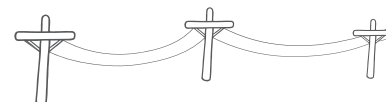
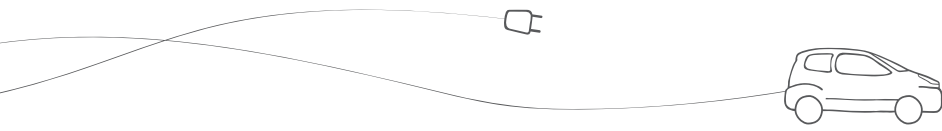


Table of Contents

MINISTER'S MESSAGE	4	STRATEGIC OBJECTIVE 3	40
MESSAGE DE LA MINISTRE	6	ELECTRIC VEHICLES IN THE	
LIST OF ACRONYMS	8	NORTHWEST TERRITORIES	40
EXECUTIVE SUMMARY	9	MONITORING THE CLEAN FUEL REGULATIONS.	42
SOMMAIRE	11	STRATEGIC OBJECTIVES 4 & 5	43
INTRODUCTION.	13	ARCTIC ENERGY ALLIANCE (AEA) PROGRAMS	
NWT ENERGY SNAPSHOT	16	AND SERVICES	43
NWT ENERGY SUPPLY AND DEMAND	16	CAPITAL ASSET RETROFIT FUND.	49
POWER GENERATION	19	HOUSING NORTHWEST TERRITORIES.	53
GREENHOUSE GAS EMISSIONS.	19	STRATEGIC OBJECTIVE 6	54
ENERGY TRANSITION INVESTMENTS.	21	GHG GRANT PROGRAM FOR BUILDINGS	
ENERGY TRANSITION CHALLENGES		& INDUSTRY	54
IN THE NWT	23	HYDROELECTRIC SYSTEMS UPGRADES.	54
ORGANIZATIONAL ROLES.	25	TALTSON HYDROELECTRICITY EXPANSION	
STRATEGIC OBJECTIVE 1	26	PROJECT.	56
COMMUNITY PROJECTS	26	HYDROGEN WORKSHOP.	58
GHG GRANT PROGRAM	28	LOW-CARBON PATHWAYS.	58
2022-2025 ENERGY ACTION PLAN ENGAGEMENT	31	FIVE-YEAR REVIEW OF THE	
INDEPENDENT POWER PRODUCERS	32	2030 ENERGY STRATEGY.	59
STRATEGIC OBJECTIVE 2	33	APPENDIX A: GNWT BUILDINGS' ENERGY	
TRANSMISSION LINES	33	USE AND GHG EMISSIONS	60
WIND ENERGY	35	APPENDIX B: 2021-2022 CAPITAL ASSET	
GEOTHERMAL	37	RETROFIT FUND PROJECTS.	63
DIESEL PLANT REPLACEMENTS AND EFFICIENCY		APPENDIX C: BIOMASS PROJECTS	
IMPROVEMENTS	37	COMPLETED BY GNWT SINCE 2007-2008	64
LIQUEFIED NATURAL GAS (LNG)	39	APPENDIX D: GHG EMISSIONS	
LOOKING AHEAD	39	REDUCTIONS FORECAST	66
		APPENDIX E: STATUS OF ACTIONS AND	
		INITIATIVES FROM THE 2019-2022 ENERGY	
		ACTION PLAN	68





Minister's Message

Four Years of Change and Progress



The Honourable Diane Archie
Minister of Infrastructure

It's been four years since we launched the *2030 Energy Strategy (Strategy)*, our long-term vision for an NWT with access to reliable, affordable and sustainable energy. Much has changed over those four years—some caused by the normal course of time, some by unpredictable events.

The *2019-2022 Energy Action Plan (Action Plan)* contained 44 initiatives focused on implementing the *Strategy* through new energy efficiency and GHG emissions reduction incentive programs, along with taking steps to position the territory to complete larger infrastructure projects by 2030.

The GNWT invested \$52.9 million in those energy initiatives in 2021-2022. Much of that money went toward funding projects to refurbish strategic infrastructure—like our existing hydropower facilities—as well as upgrading our thermal community power grids to be more efficient and able to use more renewable energy. These projects will ensure decades of reliable and cleaner energy. Other major infrastructure projects—like the proposed Fort Providence/Kakisa and Whatì Transmission Lines—will allow some thermal communities to get off fossil fuels and help stabilize the cost of power.

The last four years have also shattered the myth that electric vehicles (EVs) don't work in the North. The NWT's transportation sector currently contributes more GHG emissions than any other sector. That is why the GNWT is investing in rebates and infrastructure for EVs in hydro communities. EVs are proven to reduce Northerners' transportation emissions and mobility costs while making use of our nearly year-round excess hydro—which also helps stabilize the cost of power.

We continued investing in energy conservation and efficiency initiatives in 2021-2022, through community programs delivered by the Arctic Energy Alliance (AEA), and larger projects funded by the GNWT's GHG Grant Program. We also continued to reduce the GNWT's GHG emissions and energy use through projects funded by the Capital Asset Retrofit Fund (CARF).

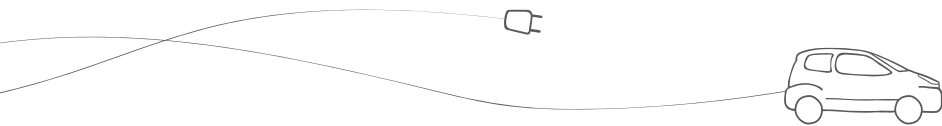
Tremendous effort was spent this year developing the *2022-2025 Energy Action Plan*, which will be released in 2022. The new *Action Plan* will guide our implementation of the *Strategy* for the next three years, building on our past successes while also launching promising new initiatives.

With continued federal funding, we are broadly on track to meet our 2030 emissions target. Although it's a huge challenge, the GNWT has taken the lead on climate change by initiating work with multiple departments to assess what we can do in the North to help Canada meet its 2050 net-zero emissions target. Along with facilitating the use of EVs and working toward providing clean energy to our industrial sector by connecting our hydro systems, we continue to explore the potential role of emerging technologies—such as hydrogen, nuclear and biofuels—in our energy systems. Modelling developed from this work will inform the five-year review of the *Strategy* scheduled in 2023-2024.

Yes, much *has* changed in the last four years. The original vision in the *Strategy* is unfolding now, even as we factor in unforeseen global health and economic inputs. What *hasn't* changed is our commitment to finding energy solutions by collaborating with our communities, our Indigenous partners, industry and the federal government to make a successful transition to a low-carbon economy that runs on reliable, affordable energy and promotes the wellbeing of our residents.

Quyananni

*The Honourable Diane Archie
Minister of Infrastructure*



MESSAGE DE LA MINISTRE

Quatre années de changements et d'avancées



Madame Diane Archie
Ministre de l'Infrastructure

Quatre années se sont écoulées depuis le lancement de la *Stratégie énergétique 2030 (Stratégie)*, notre plan à long terme pour permettre aux TNO d'avoir accès à une énergie fiable, abordable et durable. Beaucoup de choses ont changé au cours de ces quatre années, certaines causées par le cours normal des événements, d'autres par des événements imprévisibles.

Le *Plan d'action énergétique 2019-2022 (Plan d'action)* comportait 44 initiatives axées sur la mise en œuvre de la Stratégie par de nouvelles mesures incitatives relatives à l'efficacité énergétique et à la réduction des émissions, ainsi que sur la prise de mesures visant à positionner le territoire pour pouvoir réaliser de plus grands projets d'infrastructure d'ici 2030.

Le GTNO a investi 52,9 millions de dollars dans ces initiatives énergétiques en 2021-2022. Une grande partie de cet argent a servi à financer des projets visant à remettre en état des infrastructures stratégiques – comme nos installations hydroélectriques existantes – ainsi qu'à moderniser les réseaux électriques de nos collectivités alimentées par des centrales thermiques afin qu'ils soient plus efficaces et qu'ils puissent utiliser davantage d'énergie renouvelable.

Ces projets permettront d'offrir une énergie fiable et plus propre pendant des décennies. D'autres grands projets d'infrastructure, comme les lignes de transmission proposées à Fort Providence, Kakisa et Whati, permettront à certaines collectivités alimentées par des centrales thermiques d'abandonner les combustibles fossiles et contribueront à stabiliser le coût de l'électricité.

Ces quatre dernières années ont également permis de déconstruire le mythe selon lequel les véhicules électriques (VE) ne fonctionnent pas dans le Nord. Le secteur des transports des TNO produit actuellement plus d'émissions de GES que tout autre secteur. C'est pourquoi le GTNO

investit dans des remises et des infrastructures pour les VE dans les collectivités alimentées par des centrales hydroélectriques. Il est prouvé que les VE réduisent les émissions liées au transport et les coûts de mobilité des habitants du Nord tout en utilisant notre excédent d'hydroélectricité presque toute l'année, ce qui contribue également à stabiliser le coût de l'électricité.

Cette année, nous avons continué à investir dans des initiatives d'économie d'énergie et d'efficacité énergétique, par l'intermédiaire de programmes communautaires mis en œuvre par l'Arctic Energy Alliance (AEA) et de projets de plus grande envergure financés par le Programme de subventions publiques pour la réduction des GES du GTNO.

Nous avons également continué à réduire les émissions de GES et la consommation d'énergie du GTNO grâce à des projets financés par le Fonds de modernisation des immobilisations (le Fonds).

Des efforts considérables ont été déployés cette année pour élaborer le *Plan d'action énergétique 2022-2025*, qui sera publié en 2022. Le nouveau *Plan d'action* orientera la mise en œuvre de la *Stratégie* au cours des trois prochaines années, en s'appuyant sur nos réussites passées tout en lançant de nouvelles initiatives prometteuses.

Grâce au financement fédéral continu, nous sommes globalement sur la bonne voie pour atteindre notre cible d'émissions pour 2030. Bien qu'il s'agisse d'un défi de taille, le GTNO a pris les devants en matière de changements climatiques en entreprenant des travaux avec de nombreux

ministères afin d'évaluer les mesures que nous pouvons prendre dans le Nord pour aider le Canada à atteindre sa cible de carboneutralité pour 2050.

En plus de faciliter l'utilisation des VE et de travailler à fournir de l'énergie propre à notre secteur industriel en reliant nos réseaux hydroélectriques, nous continuons d'explorer le rôle potentiel des technologies émergentes – comme l'hydrogène, le nucléaire et les biocarburants – dans nos systèmes énergétiques. La modélisation élaborée à partir de ces travaux servira de base à l'examen quinquennal de la *Stratégie* prévu en 2023-2024. Beaucoup de choses ont changé au cours des quatre dernières années.

Les ambitions originales de la *Stratégie* se concrétisent aujourd'hui, même si nous tenons compte des imprévus sur le plan de la santé et de l'économie à l'échelle mondiale. Ce qui n'a pas changé, c'est notre engagement à trouver des solutions énergétiques en collaborant avec nos collectivités, nos partenaires autochtones, l'industrie et le gouvernement fédéral pour réussir la transition vers une économie à faibles émissions de carbone qui fonctionne avec une énergie fiable et abordable et qui favorise le bien-être de nos résidents.

Quyananni

Madame Diane Archie
Ministre de l'Infrastructure

List of Acronyms

This page lists and spells out the acronyms used throughout the Report.

AEA..... Arctic Energy Alliance	INF GNWT Department of Infrastructure
ARI Aurora Research Institute	kW Kilowatt
BEV Battery Electric Vehicle	LCELF Low Carbon Economy Leadership Fund
CARF Capital Asset Retrofit Fund	LED Light-emitting Diode
CCSF Climate Change Strategic Framework	LNG Liquefied Natural Gas
CFR Clean Fuel Regulations	MTS Marine Transportation Services
CIRNAC Crown-Indigenous Relations and Northern Affairs Canada	MW Megawatt
CNG Compressed Natural Gas	NTPC Northwest Territories Power Corporation
DDC Direct Digital Control	NUL Northland Utilities Ltd.
ECCC Environment and Climate Change Canada	NWT Northwest Territories
ECM Electronically Commutated Motor	PPA Power Purchase Agreement
ENR GNWT Department of Environment and Natural Resources	REACHE (Northern) Responsible Energy Approach for Community Heat and Electricity (Program)
EV Electric Vehicle	SCEDE Standing Committee on Economic Development and Environment
GHG Greenhouse Gas	TJ Terajoule
GJ Gigajoule	ZEV Zero Emission Vehicle
GNWT Government of the Northwest Territories	
HNWT Housing Northwest Territories	
ICIP Investing in Canada Infrastructure Program	

Executive Summary

The *2021-2022 Energy Initiatives Report: Reporting on Actions under the 2030 Energy Strategy (Report)* highlights planning for the *2022-2025 Energy Action Plan*, community energy initiatives, upgrades to existing energy infrastructure, energy conservation and efficiency initiatives, and the GNWT's work on developing incentives for electric vehicle (EV) use in the NWT.

The NWT is committed to reducing GHG emissions by 30% below 2005 levels by 2030. In 2020, the NWT's GHG emissions totaled 1,401 kt CO₂e, 19% lower than 2005 levels. The GNWT continues to work with the federal government to refine estimates of the NWT's current GHG trajectory.

In 2021-2022, the GNWT made \$52.9 million in energy-related investments to support projects that reduce GHG emissions, improve energy systems reliability, and stabilize energy costs. The development of transformational projects and initiatives supported through federal funding increased the budget by 39% from the previous fiscal year (\$38 million).

Actions and initiatives conducted under the *Strategy* reduced NWT emissions by 12.8 kt CO₂e in 2021-2022. Projects currently in development are anticipated to reduce 47.3 kt of emissions by 2025.

The GHG Grant Program approved three projects in 2021-2022. Eight projects have now been funded through both streams of the Program, which will reduce 2.8 kt of

GHG emissions every year. The GNWT and its partners continued working with Northland Utilities/ATCO and CIRNAC to conduct renewable energy pre-feasibility studies for the communities of Wekweètì and Smbaa K'e. The AEA also entered into partnership agreements with the Community Government of Wekweètì, the Hamlet of Tulita, and the Town of Fort Smith to develop community energy plans.

Two solar project proponents also signed a power purchase agreement with NTPC to feed electricity into the local grid, the most recent being a 1-MW solar array developed by Nihtat Energy Ltd. in Inuvik.

The GNWT engaged with partners, Indigenous governments and Indigenous organizations, stakeholders and the public to solicit input and inform the development of the *2022-2025 Energy Action Plan*, to be released later in 2022. This included an ad campaign, a public engagement portal on the GNWT's website, one-on-one meetings with our partners, as well as letters to Indigenous governments requesting input.

In 2021-2022, the GNWT continued work to advance several transformational projects to reduce GHGs from electricity generation across the NWT.

- An environmental field program was completed for the proposed 170-km transmission line from the existing Taltson hydroelectricity system to Fort Providence, Kakisa and Dory Point. Consultation and engagement activities were continued, and funding was provided for additional engineering studies and planning for procurement and construction.
- The GNWT and Tłı̨chǫ Government also initiated technical work and committed to working in partnership to advance the proposed construction of a 60-km transmission line to connect Whatı to the Snare electricity system.
- Construction began on the six-kilometre access road for the Inuvik Wind Project. The turbine blades wintered in Hay River and are being barged to Inuvik later in 2022.

- Work to install new high-efficiency diesel power plants continued in Sachs Harbour and Łutselk'e. Construction in Sachs Harbour began in the spring of 2022, while in Łutselk'e, material and equipment were shipped to the site, where initial construction starts in 2022-2023.
- The GNWT completed a climate adaptation study that recommended the existing diesel power plant in Fort Simpson be relocated to the same site identified for the LNG project due to future flooding risks. NTPC has begun estimating the scope of work and capital costs.
- The GNWT and NTPC worked to select a preferred solution and complete additional pre-design work to install natural gas-fired generation units in Tuktoyaktuk.

In 2021-2022, the Pilot Electric Vehicle Incentive Program provided rebates for 16 EVs and 10 Level 2 chargers. Rebates for 21 EVs and 11 chargers have been provided since the pilot program was launched by the AEA in 2020. In 2022, the GNWT provided an additional \$100,000 to the AEA to clear the waitlist and fund additional EV rebates. The GNWT partnered with Northland Utilities (NUL) to install two fast charging stations in Yellowknife, which will be able to fully charge an EV in about 30 minutes. The GNWT also provided funding to NTPC to install a fast-charging station near Behchokò, the first milestone of a charging corridor between Yellowknife and the Alberta border.

In 2021-2022, the AEA gave out 2,802 incentives worth \$1.8 million that saved 1,800 MWh and avoided 6,800 GJ of fossil fuel use. The AEA has reduced the territory's GHG emissions by 1.0 kt of CO₂e annually, at an average cost-per-rebate of \$99 per lifetime tonne of emissions avoided.

In 2021-2022, the Capital Asset Retrofit Fund (CARF) assigned \$3.8 million to energy projects resulting in an estimated \$263,000 of annual savings. Since its inception, CARF projects have reduced 16.2 kt CO₂e in GNWT-owned assets and saved the GNWT over \$4.1 million.

Using \$4 million of LCELF funding, Housing NWT installed a district heating system running on biomass for a 53-unit public housing development in Yellowknife and transitioned several housing units around the territory to more efficient furnaces and boilers.

In 2021-2022, a new turbine and generator were manufactured for the Taltson hydroelectric facility, anticipated to be shipped and installed in 2023. At the Snare facility, work on Unit 1 was completed. Newly installed asset monitoring systems and a pre-feasibility assessment have identified options for NTPC to complete the work on Unit 2 cost-efficiently. A decision will be made sometime in 2022-2023.

The GNWT and Indigenous Government partners signed a Memorandum of Understanding to develop the Taltson Hydroelectricity Expansion Project. Potential transmission routes were also narrowed down to two feasible options. Engagement with IG partners will continue in 2022-2023.

In 2021-2022, the GNWT convened a workshop with NWT stakeholders to explore the potential role of hydrogen-based technologies in the NWT's energy system and economy. The GNWT also initiated modelling work to better understand what low-carbon pathways could look like in the North. Scenarios will assess the potential for existing and emerging technologies to further reduce emissions in the buildings, transportation, and industrial sectors by 2030 and 2050. Modelling will inform the five-year review of the *Strategy* scheduled in 2023-2024.

Sommaire

Le Rapport sur les initiatives énergétiques 2021-2022 : rapport sur les mesures prises dans le cadre de la Stratégie énergétique 2030 (Rapport) met en évidence la planification du Plan d'action énergétique 2022-2025, les initiatives énergétiques dans les collectivités, les mises à niveau de l'infrastructure énergétique existante, les initiatives en matière de conservation de l'énergie et d'efficacité énergétique, ainsi que le travail du GTNO sur l'élaboration de mesures incitatives à l'utilisation des véhicules électriques (VE) aux TNO.

Les TNO se sont engagés à réduire leurs émissions de GES de 30 % d'ici 2030 par rapport aux niveaux de 2005. En 2020, les émissions de GES des TNO s'élevaient à 1 401 kt d'éq. CO₂, soit 19 % de moins que les niveaux de 2005. Le GTNO continue de travailler avec le gouvernement fédéral pour affiner les estimations de la trajectoire actuelle des émissions de GES aux TNO.

