

A Greenhouse Gas Strategy

for the Northwest Territories

2011-2015



Northwest Territories Environment and Natural Resources

Message from the Minister



Global climate change continues to be one of the most serious environmental, economic and political challenges of our time. The debate about the existence and cause of climate change is effectively over. The debate about what can be done to mitigate and adapt to climate change and who should do it remains to be resolved.

In 1998, the Government of the Northwest Territories (GNWT) recognized that the NWT needed to make an appropriate contribution to reducing greenhouse gas emissions and committed to working with federal and provincial governments to reduce Canada's emissions. The first step towards this commitment was the release of the first NWT Greenhouse Gas Strategy in 2001. The focus of this Strategy was to identify and coordinate northern actions to begin to control greenhouse gas emissions and assist in developing and contributing a northern perspective as part of Canada's national climate change implementation strategy.

A revised Strategy, released in 2007, built on the knowledge and experience gained since 2001. It committed the GNWT to lead through example by adopting a target to reduce greenhouse gas emissions from its own operations to 10 percent below 2001 levels by the year 2011. It also included actions to encourage and assist other sectors to develop their own emission management plans and targets.

This latest Strategy identifies actions that the GNWT, industry and communities can take over the next five years to stabilize territorial greenhouse gas emissions at or below 2005 levels. It also looks further into the future, to 2020 and 2030, and identifies measures that will need to be taken to limit emissions increases during anticipated increases in non-renewable resource development activities and to then reduce emissions from these and future developments.

The GNWT has chosen to establish NWT greenhouse gas emissions targets based on optimistic assumptions regarding economic growth in the territory. This approach highlights the importance of taking action now and planning for renewable energy supplies needed to control and reduce greenhouse gas emissions. As the extent of future development becomes clearer the GNWT will review and revise these targets to ensure that the NWT continues to make an appropriate contribution to reducing its contribution to global greenhouse gas emissions.

A handwritten signature in black ink, reading "J. Michael Miltenberger". The signature is written in a cursive, flowing style.

J. Michael Miltenberger

Minister of Environment and Natural Resources

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Introduction



Photo Credit: CNWT/D. Brosha

Increasing emissions of human-caused greenhouse gases released into the atmosphere are affecting the Earth's climate. Impacts from climate change across the Northwest Territories (NWT) are consistent with those described in reports prepared by the Intergovernmental Panel on Climate Change and the Arctic Council. Both groups concluded warming trends already evident in the North will accelerate unless global emissions of greenhouse gases are reduced.

A Greenhouse Gas Strategy for the NWT 2011-2015 lays out actions the Government of the Northwest Territories (GNWT) will take to reduce greenhouse gas emissions in the NWT and identifies actions industry and communities can take to allow the NWT to make an appropriate contribution to global reductions of greenhouse gas emissions during the coming decades.

The first Greenhouse Gas Strategy was released in 2001. It was prepared by a broad range of stakeholders to identify a northern approach to mitigate or control greenhouse gas emissions in the NWT. At the time, it was recognized the Strategy would need to be revised in future years. Following a review in 2005, a new version was released in 2007. It reflected experience gained since the Strategy was first released. Some key changes were the introduction of short-term targets and better measures to track and report progress. The 2007-2011 Strategy described 39 initiatives covering all sectors in the NWT. Achievements since 2001 to improve energy efficiency and foster the growth of renewable energy were founded on a commitment to support local initiatives and new partnerships. The 2011-2015 Strategy builds on our past challenges and successes.

Consultations with Aboriginal and community governments, residents, industry representatives and researchers were involved with development of this Strategy. In addition to a multi-stakeholder meeting held in Yellowknife on January 31, 2011, public consultations in April and May of 2011 were held in 12 small communities and regional centres.

Introduction

Since 2001, residents in the NWT have become increasingly vocal about their concern regarding global and local climate changes. Many people are taking their own action and strongly believe more needs to be done at all levels. The 2011-2015 Strategy is the product of the views and values voiced by many individuals and organizations, including those who learned from delivering on actions during the last 10 years.

Be bold. Assemble a smart plan and act quickly, with meaningful next steps forward. Take good ideas and transform them into actions. Be creative and capitalize on our own unique opportunities by working together with our communities. Be determined to show leadership on behalf of all current and future northerners.