En 2021-2022, le GTNO a investi 52,9 millions de dollars dans le domaine de l'énergie afin de soutenir des projets visant à réduire les émissions de GES, à améliorer la fiabilité des systèmes énergétiques et à stabiliser les coûts de l'énergie. L'élaboration de projets et d'initiatives de transformation soutenus par le financement fédéral a augmenté le budget de 39 % par rapport à l'exercice précédent (38 millions de dollars).

Les mesures et les initiatives prises dans le cadre de la *Stratégie* ont permis de réduire les émissions des TNO à hauteur de 12,8 kt d'éq. CO₂ en 2021-2022. Les projets en cours d'élaboration devraient permettre d'éliminer 47,3 kt d'émissions d'ici 2025. Le Programme de subventions publiques pour la réduction des GES a approuvé trois projets en 2021-2022. Huit projets ont maintenant été financés par les deux volets du

programme, ce qui permettra de réduire les émissions de GES de 2,8 kt chaque année.

Le GTNO et ses partenaires ont continué à travailler avec Northland Utilities/ATCO et Relations Couronne-Autochtones et Affaires du Nord Canada (RCAANC) pour mener des études de préfaisabilité sur les énergies renouvelables pour les collectivités de Wekweètì et Samba K'e. L'AEA a également conclu des ententes de partenariat avec l'administration communautaire de Wekweètì, le hameau de Tulita, et la ville de Fort Smith pour élaborer des plans énergétiques communautaires.

Deux promoteurs de projets solaires ont également signé une entente d'achat d'électricité avec la Société d'énergie des Territoires du Nord-Ouest (SETNO) pour alimenter le réseau local en électricité, le plus récent étant un panneau photovoltaïque de 1 MW mis au point par Nihtat Energy Ltd. à Inuvik.

Le GTNO a consulté des partenaires, des gouvernements et des organisations autochtones, des intervenants et le public afin de recueillir des commentaires et d'éclairer l'élaboration du *Plan d'action énergétique 2022-2025*, qui sera publié plus tard en 2022. Cela comprenait une

campagne publicitaire, un portail de mobilisation du public sur le site Web du GTNO, des rencontres individuelles avec nos partenaires, ainsi que des lettres aux gouvernements autochtones pour solliciter leurs commentaires.

En 2021-2022, le GTNO a poursuivi ses efforts pour faire progresser plusieurs projets de transformation visant à réduire les émissions de GES provenant de la production d'électricité aux TNO.

- Un programme environnemental sur le terrain a été réalisé pour la ligne de transport d'énergie de 170 km proposée entre le réseau hydroélectrique existant de Taltson et Fort Providence, Kakisa et Dory Point. Les activités de consultation et de mobilisation se sont poursuivies, et des fonds ont été fournis pour d'autres études techniques et la planification de l'approvisionnement et de la construction.
- Le GTNO et le gouvernement t̥h̥ch̥o ont également entamé des travaux techniques et se sont engagés à travailler en partenariat pour faire avancer le projet de construction d'une ligne de transport de 60 km pour relier Whatì au réseau électrique de Snare.

- Les travaux de construction de la route d'accès de six kilomètres pour le projet éolien d'Inuvik ont commencé. Les aubes de turbines ont hiverné à Hay River et seront transportées par barge à Inuvik plus tard en 2022.
- Les travaux d'installation de nouvelles centrales au diesel à haut rendement se sont poursuivis à Sachs Harbour et à Łutselk'e. La construction à Sachs Harbour a commencé au printemps 2022, tandis qu'à Łutselk'e, le matériel et l'équipement ont été expédiés sur le site, où la construction initiale commencera en 2022-2023.
- Le GNWT a réalisé une étude sur l'adaptation aux changements climatiques, dans laquelle on émet la recommandation que la centrale électrique au diesel existante à Fort Simpson soit déplacée sur le même site désigné pour le projet de gaz naturel liquéfié en raison des risques d'inondation futurs. La SETNO a commencé à estimer la portée des travaux et des coûts d'immobilisations.
- Le GTNO et la SETNO ont travaillé à la sélection d'une solution privilégiée et à la réalisation de travaux de préconception supplémentaires pour installer des unités de production au gaz naturel à Tuktoyaktuk.

En 2021-2022, le programme pilote d'incitation à l'achat de véhicules électriques a offert des remises pour 16 VE et 10 bornes de recharge de niveau II. Des remises pour 24 VE et 11 bornes de recharge ont été offertes depuis le lancement du programme pilote par l'AEA en 2020. En 2022, le GTNO a versé 100 000 \$ de plus à l'AEA pour éliminer la liste d'attente et financer des remises supplémentaires sur les VE.

Le GTNO s'est associé à Northland Utilities pour installer deux bornes de recharge rapide à Yellowknife, qui pourront recharger un VE en 30 minutes environ. Le GTNO a également versé des fonds à la SETNO pour l'installation d'une borne de recharge rapide près de Behchokò, première étape d'un corridor de recharge entre Yellowknife et la frontière avec l'Alberta.

En 2021-2022, l'AEA a accordé 2 802 remises d'une valeur de 1,8 million de dollars qui ont permis d'économiser 1 800 MWh et d'éviter 6 800 GJ de consommation de combustibles fossiles. L'AEA a réduit les émissions de GES du territoire de 1,0 kt d'éq. CO₂ par année, à un coût moyen par remise de 99 \$ par tonne d'émissions évitées pendant la durée de vie.

En 2021-2022, le Fonds de modernisation des immobilisations a affecté 3,8 millions de dollars à des projets énergétiques qui ont permis de réaliser des économies annuelles estimées à 263 000 dollars. Depuis sa création, les projets du Fonds ont permis de réduire de 16,2 kt d'éq. CO₂ les actifs appartenant au GTNO et de lui faire économiser plus de 4,1 millions de dollars.

Grâce à un financement de 4 millions de dollars du Fonds du leadership pour une économie à faibles émissions de carbone, Habitation TNO a installé un système de chauffage urbain fonctionnant à la biomasse pour un ensemble de huit bâtiments de logements sociaux à Yellowknife et a assuré la transition de plusieurs logements aux TNO vers des chaudières et systèmes de chauffage plus efficaces.

En 2021-2022, une nouvelle turbine et un nouveau générateur ont été fabriqués pour l'installation hydroélectrique de Taltson, dont l'expédition et l'installation sont prévues en 2023. À l'installation de Snare, les travaux sur l'unité 1 ont été achevés. Des systèmes de surveillance des actifs nouvellement installés et une évaluation de pré faisabilité ont permis de déterminer des options permettant à la SETNO de terminer les travaux sur l'unité 2 de manière rentable. Une décision sera prise au cours de l'année 2022-2023.

Le GNWT et les partenaires des gouvernements autochtones ont signé un protocole d'entente pour développer le projet d'expansion de l'hydroélectricité de Taltson. Les voies de transport potentielles ont également été réduites à deux options réalisables. Les échanges avec les partenaires autochtones se poursuivront en 2022-2023.

En 2021-2022, le GTNO a organisé un atelier avec des intervenants des TNO pour explorer le rôle potentiel des technologies à base d'hydrogène dans le système énergétique et l'économie des TNO.

Le GTNO a également entrepris des travaux de modélisation afin de mieux comprendre à quoi pourraient ressembler les voies à faible teneur en carbone dans le Nord. Les scénarios évalueront le potentiel des technologies existantes et émergentes pour réduire davantage les émissions dans les secteurs du bâtiment, du transport et de l'industrie d'ici 2030 et 2050. La modélisation servira de base à l'examen quinquennal de la *Stratégie* prévu en 2023-2024.

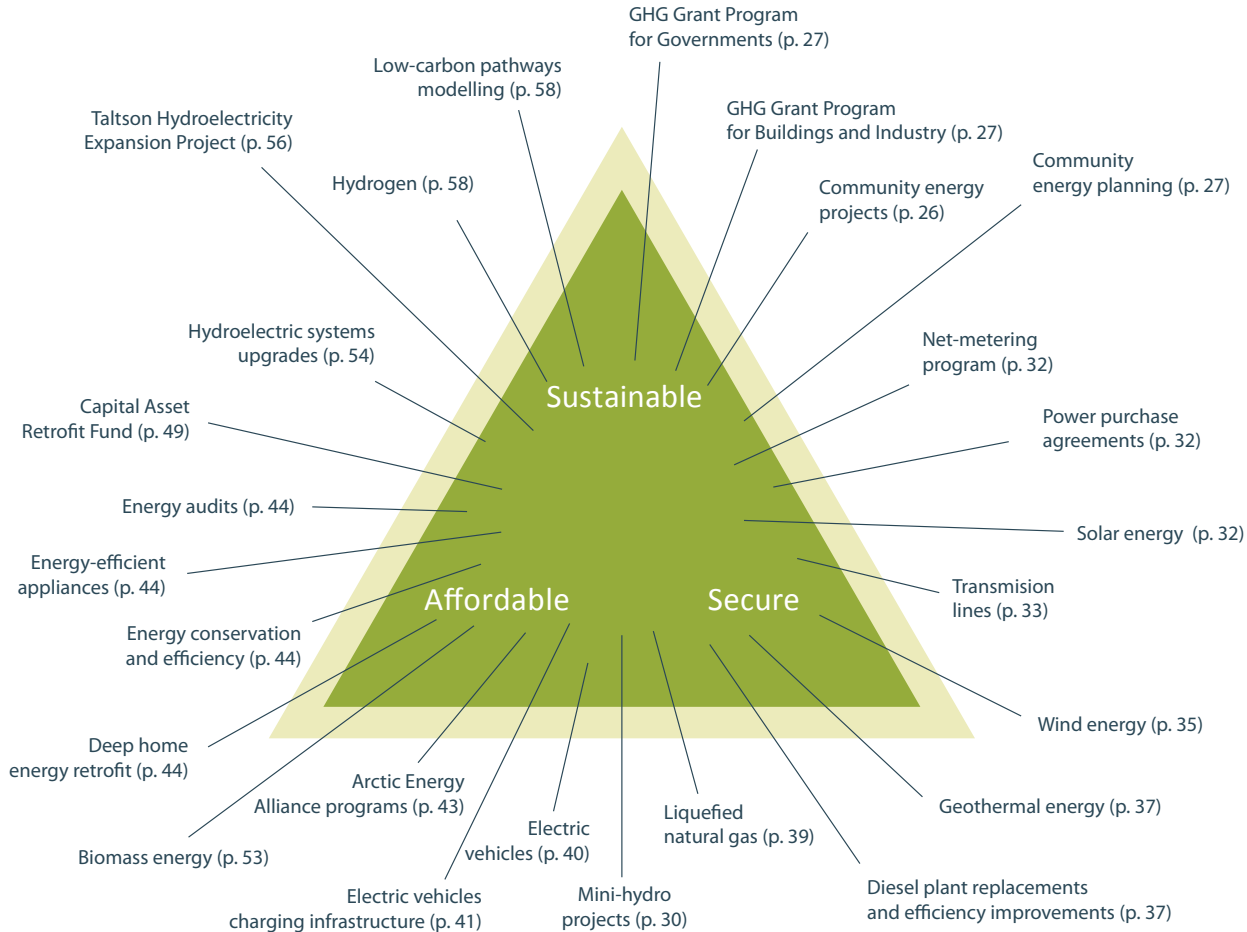
Introduction

The *2021-2022 Energy Initiatives Report: Reporting on Actions under the 2030 Energy Strategy (Report)*, summarizes the key energy actions and initiatives undertaken by the GNWT and its partners over the past year; looks ahead to potential future projects, policies and programs; and provides a high-level review of the NWT’s current energy and greenhouse gas (GHG) emissions situation.

All the actions and initiatives in the *Report* fall under the *2030 Energy Strategy (Strategy)*, which sets out the GNWT’s long-term vision for transitioning to a lower-carbon economy while ensuring the NWT has access to reliable and affordable energy. 2021-2022 represents the fourth year of implementing the *Strategy*.

This year’s *Report* highlights efforts to advance community energy planning along with work that was done to upgrade existing infrastructure that has reached or is nearing its life-expectancy. This included hydroelectric facilities in both hydro zones, as well as diesel-powered grids in remote communities.

Figure 1. Energy programs, initiatives, and issues advanced in 2021-2022



The *Report* also shows the GNWT's emphasis on developing incentives for electric vehicle (EV) use in the NWT, through rebates and investment in charging infrastructure. Now that we know that EVs work in the North—and can tap excess hydropower in hydro communities—they can be a big contributor to reducing GHGs in the transportation sector—the leading source of emissions in the territory.

The *Report* provides an update on the GNWT's energy conservation and efficiency initiatives, including a feature on the 25th anniversary of the AEA's programs and services, the GNWT's GHG Grant Program and the Capital Asset Retrofit Fund (CARF).

The *Report* highlights planning to update the *2019-2022 Energy Action Plan (Action Plan)*, which is in its final year. Actions and initiatives implemented under the current *Action Plan* were analyzed and evaluated

to determine initiatives to be continued, and emerging technologies with potential applications in northern settings were studied extensively. The updated *Action Plan* will be released in the fall of 2022.

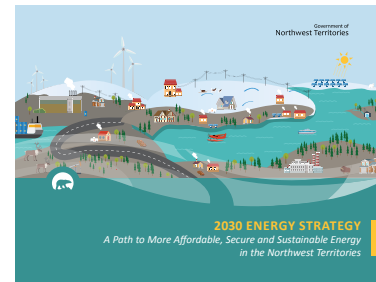
The *Report* also includes policy work that was engaged in to determine ways to keep energy reliable and affordable while promoting individual and community participation in energy issues and addressing climate change. Modelling was developed from this work and will inform the upcoming five-year review of the *Strategy*, scheduled to be initiated in 2023-2024.

Figure 1 outlines the programs, initiatives and issues covered in the *Report* and advanced in 2021-2022 to make NWT energy systems more affordable, secure, and sustainable.

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.

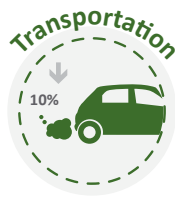


KEY LINKAGES TO THE CLIMATE CHANGE STRATEGIC FRAMEWORK AND NWT CARBON TAX

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. The *Strategy* is the main vehicle to meet the NWT objective of reducing GHG emissions by 30% below 2005 levels by 2030, as set out in the *CCSF*.

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.

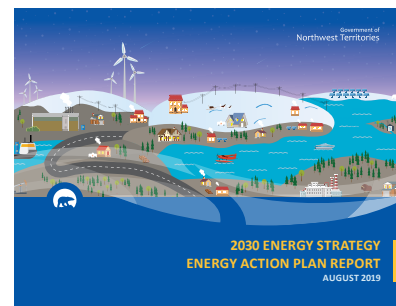
When making decisions about energy initiatives, the GNWT must also consider whether the initiative has community and Indigenous engagement, approval, and participation. Other factors that affect decision-making include stakeholder interest, project complexity, optimizing resources—including GHG reductions 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, Housing NWT (HNWT), the Arctic Energy Alliance (AEA), and the NWT Power Corporation (NTPC)—as well as residents, businesses, communities, Indigenous Governments and Organizations, and industry.

The current *Action Plan*, laid out for the 2019-2022 period, expired on March 31, 2022. In the last quarter of 2021-2022, the GNWT conducted several activities to develop the *2022-2025 Energy Action Plan*. The GNWT plans to release the new action plan by Fall 2022. The new plan will notably include the five-year review of the *Energy Strategy*, scheduled to occur in 2023-2024.



Appendix E provides a status update for each of the 44 actions and initiatives included in the *2019-2022 Energy Action Plan* as of March 31, 2022.

NWT Energy Snapshot

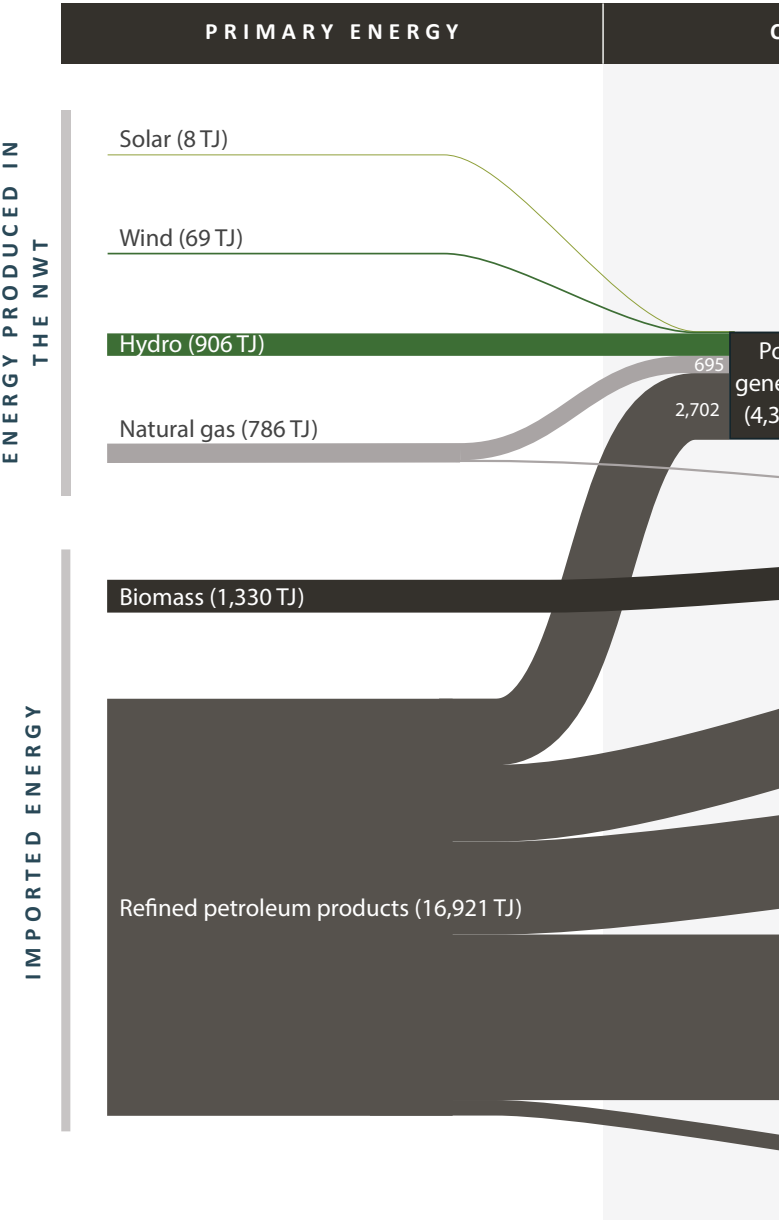
NWT Energy Supply and Demand

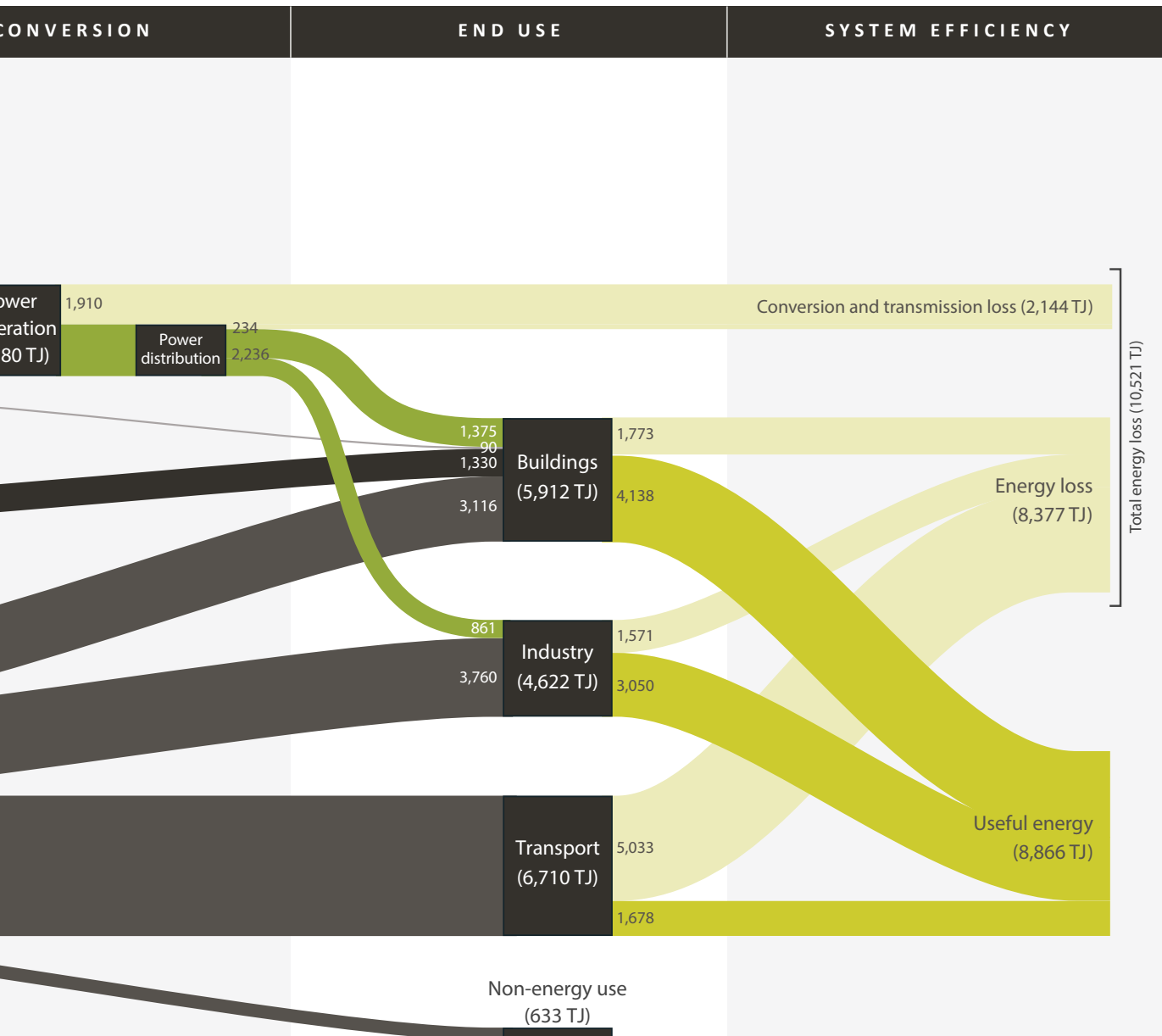
The diagram on these pages is called a Sankey diagram. Sankey diagrams are used to show the energy flow from its primary sources to its conversion to fuels and electricity, and how fuel and electricity are used to deliver energy services (e.g., heating, light, transport of people and goods). This diagram shows the NWT’s energy sources and uses in 2020, the most recent year for which data is available.

The key to interpreting a Sankey diagram is to remember that the width of each line shows the quantity of energy. Also, the left side of this diagram highlights the difference between local and imported energy in the NWT; the right side of this diagram (under System Efficiency) shows where energy is most efficiently used (buildings and industry) and where it is lost (power generation and transportation).

In 2020, NWT primary energy supply represented 20,020 TJ. Fossil fuels were the dominant source of energy in the NWT, accounting for 85% of the overall territorial energy supply. Transportation accounts for most of the energy used in the NWT, with industry driving demand. Transportation relies on gasoline for light-duty vehicles and diesel for heavy-duty vehicles. Refined petroleum products are the industry’s primary source of energy to operate its facilities. Buildings primarily use a mix of electricity and petroleum products (e.g., heating oil and propane), with biomass becoming an emerging alternative for heating.

Figure 2. Energy flows in the NWT in 2020 (in terajoules)



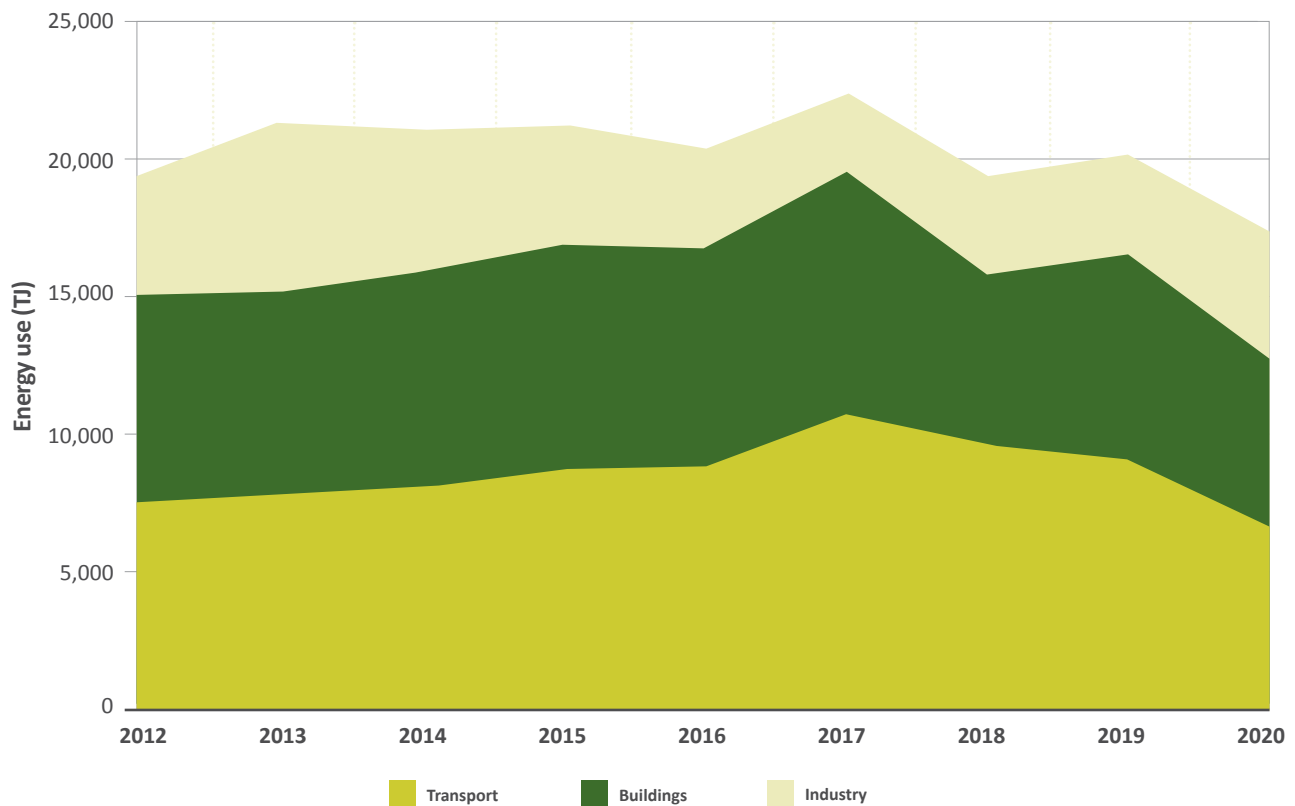


Source: Statistics Canada, GNWT, NTPC, NUL

Notes: Power generation in the industrial sector is estimated using data from Statistics Canada. Energy loss from the end use is estimated using the average conversion efficiency of technologies for a given sector in North America. Buildings demand for natural gas uses 2019 data since 2020 data was deemed unreliable. 1 terajoule (TJ) equals 1,000 gigajoules (GJ).

Figure 3 shows NWT final energy use for each sector between 2012 and 2020. NWT final energy demand decreased by 14% between 2019 and 2020, a decline primarily attributable to the effects of the global COVID pandemic. Transport drove the energy demand in 2020, representing 6,710 TJ or 39% of NWT final energy demand, despite a 26% decrease in energy requirement between 2019 and 2020. Buildings' energy needs decreased by 21% between 2019 and 2020, when they reach 5,912 TJ (34% of final demand). With 4,622 TJ, industry accounted for 27% of NWT final energy demand in 2020.

Figure 3. Final energy demand by sector between 2012 and 2020



Sources: Statistics Canada, GNWT

Note: Buildings final energy demand includes biomass used for space heating. Buildings demand for natural gas uses 2019 data since 2020 data was deemed unreliable. All tables go to 2020 for consistency.

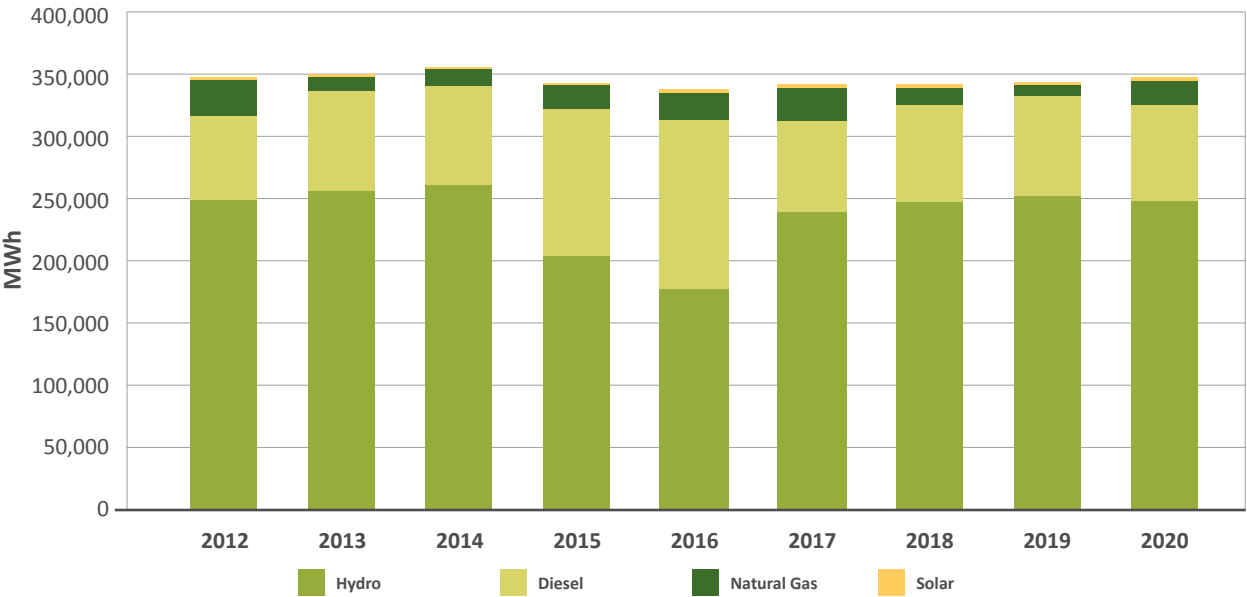
POWER GENERATION

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 4 shows the energy sources that were used to generate power for NWT communities between 2012 and 2020.

About 72% of the community 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 fossil fuels to produce electricity. Diesel and natural gas generators respectively account for 22% and five percent of overall community power generation in 2020. Most NWT communities have also deployed residential and community scale solar electricity generation, although it makes up a fraction of electricity generated in the territory (less than one percent in 2020).

Figure 4. Community power generation by type between 2012 and 2020



Sources: NTPC, NUL

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, except for electricity generated by Imperial Oil and sold to NTPC in Norman Wells.

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 5 shows the NWT’s historical total annual GHG emissions. In 2020—the most recent year for which data is available—the NWT’s overall annual emissions were 1,401 kt CO₂e. 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.

NWT’s GHG emissions are historically dominated by the transportation sector, and 2020 is no exception. Primarily driven by demand from remote industrial sites, transportation accounted for 55% of territorial

emissions. The building sector was second, responsible for 21% of the NWT's GHG emissions. Due to its reduced activity due to the COVID-19 pandemic, industry only contributed to 17% of NWT emissions in 2020. Lastly, electricity generation and waste were respectively responsible for five per cent and three per cent of overall carbon emissions.

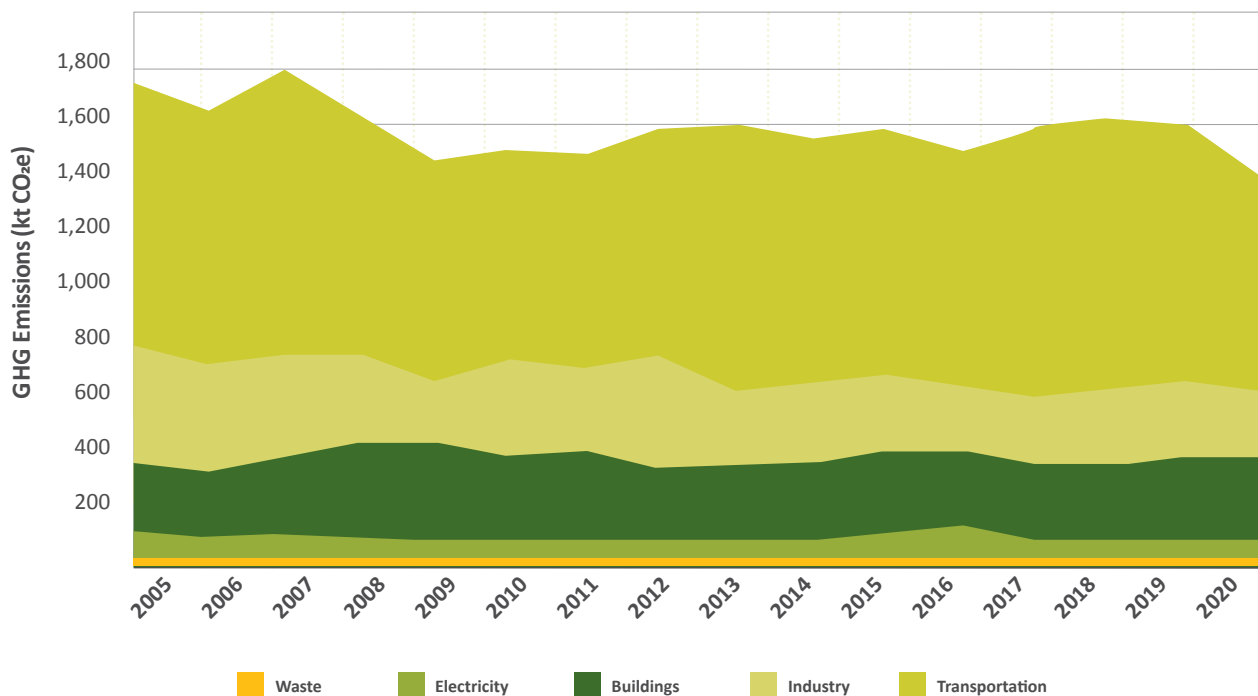
In 2020, the NWT's GHG emissions were 19% lower than 2005 levels. Territorial emissions fluctuate each year depending on economic activity, climate conditions

and investments in low-carbon technologies—all of which affect the total demand for fossil fuels. However, one more prominent factor in 2020 was the COVID-19 pandemic, whose associated health restrictions significantly reduced NWT economic activity.

While there is a general downward trend in emissions since 2005, another factor making NWT emissions fluctuate greatly year-over-year is Statistics Canada revisions to NWT energy data. In the past, recurring updates to historical data would

generate material variations in overall NWT emissions, well beyond the incremental changes caused by updates to methodology employed to estimate emissions. In 2021-2022, the GNWT started working with Statistics Canada to fix major discrepancies observed between federal and territorial energy data and ensure Canada's statistics better represent the NWT energy system. This work will continue in 2022-2023 so that the GNWT can better track progress against the territorial 2030 target.

Figure 5. NWT Greenhouse Gas Emissions between 2005 and 2020



Source: Environment and Climate Change Canada, NTPC, NUL

Note: Emissions from agriculture are virtually zero.

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

ENERGY TRANSITION INVESTMENTS

The GNWT and its partners—including the federal government, NTPC and the AEA, as well as residents, communities, businesses and industry—are making significant investments to implement the *Strategy*. Between 2018-2019 and 2021-2022, the GNWT invested \$138 million to advance towards the objectives of the *Strategy*.

In 2021-2022, the GNWT invested \$52.9 million to support energy projects and initiatives across the NWT, a 39% increase in budget when compared

to the previous fiscal year (\$38.0 million). Last year’s unmatched budget reflects the development of projects and initiatives supported through federal funding, such as the Investing in Canada Infrastructure Program and the Low Carbon Economy Leadership Fund.

Table 1 provides a breakdown of energy-related investments made by *Strategic Objective* since 2018-2019.

Table 1. GNWT Energy-Related Investments by Strategic Objective

STRATEGIC OBJECTIVE	2018-2019	2019-2020	2020-2021	2021-2022
1. Working Together	N/A	\$103,000	\$807,000	\$585,000
2. Electricity		\$12,444,000	\$21,480,000	\$36,287,000
3. Transportation		\$421,000	\$530,000	\$823,000
4 & 5. Energy Efficiency and Space Heating		\$9,379,000	\$10,368,000	\$12,480,000
6. Long Term Vision		\$3,492,000	\$4,872,000	\$2,716,000
Total	\$21,000,000	\$25,837,000	\$38,007,000	\$52,891,000

Note: Breakdown for investments made in 2018-2019 is not available.

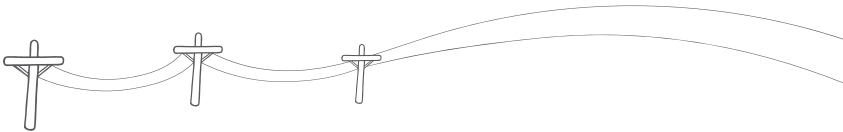


Table 2 provides a breakdown of \$52.9 million in energy-related investments the GNWT made during 2021-2022 by funding stream.

Table 2. GNWT Energy-Related Investments by Funding Stream

FUNDING STREAM	2018-2019	2019-2020	2020-2021	2021-2022
GHG Grant Programs	N/A	\$159,000	\$331,000	\$1,369,000
Arctic Energy Alliance (core funding and LCELF funding)		\$4,990,000	\$5,191,000	\$4,117,000
Federal Low Carbon Economy Leadership Fund Portfolios (excluding AEA supplement)		\$449,000	\$1,239,000	\$2,923,000
Federal Investing in Canada Infrastructure Program Projects		\$11,814,000	\$20,469,000	\$34,556,000
Crown-Indigenous Relations and Northern Affairs Canada (Taltson Expansion)		\$2,288,000	\$3,995,000	\$2,228,000
Energy Core Funding		\$843,000	\$1,146,000	\$1,982,000
Capital Asset Retrofit Fund		\$3,800,000	\$3,800,000	\$3,800,000
Salaries and Administrative Expenses		\$1,494,000	\$1,836,000	\$1,916,000
Total	\$21,000,000	\$25,837,000	\$38,007,000	\$52,891,000

Note: Breakdown for investments made in 2018-2019 is not available.