– Consultation Participant

The Strategy acknowledges the NWT's responsibility for reducing greenhouse gas emissions as well as its unique opportunities and challenges. It recognizes, as a jurisdiction, which is and will continue to be impacted by climate change, the NWT needs to demonstrate appropriate local action to be able to promote global action.

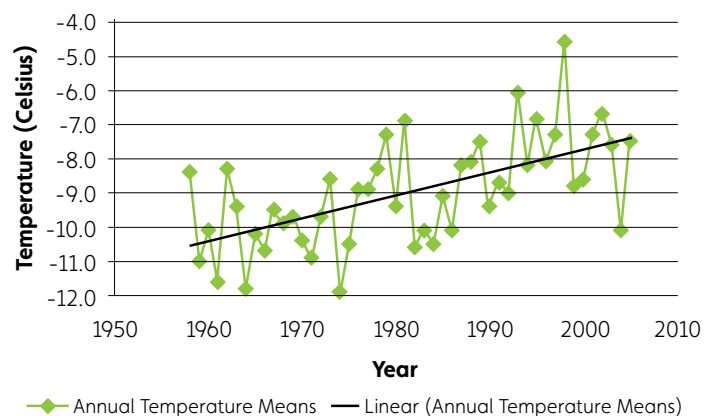
Climate Change Impacts in the NWT

During the past 50 years, climate in the NWT has warmed at a rate four to five times faster than the global average. While annual average air temperatures in the NWT have increased by 2 to 2.7° C (Celsius), global temperatures have increased by 0.5° C.

The average annual temperature measured at the Inuvik airport by Environment Canada has increased 3° C since 1960 (Figure 1). While Inuvik has warmed the fastest, all other NWT communities are experiencing similar warming trends. Scientists have projected that without global action to reduce greenhouse gas emissions, average annual air temperatures in Inuvik could increase by 4° C during the 2046-2065 period and by 8° C during the 2081-2100 period. In 60 years, Inuvik might have a climate similar to one Peace River, Alberta, has today.



Figure 1: Inuvik – Annual Temperature Means, 1958-2005



Another strong indication of climate change is the decline in Arctic sea ice coverage. Since 1979 when satellite records first began tracking sea ice, Arctic ice coverage in July has been decreasing by 6.8 percent per decade (Figure 2). Under water measurements show average Arctic sea ice thickness has decreased from 3.6 metres in 1980 to 1.9 metres in 2008.

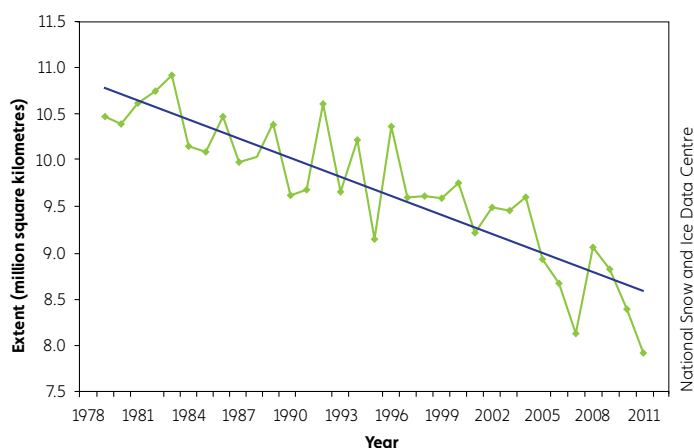


Risks to economic, social and cultural values in our communities will intensify if climate change continues to limit traditional pursuits and lifestyle, including the ability to harvest local animals and plants.

In 2007, Natural Resources Canada assessed the potential impacts of melting permafrost on building foundations in five NWT communities. They found, even under moderate warming scenarios, 40 to 75 percent of buildings in Inuvik are likely to incur foundation damage during the buildings' lifetime resulting in a cost ranging between \$50-60 million if no action is taken.

“Actions to reduce emissions and increase energy efficiency, no matter how small, will cumulatively affect the rate of change while we learn to adapt to the new reality of climate change and what this means in our daily lives.”
– Consultation Participant

Figure 2: Average Monthly Arctic Sea Ice Extent, July 1979 to 2011



The signs of a changing climate are familiar to NWT residents. According to the Northwest Territories Climate Change and Adaptation Report (2008), residents and businesses are already facing winter road problems, melting permafrost and shoreline erosion. A common observation is weather patterns are different today. Forest fire regimes are changing and there are shifts in plant and animal habits and distribution.