The Infrastructure Canada funding noted above 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 future electricity costs.



GNWT investments in initiatives like support for EV charging infrastructure is helping achieve the objectives of the 2030 Energy Strategy.

ENERGY TRANSITION CHALLENGES IN THE NWT

The NWT faces many challenges to a lower carbon energy transition, which in some cases will require solutions that differ from workable solutions in other Canadian jurisdictions.

UNIQUE CIRCUMSTANCES

The NWT's immense geography (1.3 million km²) and low population (approximately 44,000 people) mean that the territory has a fragmented energy grid.

The NWT is not connected to the North American electricity system, eliminating the possibility of buying from, or selling power to, southern

jurisdictions. There are two islanded hydro zones, and 25 local grids in remote communities that are supplied by diesel-generated electricity (thermal communities). Extreme winter temperatures also make it difficult to find and supply viable heating and transportation fuel solutions in the North.

BALANCING TRADE-OFFS: RELIABILITY, AFFORDABILITY, SUSTAINABILITY

Energy security is a crucial issue in the North, as the reliability of energy systems in cold, remote areas can be a matter of life and death. Energy affordability is also critical, as the NWT already deals with some of the highest energy costs in Canada. This means that even though residents and businesses in the NWT are committed to doing their part to reduce GHG emissions, all energy initiatives in the *Strategy* are led by what we call our trade-off triangle, which ensures communities, businesses, industry, and people in the NWT have access to reliable, affordable, and sustainable energy.

Massive investment into capital generation assets, development of transmission lines to bring clean hydroelectricity to thermal communities, and deployment of higher efficiency end-use technologies are how we are achieving our climate commitments while keeping energy reliable and costs stable. These investments also generate economic benefits by employing Indigenous and local businesses, building local capacity, and highlighting northern solutions.

LOW-CARBON TECHNOLOGIES IN THE NORTH

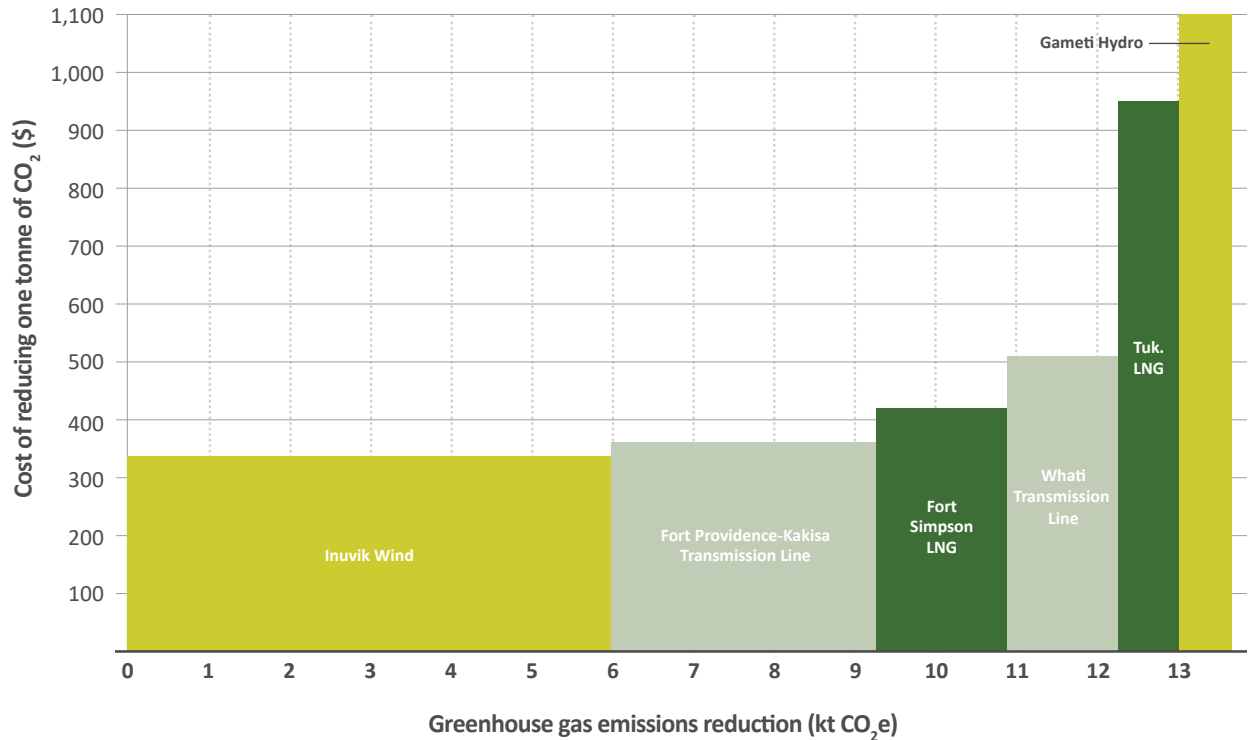
Although it seems counterintuitive, new technologies often lead to increased costs for consumers. Even if a technology is proven to work in the North, the NWT must often spend more to implement it than other provinces. It may cost hundreds—up to thousands—more dollars per tonne to reduce our GHG emissions compared to southern Canada.

Figure 6 shows that the estimated per-tonne cost for current projects aimed at reducing emissions in diesel-powered communities ranges from \$330 to \$1,100 per tonne of CO₂e. This is partly because our residents are spread out across such a large land

area—which does not allow for economy of scale—and our extremes in climate, especially in the winter.

Without federal funding as a primary funding source, most emissions-reducing projects do not make economic sense on their own in the NWT, and would adversely affect energy costs for Northerners. The reality is that continued federal support is critical as we transition our energy systems. One notable exception is biomass (e.g., firewood, wood pellets), a low-tech source of energy effectively used to heat buildings throughout the NWT.

Figure 6. Estimated per-tonne cost of reducing emissions for upcoming electricity projects



ABOUT DEEP DECARBONIZATION PATHWAYS IN THE NWT

The GNWT has initiated modelling work to better understand how the NWT could transform its energy systems and reduce more GHG emissions in the longer run. The analysis aims to explore and cost out achievable emissions reductions at the 2030 and 2050 horizons, based on various technology pathways. This work—key to inform the upcoming five-year review of the *Strategy*—is explained in more detail on page 58.

ORGANIZATIONAL ROLES

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

GOVERNMENT OF THE NORTHWEST TERRITORIES (GNWT)

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 program and Marine Transportation Services (MTS) fleet retrofits—as

well as other GNWT departments and agencies to support energy initiatives such as public housing upgrades, community energy planning, and carbon sequestration.

The Energy Division also works closely with other levels of government including the federal government, community governments, as well as Indigenous governments and organizations, to facilitate consultation, partnership opportunities and funding for energy projects throughout the territory.

NORTHWEST TERRITORIES POWER CORPORATION (NTPC)

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 (AEA)

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. An overview of AEA’s activities in 2021-2022 is included in this report.

2021-2022 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 1 – WORK TOGETHER

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

We know that communities want to be more engaged and involved in energy solutions. By improving our communication and increasing our support, the GNWT is working to ensure communities can partner in developing solutions, undertake projects independently, and stay updated on local initiatives. The number, scope and scale of energy projects

being undertaken independently by communities, individuals and Indigenous governments and organizations across the NWT is increasing rapidly. Most of these projects are not captured in this report, but the GNWT is encouraged by this development and supports this trend.

COMMUNITY PROJECTS

The GNWT recognizes that Indigenous and community governments are increasingly interested in being directly involved in—or in control of—local energy planning and projects. The GNWT works directly with Indigenous and community governments—or through the AEA's community energy planning programs—to help them identify and implement energy projects.

Federal departments—such as Natural Resources Canada (NRCan) and Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)—are also supporting this approach by providing funding directly to communities for energy efficiency and renewable energy projects.

The federal government announced in April 2022 it will be investing \$300 million over five years in clean energy projects in Indigenous, rural and remote communities. This funding program, managed jointly by CIRNAC and NRCan, will give communities the opportunity to fund capacity-building and GHG-reducing projects at all stages. Applications will be accepted on a rolling basis until 2027.

The GNWT is committed to supporting community-led projects where possible. In 2022-2023, the GNWT will undertake outreach efforts to build relationships with project proponents and offer support and advice on any potential applications.

REGIONAL ENERGY PLANNING IN THE DEHCHO

In January 2022, the GNWT signed a \$25,000 contribution agreement with the Dehcho First Nations to assist with Dehcho regional energy planning activities, such as organizing meetings, training, acquiring professional expertise, and identifying specific energy initiatives within communities.

GAMÈTÌ MINI HYDRO

As part of the *2030 Energy Strategy*, funds are 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.

In 2015, a pre-feasibility report was completed by an independent engineer hired by the community. As no water flow was being monitored, this work was based on modelled 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. During 2021-2022, COVID-19-related challenges delayed the completion of the updated study. During 2022-2023, the GNWT

will continue to work with the Community of Gamètì and the Tłıchǫ Government to complete the updated study, confirm the technical viability of the project and, if deemed viable, plan additional engineering as well as preliminary environmental studies.



RENEWABLES PROJECTS IN WEKWEÈTÌ AND SAMBAA K'É

During 2021-2022, the GNWT worked with Northland Utilities/ATCO and CIRNAC to conduct renewable energy pre-feasibility studies for the communities of Wekweètì and Sambaa K'e. These studies—along with studies to be undertaken in 2022-2023—will assess and evaluate various renewable energy alternatives to the current use of fossil fuels for electricity generation and heating,

and will help to advance the development of community-led renewable projects that will reduce GHG emissions and provide economic benefits for the community. If viable renewable energy projects are identified and receive community support, the GNWT will support a funding application to Infrastructure Canada to secure funding to implement the projects.

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 2021-2022, the AEA completed the second full year of a three-year project to work with partner communities to develop community energy plans. This project is funded by Natural Resources Canada, through its Clean Energy for Rural and Remote Communities Capacity Building Stream.

As part of its community energy planning project for 2021-2022, the AEA entered into partnership agreements with the Community Government of Wekweètì, the Hamlet of Tulita and the Town of Fort Smith. Each of these organizations hired a

community energy champion to help with planning activities. These champions are key to project success. In addition to guiding the community engagement process, they ensure projects are grounded in Indigenous community traditions, and that local governance and protocols are respected.

With the AEA's help, the community energy champions led their communities through a process of sharing and collecting information, which helped all three communities develop their plans. The plans are expected to be reviewed by their councils in the 2022-2023 fiscal year.

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.

GHG GRANT PROGRAM

The Greenhouse Gas (GHG) Grant program is an application-based grant program designed to support GHG emissions reduction initiatives for NWT governments, organizations, and businesses. Funding and resources for this program have been provided jointly by the GNWT (in support of the territory's *2030 Energy Strategy*), and by ECCC under the LCELF (in support of the *Pan-Canadian Framework on Clean Growth and Climate Change*).

The program is open to all governments in the NWT, as well as private business and industry. Projects may include—but are not limited to—initiatives such as support to implement community energy plans, community government biomass boilers and district heating, renewable electricity outside of communities, community-based transportation initiatives, electric vehicles charging infrastructure, and waste-to-energy projects.

This program supports external organizations who would like to lower their operating costs as well as reduce GHG emissions. The GNWT would like to aid these organizations in doing their part to meet national climate change objectives.

Designed to fill a gap in funding for larger GHG reduction initiatives, there is a minimum project size to be eligible for these funds of \$100,000. The GNWT provides smaller grants through the AEA.

GOVERNMENT STREAM

The GNWT's GHG Grant Program for Government is designed to support GHG emissions reduction projects and initiatives for NWT community governments, municipalities, GNWT departments, and Indigenous governments and organizations (which includes band or tribal councils, land claim organizations, development corporations and self-governments). This program provides grant support up to 75% of the total eligible project cost.

In 2021-2022, the GHG Grant Program for Government approved three applications:

1. The Gwich'in Tribal Council was approved for funding and was awarded \$235,000 to install a wood energy system consisting of a mixed fuel biomass heating system at the Gwich'in Multi-Use Camp. These installations are expected to reduce up to 103 tonnes of GHG emissions annually and be completed by the fall of 2022.
2. The Yellowknife Catholic School Board was approved for funding and was awarded \$928,000 to install a 540-kW wood pellet boiler system that will serve both Ecole St. Patrick School and Weledeh Catholic School. This system is expected to reduce up to 449 tonnes of GHG emissions annually and be completed in the fiscal year 2022-2023.
3. NTPC was approved for funding and was awarded \$879,000 to install a third LNG tank at the Inuvik power plant to support the increased use of LNG for generating electricity, as opposed to diesel. This installation is expected to reduce the GHG emissions associated with generating electricity in Inuvik up to 606 tonnes annually and be completed in 2022-2023.

During the first application intake period of 2022-2023 three new applications were received for this funding stream.

BUSINESS AND INDUSTRY STREAM

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. However, there may be other competitive applicants requesting funding and

the GNWT may choose to support multiple projects over just one.

In 2021-2022, the GHG Grant Program for Buildings and Industry did not receive any applications. Five applications were received for this funding stream during the first intake period of 2022-2023.

Table 3. Approved projects under the GHG Grant Program as of March 31, 2022

START	TITLE	LOCATION	STATUS	PROPO- NENT	FUNDING AMOUNT	EMISSIONS REDUCTIONS (tonnes CO ₂ e/year)
Business and Industry stream						
2020-2021	Fort Providence Energy Incubator	Fort Providence	Complete	Snowshoe Inn	\$37,000	87
2020-2021	Woolgar Avenue Biomass District Heating System	Yellowknife	Complete	J&R Mechanical Ltd	\$274,000	396
Government Stream						
2018-2019	Sustainable Northern Agriculture Project	Gamètì	Complete	Community Government of Gamètì	\$133,000	93
2019-2020	Energy Management in Community Buildings	Fort Smith	Ongoing	Town of Fort Smith Public Government	\$360,000	510
2020-2021	Pellet Boiler Installations for Mildred Hall School and Range Lake School	Yellowknife	Ongoing	Yellowknife Education District no. 1	\$1,125,000	578
2021-2022	Wood Pellet Boiler Project at Ecole St Patrick and Weledeh Schools	Yellowknife	Ongoing	Yellowknife Catholic Schools	\$928,000	449
2021-2022	Biomass Furnaces for Gwich'in Camp	Inuvik	Ongoing	Gwichin Tribal Council	\$235,000	103
2021-2022	Inuvik Power Plant - 3rd LNG Fuel Tank	Inuvik	Ongoing	NTPC	\$879,000	606
Total					\$3,972,000	2,822

LOOKING AHEAD

The GHG Grant Program is entering its last two years, as it is funded under the LCELF until March 31, 2024. As of March 31, 2022, \$2.7 million of funding remains available under the Building and Industry stream of the GHG Grant program, and \$4.1 million remains under the Government stream. It is possible the program could be extended or continued—as the Government of Canada has announced its intention to continue the LCELF program—though no details have been released.

Last year, the GNWT increased its communication effort to ensure broader awareness of the GHG Grant Program, including paid advertisement in media, posts on social media, targeted phone calls and emails, sponsored news articles and media attention, as well as attending trade shows and conferences (including the NWT Geoscience Forum, Polar Pond Hockey and Energy Fair in Hay River, AEA Biomass Conference, and Arctic Development Expo in Inuvik). Table 3 provides a list of projects supported by the GHG Grant program since its inception.

2022-2025 ENERGY ACTION PLAN ENGAGEMENT

The *2019-2022 Energy Action Plan* ended on March 31, 2022. The GNWT conducted several activities during Fall 2021 and Winter 2022 to support the development of the *2022-2025 Energy Action Plan*.

The GNWT first reviewed projects and initiatives included in the *2019-2022 Energy Action Plan* to identify projects that could be replicated, technologies that should be further invested in, and research that should be conducted in the new *Action Plan*. The GNWT initiated an assessment to estimate a realistic range of GHG emissions reduction required by 2025 to put the NWT on track to meet the 2030 target. Additional analysis was conducted to estimate and compare the per-tonne cost of various programs and initiatives.

The GNWT also reviewed funding available through existing federal programs (e.g., ICIP, LCELF) and investigated potential new funding streams available to help finance energy projects and initiatives across the NWT.

The GNWT then conducted a public engagement campaign in 2022 to get feedback that will inform the development of the *2022-2025 Energy Action Plan*. The engagement included:

- A call for public input on the GNWT engagement portal (from Feb 22 to March 22, 2022), which was pushed through social media channels, targeted emails to specific organizations/individuals, as well as paid media advertisements.
- Meetings with other GNWT departments and divisions, the AEA as well as the NWT Association of Communities.
- In addition to the call to the public, the GNWT sent a letter to Indigenous governments to request input and help craft the 2022-2025 Energy Action Plan.

Seven submissions from industry, non-profits and individuals were received during the engagement. Most of these submissions contained extensive ideas aimed at reducing energy costs for Northerners and businesses while advancing GHG emissions reductions in the electricity, transportation, buildings, and industrial sectors.

The GNWT also hired a firm that specializes in economic and energy modelling to provide third-party analysis of current energy, climate and economic trajectories in the NWT. Scenario development was initiated to estimate the costs of achieving additional GHG emissions reductions by 2030. The GNWT will keep building on this tool as it initiates the five-year review of the *Strategy* and discusses possible changes to territorial emissions reduction targets.

Analysis and feedback was used to assess the success of initiatives, incorporate lessons learned, and keep up with emerging technologies, potential energy sources, and the ever-evolving social, political, and economic landscape. Engagement results were communicated in a briefing to the Standing Committee on Economic Development and Environment (SCEDE)—with an opportunity for questions—in April 2022.

The Department of Infrastructure anticipates the *2022-2025 Energy Action Plan* to be released in Fall 2022.

INDEPENDENT POWER PRODUCERS

As part of the *Strategy*, the GNWT established a participation model to allow NWT residents, communities and Indigenous governments to participate in the supply of renewable electricity. While residents can get a credit for power fed into the grid through the net-metering program, communities and Indigenous governments—and related businesses—developing larger renewable generation assets and can sell power to utilities as Independent Power Producers through a Power Purchase Agreement (PPA).

To date, four Power Purchase Agreements have been signed in the Northwest Territories, all with NTPC. These PPAs are listed in Table 4. The most recent PPA to be signed is with Nihtat Energy Ltd. for a 1-MW grid-connected solar farm located in Inuvik. The project is funded by NRCan and is expected to be operational by the end of 2022-2023. It will displace up to 1,189 t of CO₂e annually on Inuvik’s power grid.

Table 4. Power Purchase Agreements signed with utilities in the NWT

LOCATION	PROPONENT	PROJECT TYPE	INSTALLED CAPACITY (kW)	YEAR PPA WAS SIGNED	YEAR PROJECT CONNECTED TO NTPC GRID	ESTIMATED ANNUAL GHG DISPLACEMENT (t CO ₂ e) **
Lutselk'e	Lutselk'e Dene First Nation	Solar	36	2015	2016	50
Aklavik	Nihtat Energy Ltd.	Solar	150	2020	2022/2023	168
Tulita	Tulita Forest Products Ltd	Solar	45	2021	2022*	57
Inuvik	Nihtat Energy Ltd.	Solar	1,000	2022	2023*	1,189

* Tentative

** Estimates based on the carbon emissions intensity of local electricity grids



Nihtat Energy Ltd. is installing a 150-kW solar system in Aklavik. The project is expected to be connected to the NTPC grid in 2022-2023.

2021-2022 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% below average historical levels by 2030.

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. This project will reduce diesel fuel consumption for power generation by approximately one million litres and reduce GHG emissions by 3,000 tonnes of CO₂e per year. Replacing diesel electricity with hydroelectricity should also help stabilize the cost of power in these communities in future years.

PROJECT MILESTONES

2019-2020 – Infrastructure selected the highway routing and updated previous technical and costing studies, initiated engagement with Indigenous governments and organizations and conducted engagement activities with project stakeholders.

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.

2021-2022 – Infrastructure completed an environmental field program to gather baseline data and identify potential impacts. This information is being used to prepare a Land Use Permit application package. During the year, Infrastructure continued consultation and engagement activities with Indigenous governments and organizations, communities and other stakeholders to provide information on the project and address concerns. As well, \$550,000 was provided to NTPC and \$100,000 to Northland Utilities to undertake additional engineering studies and begin planning for the procurement and construction phase.

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.

TENTATIVE TIMELINE FOR CONSTRUCTION

Construction of the proposed transmission line is tentatively planned to begin in 2024, subject to the project obtaining a land use permit and other authorizations.

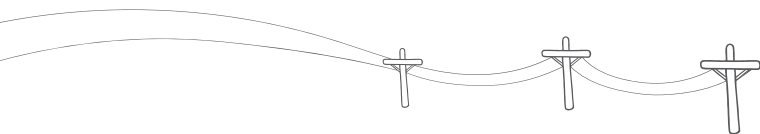
WHATÌ TRANSMISSION LINE

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 operating costs by \$600,000.

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. Hydroelectricity will be provided by NTPC to the local utility—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.

The project is located almost entirely on Tłıchǫ lands and is supported by the Tłıchǫ Government. In 2021-2022, the GNWT and Tłıchǫ Government initiated discussions on the project and committed to working in partnership to advance the project. In 2022-2023, updates to previous technical studies will be completed to identify an acceptable routing corridor for the project. Once the routing is confirmed, the GNWT and Tłıchǫ Government will continue collaborating to identify and initiate additional technical and environmental studies.





The blades for the Inuvik Wind Project will be shipped to Inuvik during summer 2022.

WIND ENERGY

Inuvik Wind Project

The Inuvik Wind Project is a key initiative under the *2030 Energy Strategy*, and it is the first project in the NWT approved for funding under the federal government's ICIP. This project includes the installation of a single 3.5-megawatt wind turbine and battery storage system, a six-kilometre access road, and a distribution line connecting to existing lines near Inuvik's Mike Zubko Airport. \$40 million in funding has been secured for the project, with 75% provided by the Government of Canada and the GNWT paying for the remaining 25%. The project is dealing with higher costs than budgeted and the GNWT is working with Infrastructure Canada to try and address them through ICIP.

The GNWT has worked closely with the Gwich'in Tribal Council and the Nihtat Gwich'in Council on the Inuvik Wind Project. After commissioning, ownership of the project will be transferred to NTPC, which will also operate it.

Inuvik is the largest thermal community in the NWT, and the wind turbine is expected to deliver 30% of Inuvik's annual electricity requirements, while contributing to the GNWT's 25% diesel reduction

target for electricity. Once operational, the project is anticipated to reduce GHG emissions by 6,000 tonnes, and offset diesel consumption in Inuvik by up to three million litres per year. This represents over \$3.4 million in annual fuel savings.

The construction of the six-kilometre access road to the site—along with the wind turbine and battery storage system—started in January 2022. The turbine, wintered in Hay River and barged to Inuvik. Installation is expected to be complete in the Spring of 2023.

Building strong partnerships with Indigenous governments, communities and organizations is critical to advancing the objectives of the *Strategy*. As the project is in the Gwich'in Settlement Area, contract work flowing from this project during the construction phase will significantly benefit Gwich'in businesses, creating jobs and spurring economic development in the Beaufort-Delta region. Approximately 90% of the work on the road is being performed by local businesses.

The project's completion will help stabilize the cost of living and doing business in Inuvik. The planned operational start date for the wind turbine is 2023.

SACHS HARBOUR WIND MONITORING

In 2016-2017, Infrastructure received funding from CIRNAC's 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.

Between 2018 and 2021, a wind monitoring campaign was conducted, 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. Based on the wind data recovered from the wind monitoring equipment, the quality of the potential wind resource was considered low. In addition, the Hamlet advised Infrastructure in 2021-2022 that it no longer supported the project. As a result, the project was cancelled, and Infrastructure has removed the wind monitoring tower from the community.

NORMAN WELLS WIND MONITORING

A previous study from the Aurora Research Institute (ARI) 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 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.

In the summer of 2021, the Norman Wells wind monitoring station completed its two years of wind data collection, and the wind monitoring equipment was removed from the site. Assessment of the wind data, as well as issues with ground stability at the preferred site, show that a wind project in Norman Wells is not a viable project.



LOOKING AHEAD

The ARI is currently investing over \$500,000 in LiDAR Wind Monitoring units to remove the need for costly wind monitoring towers to collect data. With GNWT and federal government assistance, ARI now has three LiDAR wind monitoring units that are capable of capturing wind measurements from 10 to 200 plus metres above the ground, including wind speeds, directions and turbulence intensities. The equipment proved its ability to operate in extreme weather conditions when it supplemented data collection for the Norman Wells Wind Monitoring Tower in early 2021. This investment in LiDAR wind monitoring technology and the subsequent increase in ARI's capacity will help improve our understanding of the wind regime in the NWT and prevent the need for wind monitoring towers in future deployments.

GEOTHERMAL

FORT LIARD GEOTHERMAL PROJECT

Geothermal energy is identified as a potential longer-term option for energy production in the *2030 Energy Strategy*. There may be significant geothermal energy potential in the NWT, but much of it is very deep, untested, and potentially very expensive to develop. More study and data are needed to better understand geothermal resources across the Northwest Territories.

In 2018, the GNWT committed to lead a science-based study—with the assistance of the NWT Geological Survey (NTGS)—to assess the geothermal

potential near the community. Scheduled for summer 2020, the field season in the Fort Liard area was postponed due to COVID-19. NTGS was able to complete the necessary fieldwork to collect samples the following summer. The samples were analyzed in the fall of 2021 and the findings were made available to NTGS in March of 2022. NTGS will be working to interpret the data and share findings publicly in 2022/23. Should the geothermal potential be established, the availability of funding — among other factors—will determine whether an exploratory drilling program can be undertaken near Fort Liard.

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 has a fuel efficiency of 3.1 kWh/L, which is considered to be 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. Construction on the project was restarted in the spring of 2022. NTPC is taking steps to ensure the existing plant can continue to operate until 2023, when it is expected the new plant will be online.

ŁUTSELK'É

Like Sachs Harbour, the existing diesel-electric plant in Łutselk'É 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 pressure on electricity rates.

At Łutselk'É's request, the new diesel plant will be constructed on 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 initial construction of the plant was undertaken during 2021-2022. Completion of construction and commissioning of the new plant is scheduled to occur during 2022-2023.

FORT SIMPSON

In 2021-2022, the GNWT completed a climate adaptation study that recommended the existing diesel power plant be relocated due to future flooding risks. NTPC has begun estimating the scope of work and capital cost to relocate the existing diesel power plant, which will be moved to the same site identified for the Fort Simpson LNG project. In 2022-2023, the GNWT will work with NTPC to complete any outstanding assessments needed to support the development of a federal funding application under ICIP. A timeline for the procurement and construction phase of the project is being prepared.



The interior of Łutselk'e's new diesel power plant. The new plant is scheduled to be operating by the end of the 2022-2023 fiscal year.

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). 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. 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 due to the need to relocate the existing diesel power plant because of risks of flooding. Once NTPC has made more progress in the planning and design for the relocation of the existing diesel power plant, it will re-examine its options for the design of the gas generating plant as both projects will occur on the same site and be highly integrated.

TUKTOYAKTUK

Similar to the Fort Simpson LNG project, the intent of this project is to install a natural gas-fired generating unit in Tuktoyaktuk to displace diesel, thus reducing generating costs as well as GHG emissions. The project is currently in the feasibility stage and will require an application for federal funding under the Investing in Canada Infrastructure Program for 75% funding. 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 feasibility study, Infrastructure and NTPC reviewed the available options to determine the best potential solutions. In 2021-2022, Infrastructure and NTPC worked together to select a preferred

solution and completed additional pre-design work, including a cost estimate.

The start of construction of this project is still to be determined, and would be contingent on the advancement of a successful federal funding application.

LOOKING AHEAD

In addition to the projects already underway, the GNWT has identified other projects that could be pursued in future years through Infrastructure Canada funding. These projects, whose scope will be further developed in 2022-2023, include upgrades to other NTPC hydroelectric generating facilities as well as upgrades to other NTPC diesel generating plants.

In 2022-2023, the GNWT is planning to initiate a review of the NWT's known hydroelectric resources to determine if there are additional feasible hydro project opportunities that can be developed to meet community or regional electricity demand in the future. If additional feasible projects are identified, the GNWT will work in partnership with Indigenous governments and organizations and community governments to discuss and advance these projects.



2021-2022 ENERGY INITIATIVES

STRATEGIC OBJECTIVE 3 – TRANSPORTATION

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

Reducing emissions from transportation by 10% per capita is a strategic objective of the *Strategy*. Transportation accounts for approximately 55% of GHG emissions in the NWT and more EVs in use in the territory could make a big impact on the NWT meeting its emissions reduction target.



The GNWT continues to invest in initiatives that will increase EV adoption in the NWT.

ELECTRIC VEHICLES IN THE NORTHWEST TERRITORIES

EV adoption is accelerating across Canada and is expected to increase as the federal government recently committed to ensuring that all new light duty cars and passenger trucks must be zero emission by 2035. In 2021-2022, the GNWT advanced work to develop the use of EVs in hydro communities, where they take advantage of clean electricity to maximize emissions reductions.

One popular myth about EVs is that they won't work in the extreme cold of the NWT. While it is true that cold decreases the battery range, it will not prevent Northerners from using EVs for day-to-day commutes—especially since our communities are not as big as the ones these cars were designed for. What

is also not as well-known is car and truck engines that use gasoline also experience a decrease in performance in extreme cold, greatly reducing their fuel efficiency.

EVs are nonetheless a readily deployable option to reduce GHG emissions in hydro communities. They also significantly cut mobility cost for Northerners, as their cost represent about one quarter of what it costs to operate a gas car. Additionally, EV adoption contributes to stabilizing electricity prices by using nearly year-round excess hydropower available in hydro communities. For these reasons, there were 30 EVs registered in the NWT as of March 2022, and the number keeps growing every year.

WHAT THE GNWT IS DOING

FIT-FOR-THE-NORTH ZEV STUDY

In 2015 and 2016, the AEA tested a plug-in hybrid electric vehicle in Yellowknife to assess the potential of EVs in the North. The test involved monitoring real-world results of driving the vehicle in Yellowknife from January 2015 to the end of March 2016 and analyzing electricity and fuel used by the vehicle over

LEVEL-2 CHARGING STATIONS IN YELLOWKNIFE

The GNWT and the AEA subsidized the deployment of two Level 2 charging stations in Yellowknife. Both can currently be used free of charge. One is located at AEA's main office and can be used outside of work

AEA'S ELECTRIC VEHICLE INCENTIVE PROGRAM

In 2020, the AEA launched the Pilot Electric Vehicle Incentive Program to provide rebates to reduce the cost of purchasing and using an electric vehicle in NWT communities served by hydroelectricity. The program provides a \$5,000 rebate for EVs (whether solely battery operated or plug-in hybrids) and up to \$500 for charging infrastructure. So far, this popular program has provided incentives for 21 EVs and 11

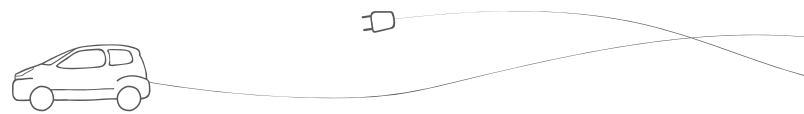
STUDY: A FAST-CHARGING CORRIDOR TO ALBERTA

In 2020, the GNWT commissioned a study to forecast electric vehicle adoption in the NWT to 2030, and examine how an electric vehicle charging corridor could be developed between Yellowknife and the Alberta border. The study estimates that EVs will represent between 2.9% and 11.3% of light-duty vehicles in the NWT by 2030. It also found that an

INVESTING IN EV INFRASTRUCTURE

In 2021-2022, the GNWT funded Northland Utilities (NUL) to install two Level 3 fast charging stations in Yellowknife, which will be able to fully charge an EV in under an hour.

In 2022-2023, the GNWT will announce a new application-based funding program to provide rebates for businesses, governments and



the period. Results were made available in a study, which determined that EVs are a viable option in the northern climate, in terms of practicality, GHG emissions reductions as well as mobility costs.

hours. The other is located in front of City Hall and is notably used as a base for the YK Car Share Co-op's BEV, *Sparky*.

chargers—with 16 EVs and 10 chargers rebated in 2021-22. It is estimated that incentives delivered to date reduce GHG emissions by 42 tonnes of CO₂e per year. In March 2022, the Department of Infrastructure provided an additional \$100,000 to the AEA to clear the waitlist and fund additional EV rebates.

EV fast-charging corridor could be developed along Highways 1 and 3 between Yellowknife and the Alberta border. Access to hydroelectricity will be a deciding factor on where the EV charging stations would be located. Recommendations from the study help guide GNWT's ongoing planning effort for upcoming EV charging infrastructure.

organizations to install Level 2 and Level 3 chargers in the NWT. By targeting organizations, the new program will complement AEA's pilot program, which offers rebates for Level 2 chargers for the residential sector. The GNWT will receive \$414,000 from Natural Resources Canada to administer the program for two years.



The adoption of more EVs and renewable energy for space heating will help the NWT meet its GHG emission target.

MONITORING THE CLEAN FUEL REGULATIONS

The Government of Canada has been working since 2016 to develop a Clean Fuel Regulations (CFR) that would reduce GHG emissions in the transportation sector through the use of lower carbon fuels and the deployment of low-carbon technologies. In the draft regulations released in December 2020, Canada proposed that remote communities, which represent all NWT communities, be exempted from the regulations.

Infrastructure monitored and provided input into the CFR's development in 2021-2022 to ensure the final regulations—to be released and come into force later in 2022—reflect the unique circumstances of the NWT.

2021-2022 ENERGY INITIATIVES

STRATEGIC OBJECTIVES 4 & 5 – HEAT & EFFICIENCY

INCREASE THE SHARE OF RENEWABLE ENERGY USED FOR COMMUNITY HEATING TO 40% AND INCREASE COMMERCIAL, RESIDENTIAL AND INSTITUTIONAL BUILDING ENERGY EFFICIENCY BY 15%

ARCTIC ENERGY ALLIANCE (AEA) PROGRAMS AND SERVICES

The AEA is a non-profit society dedicated to helping reduce the costs and environmental impacts of energy and utility services in the NWT by providing programs and services to residents and communities. Funded by the GNWT, the AEA is one of our most important partners and delivery agents for energy initiatives.

The AEA delivers programs and services directly to all communities through six regional offices—Fort Simpson, Hay River, Inuvik, Norman Wells, Whatì and Yellowknife—and maintains a close connection to communities throughout the territory.

In 2021-2022, the AEA gave out 2,802 incentives through its programs and services, representing \$1.8 million in value in all NWT communities. These translate into 1,800 MWh in energy savings, equivalent to taking three communities the size of Wrigley off the grid, and avoiding the use of 6,800 GJ of fossil fuels. Last fiscal year, programs and services delivered by the AEA reduced territorial GHG emissions by 1.0 kt of CO₂e annually, at an average cost per rebate of \$99 per lifetime tonne avoided.



A project crew removes an old stove from a home as part of the AEA's community wood stove program.

Results from the AEA's 2021-2022 programs are summarized in the following pages. To learn more about individual programs and how to apply, visit aea.nt.ca.

2021-2022 ARCTIC ENERGY ALLIANCE PROGRAM RESULTS

BIOMASS ENERGY PROGRAM

Held Biomass Week educational workshops for homeowners, students, and owners and operators of larger buildings. Launched a project to help building owners install wood pellet boilers.



Completed work on a pre-feasibility analysis for one community on a district heating system and continued working on an analysis for another community.

ENERGY EFFICIENCY INCENTIVE PROGRAM

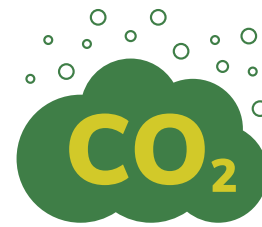


2,528
rebates provided.



LED lighting continues to be the most popular eligible product.

1,436 **478** more
LED Rebates than last year.



Combined, the energy efficient products purchased will save the NWT **550 tonnes** of greenhouse gases annually — more than any other AEA program this year.

DEEP HOME ENERGY RETROFIT PROGRAM



Completed **26** home energy evaluations, and provided **10** final rebates worth **\$91,000**, plus an additional five interim rebates valued at **\$23,000**. Five post-retrofit evaluations were also conducted under the program.

Combined, the **10** clients with completed projects are expected to save **480 GJ** of heating fuel a year — equivalent to the energy contained in 1,000 propane cylinders for home barbecues.



ENERGY RATING SERVICES SUPPORT PROGRAM



home energy evaluations completed.

Performed evaluations on new homes.

53

COMMERCIAL ENERGY CONSERVATION AND EFFICIENCY PROGRAM



Provided **30** rebates

The average client project will pay for itself through energy savings in just over three years.



Combined, annual electricity consumption avoided by all clients' projects is roughly 100,000 kWh more than the amount of annual electricity used in the community of Nahanni Butte.



Combined, all recommended upgrades on existing homes could save homeowners

\$110,000

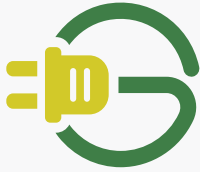
and **180 tonnes** of greenhouse gas emissions a year.

COMMUNITY GOVERNMENT BUILDING ENERGY RETROFIT PROGRAM

\$120,000

Distributed in rebates in two communities.

Completed **1** desktop “yardstick” building energy audit and **1** on-site “targeted” building energy audit in two communities.