Introduction

The Opportunity

Like other jurisdictions around the globe, the NWT is faced with a long-term necessity of transforming our economy so it will no longer be dependent on fossil fuels. The scale of this undertaking is immense and the potential is enormous. We need to begin guiding capital investment decisions during the next two decades towards energy efficiency and renewable energy to strengthen a growing economy.

The NWT is well prepared to seize this potential. We have a robust economy, a rich history of innovation and adaptation and an abundance of available renewable energy sources. We are experienced in designing and constructing efficient homes and buildings, generating clean hydro power and finding new ways to use our forests for clean energy. Given our continued reliance on expensive and imported fossil fuels in our remote communities, shifting away from our current energy structure by developing local energy sources will yield benefits to NWT residents and businesses.

Action now will allow us to diversify our economy by maximizing the value of our natural resources and stimulating green investment, green innovation and green jobs. Failure to act could mean we will miss these opportunities and remain dependent on fossil fuels. Reliance on these fuels means the NWT economy will continue to be impacted by global fossil fuel markets, our cost of living will increase with fuel prices and greenhouse gas emissions will continue to soar. The 2011-2015 Strategy outlines a path for a prosperous and sustainable future where the NWT can achieve success in the new low-carbon economy.

“There is no avoiding a transformation of the economy. It won't be done overnight, of course, but it should be one of the major long-term goals of the strategy...”

– Consultation Participant



A Northern Approach

“We need to start colouring outside the box, developing our own solutions.”

– Consultation Participant



Photo Credit: GNWT/D. Brosha

The NWT faces unique challenges in reducing emissions because of its geography, climate and economy. The NWT population is small, with communities dispersed across the land. Access to fuels, food and other amenities in remote and isolated communities is costly and in some regions the only access is by air. Given the Arctic climate, with winter temperatures ranging from -20°C to below -40°C , the cost of living, and especially the cost of fuels, is high.

Our economy is primarily resource-based. Mining, oil and gas sectors contributed 34 percent of territorial Gross Domestic Product (GDP). Most mines are located in remote areas, with established energy systems based on fossil fuels. While technology for these systems is well understood and reliable, emissions are significant and their activity largely defines emissions trends in the NWT.

Our Commitment

The GNWT will continue to support global and local actions to reduce emissions of greenhouse gases and remain committed to working with federal, provincial and territorial governments to reduce national greenhouse gas emissions.

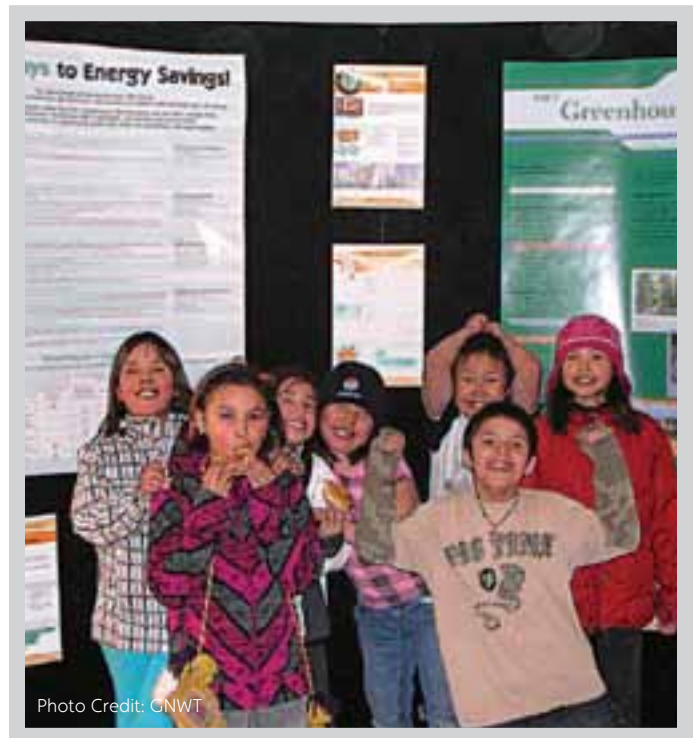
The GNWT will demonstrate leadership by diligently and responsibly taking appropriate action to control emissions of greenhouse gases in the NWT and prepare for climate change impacts. The GNWT will work with communities, local governments, industry and businesses to encourage adoption of renewable energy and installation of energy efficient systems. The NWT Energy Plan and 2011-2015 Greenhouse Gas Strategy will together guide a society-wide transition from dependence on imported fossil fuels. Controlling greenhouse gas emissions will generate environmental and health benefits for individuals, families and communities and will be done in ways to promote economic prosperity.