Energy audits identified more than

\$24,000

in potential annual savings & 34 tonnes of potential annual GHG reductions

NON-PROFIT ENERGY EFFICIENCY AND CONSERVATION PROGRAM

Distributed **6** rebates valued at approximately

\$72,000

The average client project is expected to pay for itself in approximately five years.



Combined, all client projects will avoid approximately 15 tonnes of greenhouse gases and 230 GJ of fossil fuel use every year — equivalent to 0.4 percent of the natural gas used to produce electricity in Norman Wells annually.

COMMUNITY WOOD STOVE PROGRAM

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



Coordinated the installation of **52** stoves in six partner communities.

Combined, all installed stoves will save **2,800 kg** of particulate emissions (*a 96% decrease*) and **19 tonnes** of greenhouse gas emissions a year.



Savings from the **52** wood stoves installed in 2021-2022 compared to heating with oil alone

Heating oil displaced in litres:

99,000

Annual GHG reductions:

270
Tonnes

Annual savings:

\$140,000

SPECIFIED INCOME HOME WINTERIZATION PROGRAM



Worked with **5** partner communities to hire and train local liaison workers.

Hosted educational workshops for lower-income homeowners in three communities.



Distributed **105** energy efficiency kits to workshop participants. (Up 7% over last year)

ALTERNATIVE ENERGY TECHNOLOGIES PROGRAM

65 Rebates provided

The **65** systems that the AEA's clients installed are expected to save roughly **320** tonnes of greenhouse gases a year.



The average system is expected to pay for itself in less than five years.

25 YEARS OF REDUCING NORTHERNERS'

1997

The GNWT established the AEA to take over Energy Management Programs. In its first year, the AEA travelled to 22 communities across the NWT (which then included what is now Nunavut) to meet with local government representatives and promote energy efficiency.

1999

Began delivering the **Renewable Energy Deployment Initiative program** in the NWT and Nunavut, on behalf of NRCan.

Initiated community energy planning. The Town of Norman Wells is the first community to have an energy plan developed.

2000

Created Canada's first **Climate Change Centre** for public education and outreach, in partnership with the federal government.

Launched **Energy Action Awards** to recognize people and organizations that showed initiative and leadership in energy efficiency and renewable energy.

Since 2007, the AEA has provided over **14,000 rebates** to Northerners.

(not counting rebate programs delivered on behalf of other organizations such as NRCan)

2001

2014

Opened South Slave office (Hay River).

2013

Launched **Biomass Program** to provide technical advice for people and organizations looking to use biomass heating.

2015

Alternative Energy Technologies Program transferred from GNWT to AEA.

The GNWT committed to providing an additional \$1.8 million in funding over two years for the AEA to deliver one-time supplemental projects.

Initiated the **community LED swap-out project**, which provided Northerners with the opportunity to trade their older incandescent bulbs for free LED light bulbs. This project annually saves the NWT \$390,000, 820 MWh of energy, and 550 tonnes of GHG emissions.

2018

Provided the 10,000th rebate under the Energy Efficiency Incentive Program.

ENERGY COSTS AND EMISSIONS

2002

Began conducting **EnerGuide home evaluations** under NRCan.

2007

Launched the **Energy Efficiency Incentive Program** to provide rebates on energy-efficient products. In the first year of the program, gave out \$166,000 in rebates for 547 products.

2008

Began administering the **EcoENERGY Retrofit incentive program** in the NWT on behalf of the federal government.

2009

GNWT provided funding to open **five regional offices**. Beaufort-Delta office (Inuvik) was the first to open.

Started larger community energy planning projects, thanks to funding from the federal government. Plans for three communities were initiated that year.

2004

2010

Opened Sahtú regional office in Norman Wells.

2011

Opened offices in Fort Simpson and Whatì.
Launched the **Commercial Energy Conservation and Efficiency Program**.

2012

Launched **Community Wood Stove Project**. Installed 10 stoves in Fort McPherson during the first year of the project.

2019

GNWT provided funding (through LCELF) for **major AEA program enhancements**:

- Launched new programs such as Deep Home Energy Retrofit Program, Non-Profit Energy Efficiency and Conservation Program, Specified Income Home Winterization Program
- Expanded Community Wood Stove Project into a full-time program
- Increased funding for existing programs

2020

Launched **Pilot Electric Vehicle Rebate Program** to help residents in hydro zones purchase electric vehicles and Level 2 chargers.

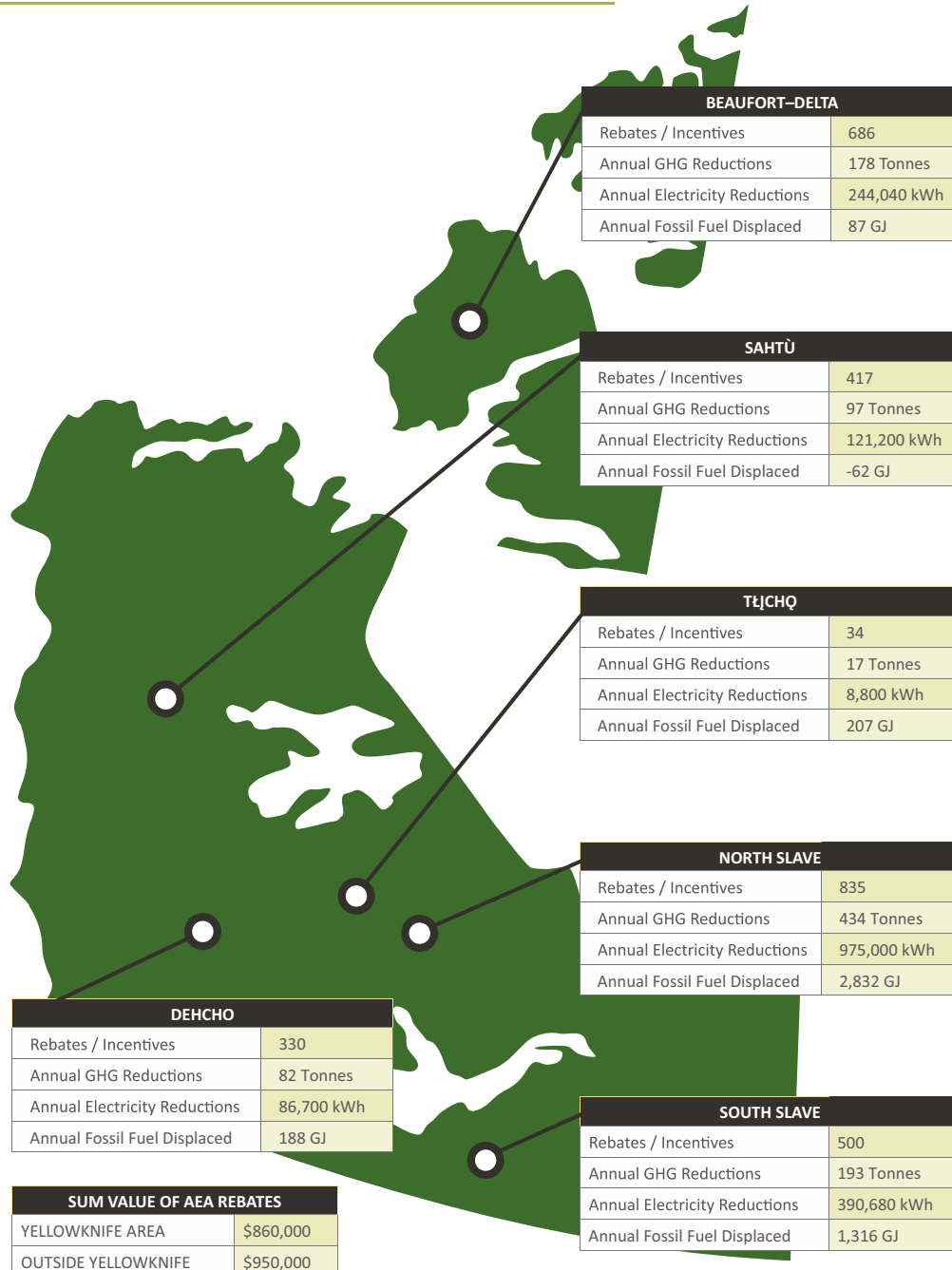
2022

Since 2011, the AEA's building energy retrofit programs for businesses, community governments and non-profits have resulted in a combined annual savings of:

*\$2.4 million in energy costs
6,000 MWh of electricity
1,300 tonnes of GHGs*

AEA PROGRAMS: REGIONAL RESULTS

Figure 7. 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 (often running on fossil fuels) will have to make up for the difference.

CAPITAL ASSET RETROFIT FUND

Initiated in 2007, the Capital Asset Retrofit Fund (CARF) program delivers energy efficiency projects for GNWT facilities to reduce GHG emissions, energy use and operating costs. In 2021-2022, approximately \$3.8 million was assigned to energy retrofit projects, resulting in an estimated \$263,000 of annual savings. Since the inception of the program, CARF projects have now reached an overall cumulative reduction of 16.2 kt CO₂e in GNWT-owned assets.

2021-2022 CARF PROJECT HIGHLIGHTS

Some of the CARF projects commissioned in 2021-2022 are showcased in this report. For a full list of CARF projects funded last fiscal year, see Appendix B. All biomass boiler replacement projects completed under CARF are listed in Appendix C.

LAING BUILDING LED LIGHTING UPGRADE AND VENTILATION UPGRADES

CARF funded this project to complete an energy upgrade at the Laing Building in Yellowknife. This included a full LED upgrade of all lighting in the building and a retrofit of the main air handling unit. An energy-efficient fan wall air handling system and a heat recovery loop were installed. This configuration provides many advantages, including reduced electricity consumption, ease of maintenance, and better control for occupancy comfort. Approximately 1,200 light fixtures in the building were replaced with LED equivalents—which use roughly half the electricity.

The project aims to reduce the overall electricity consumption in the Laing Building by 30%, which corresponds to annual savings of 297,000 kWh—or \$48,000.



This modular fan wall reduces electricity consumption in Yellowknife's Laing Building.

ANNUAL RESULTS

Savings:
\$48,000

Electricity savings:
297,000 kWh



Inuvik's Aurora College campus and student residence has received LED lighting and a Direct Digital Control system through CARF.

INUVIK AURORA COLLEGE LIGHTING UPGRADE AND DIGITAL CONTROLS

The Aurora College campus and student residence underwent an energy upgrade funded by CARF. Both buildings have been retrofitted with LED lights and a Direct Digital Control (DDC) system. With reduced lighting consumption, ECM pumps and reduced ventilation schedules, these upgrades aim to reduce electricity costs by \$93,000 annually, decrease electricity consumption by 122,000 kWh, and reduce GHG emissions by 64 tonnes.

ANNUAL RESULTS

GHG reductions:
64 tonnes

Savings:
\$93,000

Electricity savings:
122,000 kWh



Wood Pellet Boiler Container at Moose Kerr School.

MOOSE KERR SCHOOL BIOMASS INSTALLATION

Work is currently being finalized on a wood pellet boiler installation at the Moose Kerr School in Aklavik. The 300-kW boiler has a large 80-tonne silo to accommodate minimal frequency of resupply (twice per heating season). The boiler is expected to capture 80% of the school's heating load and reduce annual fuel oil use by 100,300 litres, which translates into a net \$73,000 annual savings, and offsets 197 tonnes of GHG each year.

ANNUAL RESULTS

GHG reductions:
197 tonnes

Savings:
\$73,000

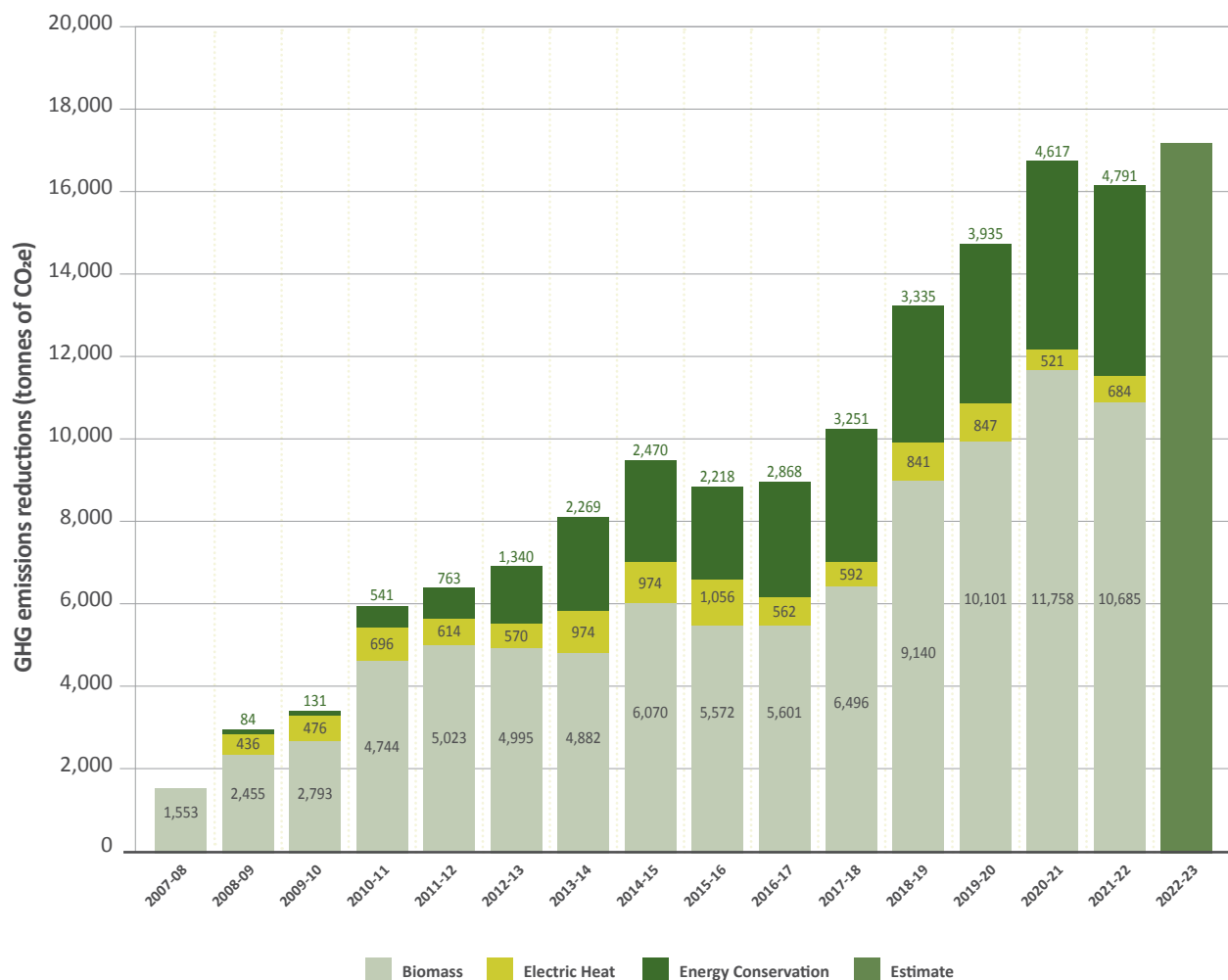
Heating oil displaced:
100,300 litres

CARF CONTRIBUTION TO EMISSIONS REDUCTIONS

Since 2007-2008, the CARF program cumulatively reduced GHG emissions by 16,160 tonnes in 2021-2022, resulting in cost savings of over \$4.1 million for the GNWT. These numbers are slightly lower than in the previous year (respectively 16,896 kt and \$4.2 million in 2020-2021) due to reduced operation of GNWT biomass boilers caused by wood pellets supply chain issues in the South Slave combined with scheduled maintenance at some of GNWT’s larger biomass plants during the last heating season.

Figure 8 shows how most of the GHG emissions reductions and resultant cost savings came from a switch to biomass for space heating. Energy conservation and electric heat projects completed in the last fiscal year decreased GNWT’s GHG emissions by 0.3 kt, while reduced reliance on biomass for space heating in that year increased emissions by 1.1 kt—resulting in a net 0.7 kt increase in emissions since the previous year.

Figure 8. GHG Reductions from Initiatives in GNWT Buildings since 2007-2008



Note: GHG emissions reductions from biomass projects include all biomass projects funded by the GNWT across the NWT, with some of them not funded by CARF.

See Appendix A for an inventory of GNWT buildings’ energy use and GHG emissions.

HOUSING NORTHWEST TERRITORIES

SISSONS COURT PUBLIC HOUSING BIOMASS PROJECT

Using \$3.2 million of funding from the LCELF, Housing NWT completed construction on a district heating system for an eight-building, multi-unit public housing development in Yellowknife. As a result, Housing has transitioned 53 units from oil-fired heating systems to biomass, which is expected to reduce 293 tonnes of CO₂e annually.

OTHER ENERGY UPGRADES

Using \$800,000 of LCELF funding, Housing NWT also transitioned several housing units around the territory to more efficient furnaces and boilers, significantly reducing oil consumption and associated GHG emissions. This funding was also used to retrofit a 19-unit residential building in Yellowknife with over 80 higher R-Value windows

and doors. Housing NWT is expected to spend the remaining portion of LCELF funding in 2022-2023 on energy efficiency initiatives that lower GHG emissions while increasing the comfort of Housing NWT tenants. When complete, these additional projects are expected to reduce Housing NWT's GHG emissions by up to 267 tonnes of CO₂e.



Yellowknife's Sissons Court district heating system project was completed in 2022.

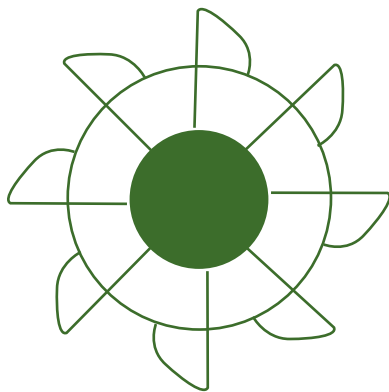
2021-2022 ENERGY INITIATIVES

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

GHG GRANT PROGRAM FOR BUILDINGS & INDUSTRY

The GHG Grant Program administered by the GNWT has a specific stream to help buildings and industry reduce their energy costs and GHG emissions. Projects developed under this stream are presented in the section dedicated to Strategic Objective 1.



HYDRO UPGRADES



New work camp (left) to house workers upgrading the Taltson Hydro facility (right).

HYDROELECTRIC SYSTEMS UPGRADES

TALTSON HYDRO OVERHAUL PROJECT

Components of the existing Taltson hydroelectric generating facility are approaching or have already exceeded their useful life. This project is a multi-year initiative to refurbish the turbine and generator components and extend the facility's operating life. \$23.8 million in funding has been secured—75% from Infrastructure Canada and the remaining 25% from NTPC.

This project is in the construction phase. The turbine and generator have been manufactured and are being stored in Montreal. They will be shipped to the site during the 2022-2023 winter road season. Construction is scheduled to begin in the spring of 2023.

Once completed, this project will ensure 40 to 60 more years of clean hydroelectricity from the Taltson facility. GHG emissions from burning diesel due to any unexpected shutdowns will also be reduced, and opportunities to increase the use of hydroelectricity to meet the NWT's annual electricity requirements for new business ventures and industry will be created.



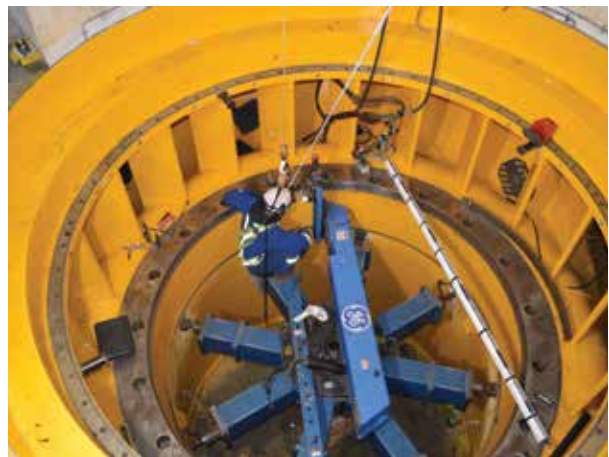
Current generation unit at the Taltson Hydro facility.

SNARE FORKS UNIT 1 & UNIT 2 OVERHAUL PROJECT

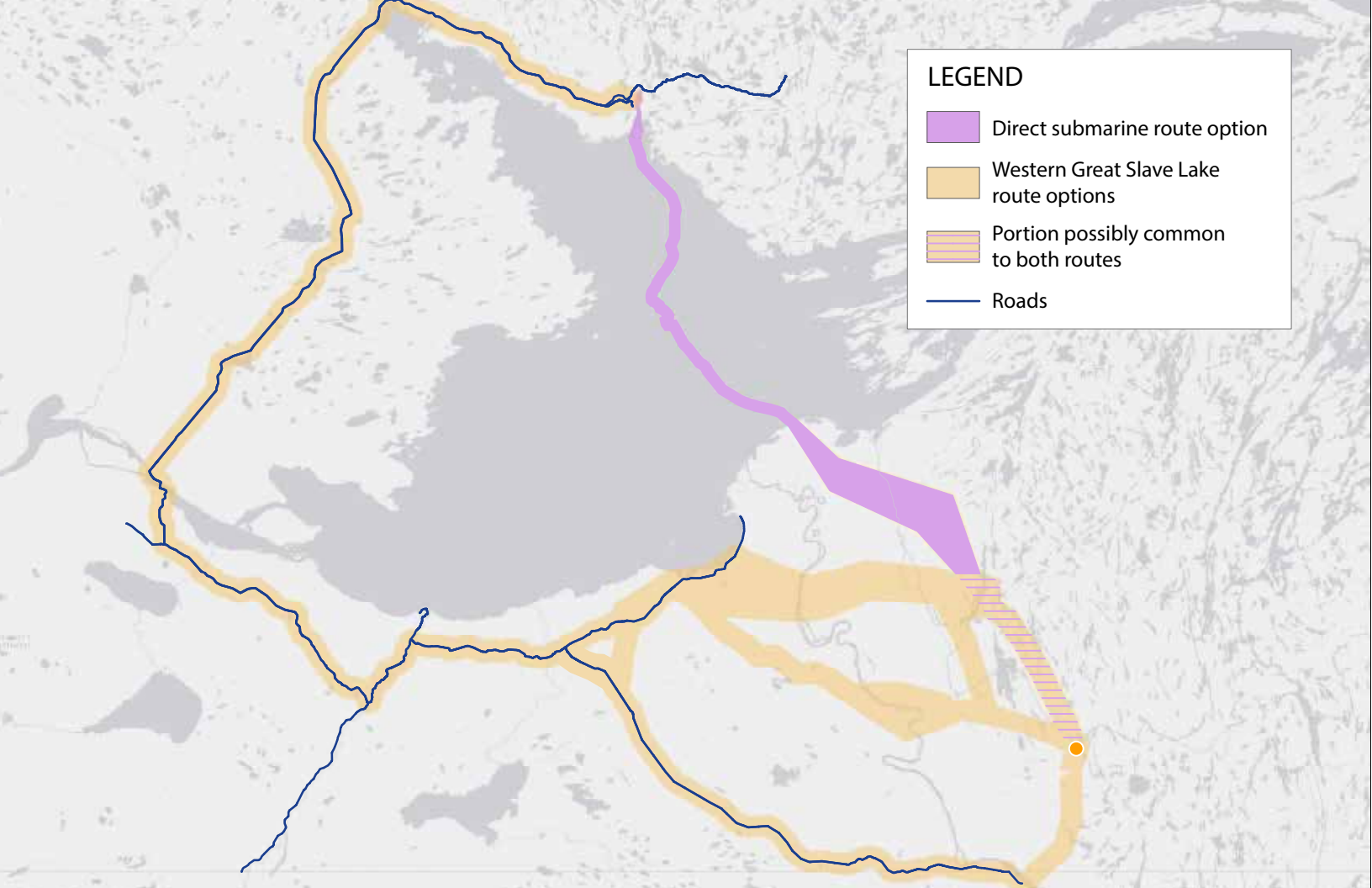
Components of the existing Snare Forks hydroelectric generating facility are also approaching or have exceeded their useful life. This project is a multi-year initiative to upgrade the Unit 1 and Unit 2 generating units and extend the facility's operating life. \$18.9 million in funding has been secured—75% from Infrastructure Canada and the remaining 25% from NTPC.

This project is in the construction phase. Work on Unit 1 is complete. Unit 1 has been operating since November 2020. Prefeasibility work on Unit 2 is complete. Based on newly installed asset monitoring systems and the prefeasibility assessment, NTPC has identified several options and timelines to complete the work while avoiding substantial COVID-19-related costs. A decision on how to proceed with Unit 2 will be determined during 2022-2023.

When finished, this project will ensure the continued reliability of the electricity supply from the 9.2-MW Snare Forks facility. GHG emissions from burning diesel due to any unexpected shutdowns will be reduced, and the percentage of hydroelectricity being supplied to meet the NWT's annual electricity requirements will be increased.



Machining the seal ring on Snare Forks turbine.



The map image above shows two technically viable options to transmit hydro power either across or around Great Slave Lake into the Yellowknife area. The beige area shows possible corridors for the above-ground transmission line portions. A direct route through Wood Buffalo National Park (WBNP) is being studied that would follow existing highways and rights-of-way. A number of potential corridors extending north around WBNP are also being examined. The lilac area is the proposed submarine route from the South Slave up to Yellowknife. The hatched area represents the above ground portion possibly common to the two main route options. There are many variabilities within each route to consider. This work will be further refined following engagement, Indigenous knowledge studies, fieldwork and environmental review.

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*.

Advancing the project remains a priority of the GNWT, and work continues to develop this transformative project with our Indigenous partners. The GNWT is working with the Northwest Territory Métis Nation and the Akaitcho Dene First Nations to plan the project, a partnership formalized through the signing of a Memorandum of Understanding,



The MV Nahidik (top right) and accompanying rigid-hulled inflatable boat map the bottom of Great Slave Lake for a potential submarine transmission route for the Taltson Hydroelectricity Expansion Project.

Fort Resolution

and an agreed to Statement of Principles in Spring 2021. Work is ongoing with the project's partners to finalize the project's business case, develop routing options, and create meaningful engagement opportunities.

Four potentially feasible transmission line routes have been examined for the project, including the Western Great Slave Lake Route (WGSL), two submarine routes, and the Simpson Islands route across Great Slave Lake. Bathymetry work undertaken over the past few years with the Arctic Research Foundation helped provide detailed mapping information about the potential submarine alignments. Technical reviews of

the transmission line options in 2021-2022 allowed the GNWT and its Indigenous partners to reduce the options to two technically viable routes. The technical studies identified specific challenges, including high costs, limited market interests in supplying the required infrastructure, and high risk in construction. This research determined that two of the four transmission line route options were not technically viable.

The two technically viable routes are the WGSL, which goes around the Great Slave Lake following the highway, and the direct to Yellowknife submarine route. These two routes will be the focus of engagement, fieldwork and further

environmental review, as there is a lot of potential variation within the options. As this work continues, the project will become better defined, which will form the basis for a regulatory application.

Work is ongoing with the project's partners to develop participation and engagement plans. The GNWT is committed to undertaking consultation with all potentially impacted Indigenous governments and organizations with established or asserted Aboriginal and Treaty rights. This process has not started yet as the project is still being defined.

South Valley

Thin Georges

Fort Smith

HYDROGEN WORKSHOP

As part of the *2030 Energy Strategy*, the GNWT is committed to exploring new and emerging energy technologies. Hydrogen is increasingly identified as a key energy carrier in a future net-zero economy. That is why it's important for the GNWT to investigate the potential for hydrogen to contribute to the NWT energy system.

As part of that investigation, the GNWT convened a workshop in January 2022 with stakeholders from across our territory, including economic development organizations from Indigenous governments, communities, utilities, industry, non-governmental organizations, and the GNWT.

The objectives of the workshop were to share what we know about hydrogen-based technologies, start a conversation with stakeholders about the

potential role of hydrogen in the NWT's energy system and economy, and seek input from stakeholders to inform GNWT work on making the energy system in the NWT more secure, affordable, and sustainable.

As part of the workshop, Dr. David Layzell, Energy Systems Architect with the Transition Accelerator, shared his expertise and provided context on the current state of hydrogen technologies and the NWT energy system. Participants were then organized into groups to discuss potential end-uses for hydrogen (e.g., transportation, buildings, power systems, industry), as well as possible sources of supply (e.g., local production or imports). There was also a discussion to identify common themes, challenges and possible solutions.

The main points of discussion included:

1. The need for more information about the technical and economic feasibility of hydrogen in the NWT.
2. The need to consider both supply and end-use.
3. The need to make hydrogen using low-carbon technology.
4. Potential end-uses, such as transportation, heat, energy storage, or electricity generation.
5. The suitability of a regional or local approach in the NWT.
6. The need for a demonstration or pilot project.

The GNWT will release a report outlining what was heard during the workshop by the end of 2022.

EXAMINING LOW-CARBON PATHWAYS FOR THE NWT

In 2021, Canada committed to reaching a net-zero emissions target by 2050. Preliminary analysis conducted by the GNWT indicates such a target will be challenging to reach for the NWT, given the limited availability of zero-carbon technologies in the North. The challenge is particularly prominent for remote communities, where electrification of end-uses

is not currently an option. It is understood that any deep decarbonization effort in the North will be tied to the availability of zero-carbon technologies and the cost of the technologies.

In 2021-2022, the GNWT initiated work with a well-respected firm that conducts economic, energy and climate modelling to

better understand what low-carbon pathways could look like in the North. In the first phase of this work, the GNWT will assess how the carbon tax, territorial actions and policy, as well as federal programs and policy, have impacted the NWT energy mix, emissions trajectory, and economy through to 2030. Scenarios will assess the potential for existing technologies

to further reduce emissions in the buildings, transportation, and industrial sectors. This step will help to evaluate and manage our progress towards the 2030 target as well as contribute to support initiatives under the new Action Plan being developed for the 2022-2025 period.

In the next phase, Infrastructure will work with other departments and partners to estimate the technical feasibility and cost of achieving higher emissions-reduction targets in the NWT, including a net-zero target by 2050. In this phase, some of the scenarios being developed will include emerging technologies and energy sources that are

not currently or commercially available at the scale we need, such as hydrogen, advanced biofuels, and small modular nuclear reactors.

Findings from the modelling work will be publicly released and will be key to informing the five-year review of the *Strategy* scheduled for 2023-2024.

HEADING TO THE FIVE-YEAR REVIEW OF THE 2030 ENERGY STRATEGY

The 2021-22 fiscal year was the last year under the *2019-2022 Energy Action Plan*, which contained 44 initiatives focused on implementing new energy efficiency and GHG emissions reduction incentive programs, and taking steps to position the territory to complete larger infrastructure projects by 2030 (see Appendix E for detailed results). In 2021-2022, the GNWT began the development of the *2022-2025 Energy Action Plan*—to be released in 2022-2023—which will build on the actions undertaken in the last four years by continuing successful initiatives and starting new ones.

One key activity included in the new *Action Plan* is the five-year review of the *2030 Energy Strategy*, scheduled for 2023-2024. The GNWT will start planning for this review in 2022-2023 by conducting additional analysis as well as crafting a plan to engage with partners,

stakeholders, Indigenous governments and organizations, industry, NGOs, and the public. Some initiatives conducted in 2021-2022 and 2022-2023—such as the low-carbon pathway work and the hydrogen workshop—will be instrumental to inform the five-year review of the *Strategy*. We also anticipate the review to dovetail with the review of the GNWT's *Climate Change Strategic Framework (CCSF)*.

In 2022-2023, we'll keep monitoring emerging emissions-reducing technologies for potential application in northern settings. We will continue to advance existing transformational infrastructure projects, such as the Inuvik Wind Project. We will equally continue to invest in initiatives that have proven to be effective, such as energy efficiency programs, biomass heating, and charging infrastructure for electric

vehicles. We will also 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.

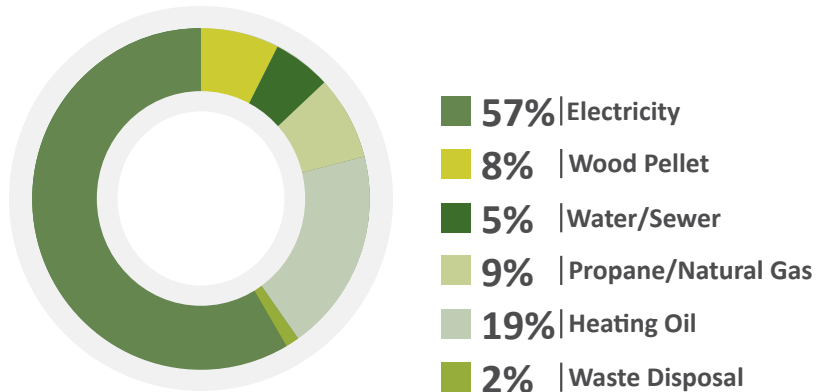
Though it will take thoughtful planning and hard work, the good news is that there are opportunities to reduce GHG emissions without sacrificing energy affordability or reliability. Efficient access to local energy sources (e.g., hydro, wind, solar, natural gas) combined with the adoption of electrified transportation, can help us make bigger gains toward achieving one of the main 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 2021-2022, the cost of heat and power for GNWT facilities totalled \$36 million. Figure 9 shows that electricity is the largest energy cost for the GNWT, followed by heating. Wood pellet expenditures slightly decreased in 2021-2022 when compared to 2020-2021, while the share of heating oil and propane slightly increased.

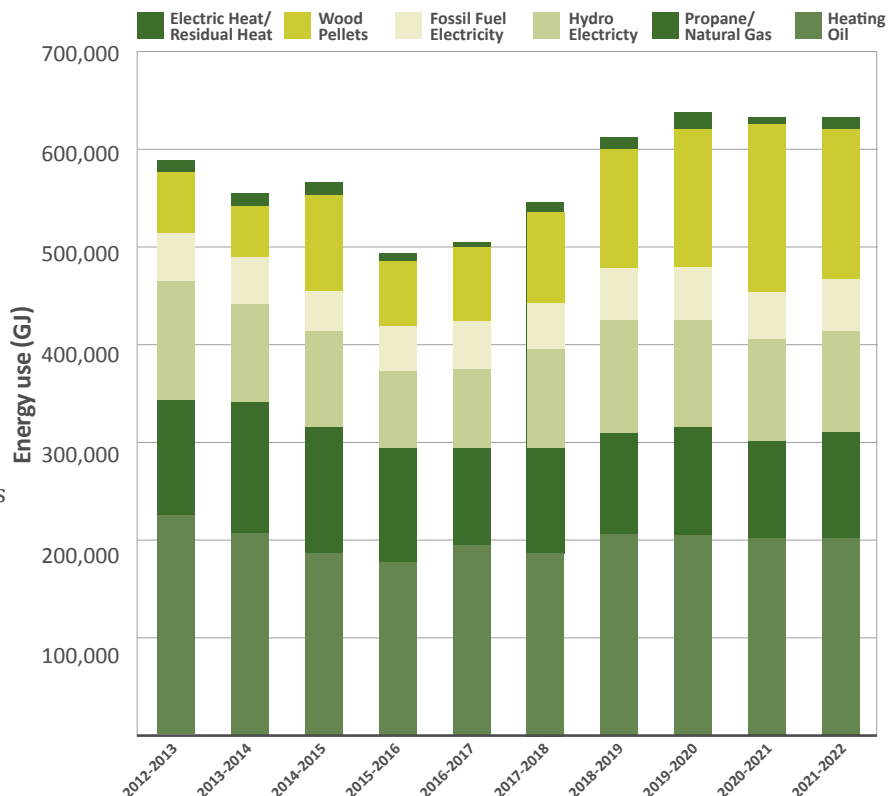
Figure 9. GNWT Utility Expenditures in 2021-2022



GNWT BUILDINGS ENERGY USE

Figure 10 outlines the breakdown of the GNWT's total annual energy use by fuel type. Compared to the previous year, the GNWT slightly decreased its overall energy consumption in 2021-2022. There was some change in the share of various energy sources last year, with wood pellets consumption decreasing by 9% and that of fossil fuels (heating oil, propane, and natural gas) increasing by 8%. This is due to the reduced operation of GNWT biomass boilers caused by wood pellets supply chain issues in the South Slave, combined with scheduled maintenance at some of the GNWT's larger biomass plants during the last heating season.

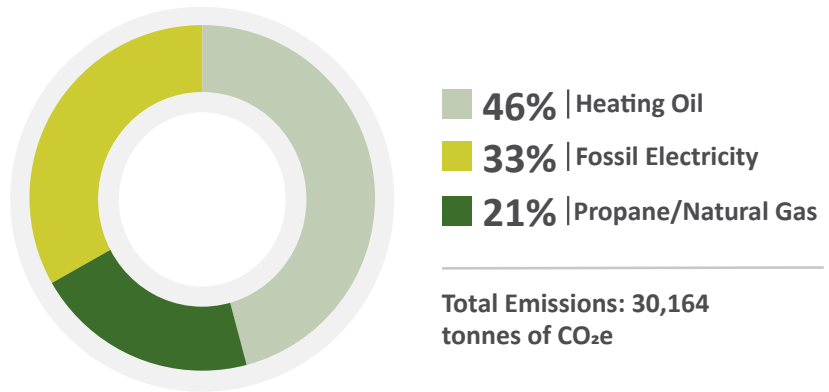
Figure 10. GNWT Energy Use by Fuel Type in 2021-2022



GNWT BUILDINGS GHG EMISSIONS

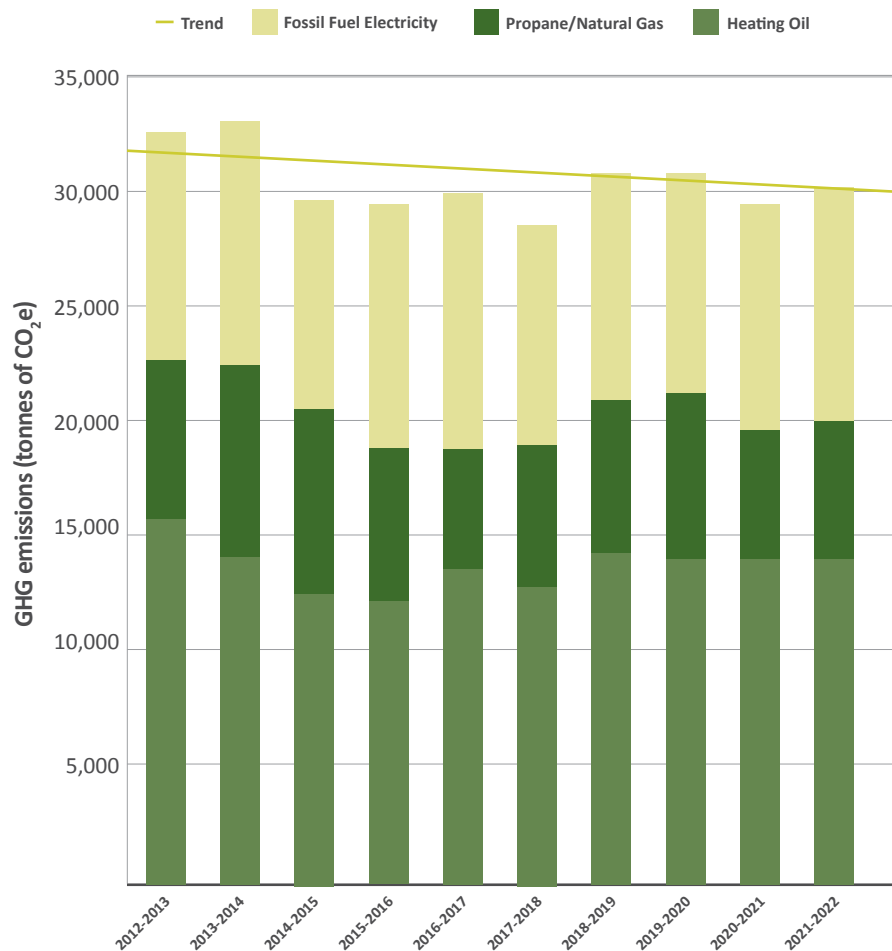
In 2021-2022, GNWT buildings were responsible for about 30,164 tonnes of GHG emissions due to fossil fuels used for heating and by using electricity generated from fossil fuels (see Figure 11). This corresponds to a 2% increase in emissions compared to the previous year. This increase was caused by a decrease in wood pellet supply, which was made up for by a higher use of fossil fuels in GNWT buildings during the last heating season.

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.

Figure 12. GNWT Buildings GHG Emissions Trend



GHG EMISSIONS REDUCTIONS

Despite an increase in overall energy consumption in recent years (Figure 10), efforts to improve energy efficiency and increase the use of biomass heating have resulted in the GNWT continuously reducing GHG emissions from its buildings between 2012-2013 and 2021-2022 (Figure 12).

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

SPACE HEATING BY FUEL TYPE

In 2021-2022, space heating for GNWT facilities totalled 469,561 GJ. As shown in Figure 13, 35% of this total was provided by renewable electric heat and biomass energy, with the remainder provided by fossil fuels such as heating oil (42%) and propane and natural gas (23%). In 2021-2022, GHG emissions associated with space heating accounted for 20,123 tonnes CO₂e, a 3% increase from the previous year.

Figure 13. GNWT Space Heating Energy Sources in 2021-2022

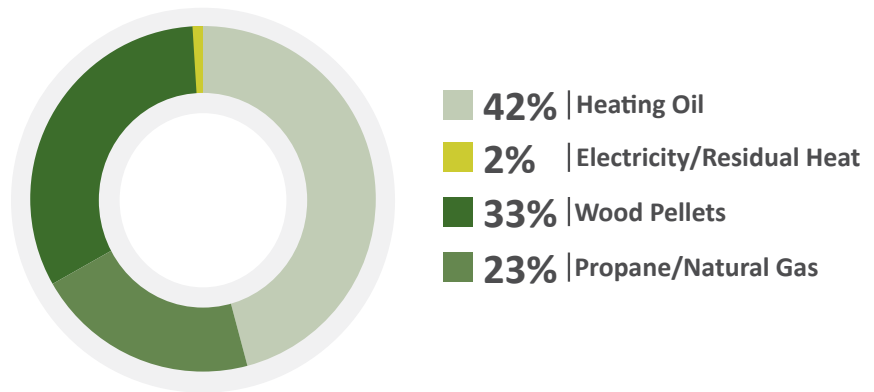
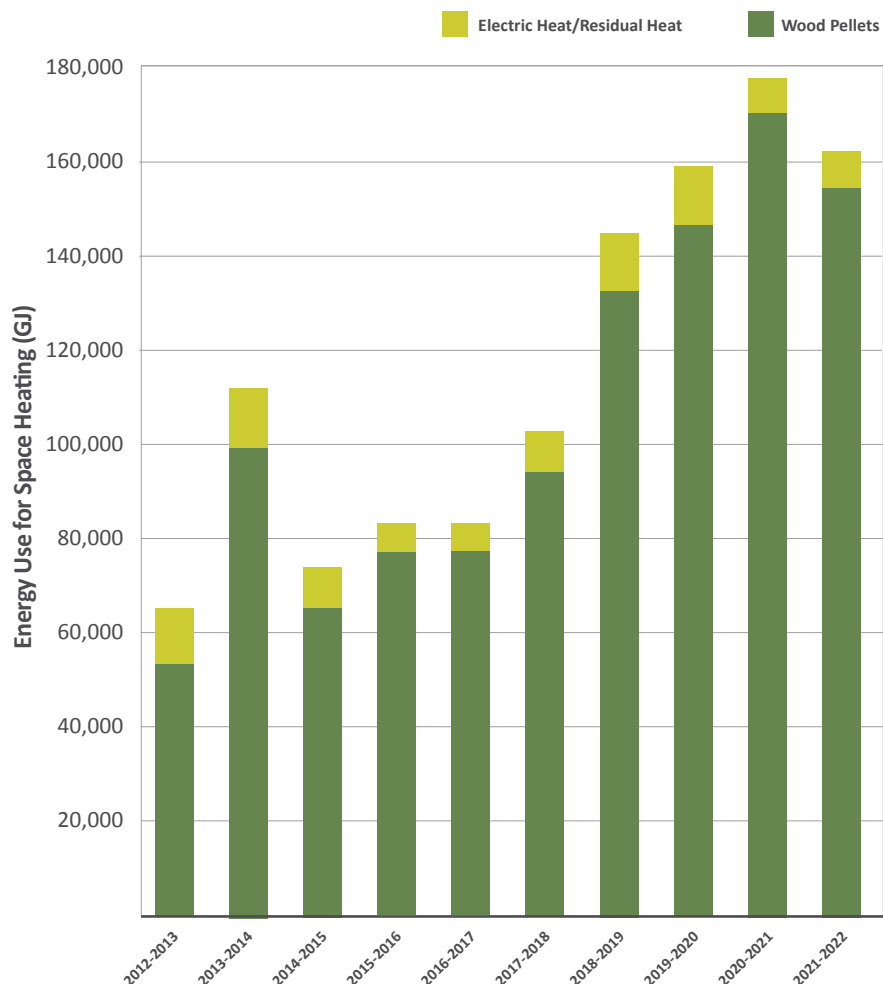


Figure 14. GNWT Space Heating Provided by Renewable Energy



RENEWABLE HEATING

Figure 14 shows the trend in heating supplied by renewable energy for GNWT buildings. Reduced operation of GNWT biomass boilers caused by wood pellet supply chain issues in the South Slave, combined with scheduled maintenance at some of the GNWT's larger biomass plants, explain the 7% decrease in renewable energy use in 2021-2022 compared to 2019-2020.

APPENDIX B: 2021-2022 CAPITAL ASSET RETROFIT FUND PROJECTS

FACILITY	LOCATION	DETAILS
North Slave Region		
Tatsaoṭṅne Building	Yellowknife	Wood Pellet Boiler silo relocation and upgrade.
Fuel Dispenser Cabinets	Wekweèṭì	LED Lighting upgrade for the Fuel Dispenser and Fuel Services Tank Farm Yard.
South Slave Region		
4-Bay Maintenance Garage	Fort Smith	LED Upgrade of High Bay Garage fixtures.
Trail-Cross Correction Centre	Fort Smith	Full LED lighting retrofit of the facility.
Grand Detour Apartments	Fort Smith	Installation of Electric Boiler.
Beaufort Delta Region		
Chief Paul Niditchie School and Community Gym	Tsiigehtchic	Full LED lighting retrofit of the facility.
Deh Cho Region		
Aurora College - Education Complex	Fort Simpson	Full LED lighting retrofit of the facility.
Fuel Dispenser	Sambaa K'e and Nahanni Butte	LED Lighting upgrade for the Fuel Dispenser and Fuel Services Tank Farm Yard.

APPENDIX C: BIOMASS PROJECTS COMPLETED BY GNWT SINCE 2007-2008

FACILITY	LOCATION	COMPLETION YEAR	SIZE (kW)
Range Lake North School	Yellowknife	2022	300
Mildred Hall School	Yellowknife	2022	300
Stanton Legacy	Yellowknife	2021	2500
Chief Sunrise School	Kát'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
Behchokò Long Term Care Facility*	Behchokò	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 Ts'elehye 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

(*) These facilities purchase heat from a third-party biomass boiler.

FACILITY	LOCATION	COMPLETION YEAR	SIZE (kW)
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	Behchokò (Rae)	2012	540
Central Heating Plant	Fort Simpson	2012	980
Fort Smith Health Centre	Fort Smith	2012	750
Combined Service Building (Department of Infrastructure)	Yellowknife	2012	540
P.W. Kaeser High School & Recreation Centre	Fort Smith	2010	750
Thebacha College (GNWT)	Fort Smith	2010	720
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	Behchokò (Edzo)	2009	720
K'alemi Dene School	Ndilò	2009	60
École St. Joseph School	Yellowknife	2009	540
Sir John Franklin High School*	Yellowknife	2008	750
North Slave Correctional Facility*	Yellowknife	2006	1500

(*) These facilities purchase heat from a third-party biomass boiler.

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. Table 5 forecasts the GHG emissions reductions expected to occur from various energy initiatives and projects conducted by the GNWT and its partners throughout 2025. This table does not include an estimate of the emission reductions resulting from the NWT carbon tax and from individual action.

Activities planned and funded under the *2019-2022 Energy Action Plan* are anticipated to result in 47.3 kilotonnes of emissions reduction in 2025. Annual GHG emissions reductions estimates are expected to continually improve throughout 2030 as new initiatives are launched and new technologies arise.

Table 5. Emissions reductions from projects and initiatives under the 2030 Energy Strategy (in kt CO₂e)

STRATEGIC OBJECTIVE	PROJECT AND INITIATIVE	2018 (Actual)	2019 (Actual)	2020 (Actual)	2021 (Actual)	2022 (Forecast)	2023 (Forecast)	2024 (Forecast)	2025 (Forecast)
1	Community projects: Heating	-	-	-	-	-	TBD	TBD	TBD
	Community projects: Renewables	0.1	0.1	0.3	0.3	0.4	1.3	1.3	1.3
	GHG Grant Program: Governments	-	0.1	0.1	0.8	4.0	4.1	4.1	4.1
2	Diesel plant replacement	-	-	-	-	0.1	0.2	0.2	0.2
	Inuvik wind	-	-	-	-	-	6.0	6.0	6.0
	Transmission lines	-	-	-	-	-	-	4.1	4.1
	Liquefied natural gas	-	-	-	-	-	-	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

STRATEGIC OBJECTIVE	PROJECT AND INITIATIVE	2018 (Actual)	2019 (Actual)	2020 (Actual)	2021 (Actual)	2022 (Forecast)	2023 (Forecast)	2024 (Forecast)	2025 (Forecast)
3	Electric vehicles incentive program	-	-	0.0	0.0	0.1	0.1	0.2	0.3
	Marine vessels upgrade	-	0.4	0.4	0.4	1.2	1.2	1.2	1.2
4&5	GHG Grant Program: Buildings and Industry	-	-	0.1	0.5	1.8	2.6	2.6	2.6
	AEA programs (excludes EV rebates)	0.6	2.0	3.3	4.3	5.5	6.7	7.9	9.1
	Capital Asset Retrofit Fund	3.0	4.6	6.6	5.9	8.1	10.3	12.5	14.7
	NWT Housing Corp	-	-	-	0.3	0.6	0.6	0.6	0.6
6	Hydro upgrades	-	-	-	-	-	-	-	-
	Biofuels	-	-	-	-	-	TBD	TBD	TBD
	Taltson Hydro Expansion	-	-	-	-	-	-	-	-
TOTAL	3.8	7.4	11.1	12.8	22.2	33.6	43.1	47.3	

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.

APPENDIX E: STATUS OF ACTIONS AND INITIATIVES FROM THE 2019-2022 ENERGY ACTION PLAN

The 2019-2022 Energy Action Plan contained 44 initiatives focused on implementing new energy efficiency and greenhouse gas emissions reduction incentive programs and taking steps to position the territory to complete larger infrastructure projects by 2030.

Table 6 provides a summary of accomplishments per strategic objective. As of March 31, 2022, 95% of projects initiated under the 2019-2022 Energy Action Plan were complete or ongoing, and 5% have not started, or have been discontinued due to being unfeasible.

Table 6. Status update for projects and initiatives initiated under the 2019-2022 Energy Action Plan

STRATEGIC OBJECTIVE	COMPLETE/ ONGOING	NOT COMPLETE	TOTAL
Working together	8	0	8
Reduce diesel use in power generation by 25%	8	0	8
Reduce emissions by 10% in transportation	8	2	10
Increase renewable energy use for heating from 20% to 40% and increase energy efficiency in buildings, per capita, by 15%	12	0	12
Long-term vision	6	0	6
Total	42 (95%)	2 (5%)	44 (100%)

The rest of the appendix provides a status update as of March 31, 2022 for the actions and initiatives included in the 2019-2022 Energy Action Plan by Strategic Objective.

WORKING TOGETHER

ACTIONS	LEAD	STATUS
Continue to involve and engage communities on energy projects	GNWT/NTPC	Complete/Ongoing
Energy mentorship for community representatives	GNWT/AEA	Complete/Ongoing
Provide community participation framework	GNWT	Complete/Ongoing
Undertake education, energy literacy and outreach initiatives	GNWT/AEA	Complete/Ongoing
Support community-based energy projects by providing technical support to help communities advance renewable energy and energy saving projects	GNWT/NTPC	Complete/Ongoing
Create partnership opportunities in local renewable energy projects for community and Aboriginal governments that support local capacity development	GNWT/NTPC	Complete/Ongoing
Support the development and implementation of community energy plans	GNWT/AEA	Complete/Ongoing
Implement a new application-based GHG Grant Program for Government* to support government energy efficiency, renewable and alternative energy projects	GNWT	Complete/Ongoing

REDUCE DIESEL USE IN POWER GENERATION BY 25%

ACTIONS	LEAD	STATUS
Inuvik Wind Project	NTPC/GNWT	Complete/Ongoing
Community wind/diesel hybrid (2 communities)	NTPC/GNWT	Complete/Ongoing
Community LNG projects (2 communities)	NTPC/GNWT	Complete/Ongoing
Transmission (2 communities)	NTPC/GNWT	Complete/Ongoing
Various community solar (7 communities)	NTPC/GNWT	Complete/Ongoing
Community-scale hydroelectricity	NTPC/GNWT	Complete/Ongoing
Diesel efficiency upgrades	NTPC/GNWT	Complete/Ongoing
Continue to undertake research and feasibility work on alternative and renewable energy	GNWT	Complete/Ongoing

REDUCE EMISSIONS BY 10% IN TRANSPORTATION

ACTIONS	LEAD	STATUS
Implementing GNWT fleet management and efficiency improvements for vehicles, heavy equipment and marine fleet through the GHG Grant Program	GNWT	Complete/Ongoing
Initiate a rebate program for low- or zero- emissions vehicles and charging stations in hydro communities	GNWT/AEA	Complete/Ongoing
Create program to support efficiency in long-haul trucks and the installation of in-line auxiliary heaters for fleet vehicles and heavy duty vehicles to reduce idling	GNWT/AEA	Not complete
Support community-based transportation initiatives through the GHG Grant Program* that reduce emissions, such as active transport, public transportation, community fleet efficiency, and car sharing programs	GNWT	Complete/Ongoing
Undertake an education and awareness campaign to encourage efficient vehicle choice, “Smart Idling”, efficient driving practices, and alternative transportation choices	GNWT	Not complete
Assess the feasibility and complete Zero-Emission Vehicle Transport Corridor NWT/Alberta Border to Yellowknife	GNWT	Complete/Ongoing
Assess the status of LNG and biofuels for transportation in the NWT context, including availability, price, long-term storage and cold weather stability	GNWT	Complete/Ongoing
Work at the national level to ensure that renewable fuel standards are applicable to the North	GNWT	Complete/Ongoing
Work at the national level to improve vehicle efficiency standards	GNWT	Complete/Ongoing
Support industrial vehicle efficiency and retrofits through the GHG Grant Program for Buildings and Industry	GNWT	Complete/Ongoing

INCREASE RENEWABLE ENERGY USE FOR HEATING FROM 20% TO 40% AND INCREASE ENERGY EFFICIENCY IN BUILDINGS, PER CAPITA, BY 15%

ACTIONS	LEAD	STATUS
Enhancements to Energy Efficiency Rebate/Incentive Program	AEA	Complete/Ongoing
Enhancement to the Alternative Energy Efficiency Technologies Program	AEA	Complete/Ongoing
Enhancement to the Commercial Energy Conservation and Efficiency Program	AEA	Complete/Ongoing
Deep Home Energy Retrofit Program (ERS Follow-up and Implementation Support)	AEA	Complete/Ongoing
Low-Income Home Energy Assistance	AEA	Complete/Ongoing
Energy Efficiency and Conservation Retrofits for Non-Government Organization (NGOs)	AEA	Complete/Ongoing
Electric Heat Incentive South Slave (to Take Advantage of Reduced Electric Heat Rate)	AEA	Complete/Ongoing
Continue Community Wood Stove Program	AEA	Complete/Ongoing
Enhancements to Community Government Program	AEA	Complete/Ongoing
Ongoing AEA Programs and Services	AEA	Complete/Ongoing
Continue the GNWT Capital Asset Retrofit Program	GNWT	Complete/Ongoing
NWT Housing Corporation Energy Efficiency and Heating Improvements	GNWT	Complete/Ongoing

LONGER-TERM VISION

ACTIONS	LEAD	STATUS
Implement the GHG Grant Program* for Buildings and Industry	GNWT	Complete/Ongoing
Exploring Partnerships and Emerging Technologies	GNWT	Complete/Ongoing
Taltson Expansion Project	GNWT/NTPC	Complete/Ongoing
NTPC Hydro Asset Overhauls	NTPC	Complete/Ongoing
Hydro and Transmission Development	GNWT/NTPC	Complete/Ongoing
Seek opportunities to replace diesel with liquefied natural gas for heating and electricity	GNWT/NTPC	Complete/Ongoing