A Northern Approach

Our Principles

The following principles were used to guide the development of the Strategy and GNWT action on climate change:

1. Northerners are empowered to address a shared responsibility to take action on climate change.
2. Northerners take real action to improve the well-being of the environment and their health in ways that help reduce the cost of living.
3. Northerners maximize the economic opportunities created by shifting to local low-carbon energy sources.
4. The GNWT delivers programs and designs policies reflecting the needs and priorities of residents, communities, local and regional governments and industry.
5. GNWT programs are transparent and results are measurable.
6. The NWT collaborates with other territorial, provincial, national and international jurisdictions to coordinate action on climate change.

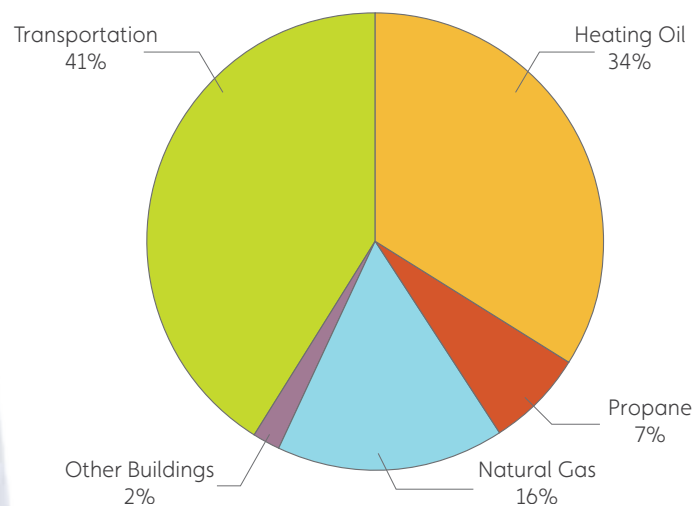


NWT Greenhouse Gas Emissions

GNWT Emissions

GNWT direct emissions from purchased fuel in 2001 were 54 kilotonnes CO₂ emissions (Kt). By 2006, GNWT emissions had increased eight percent to 58 Kt. In fiscal year 2009/10, emissions had decreased by 24 percent to 41 Kt, with the majority of emissions coming from heating of buildings (Figure 3).

Figure 3: Distribution of GNWT Emissions by Source for the 2009/10 Fiscal Year



The GNWT's 2011 greenhouse gas emissions will be reported through protocols established by The Climate Registry (TCR). TCR is a policy neutral, non-profit organization governed by states, provinces and Aboriginal organizations in North America. TCR currently has 430 members from business, government, non-government organizations (NGOs) and academia. It also includes all provincial and territorial governments in Canada.

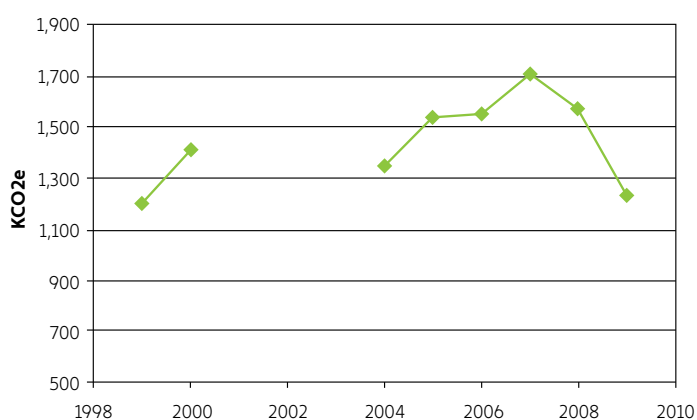


NWT Greenhouse Gas Emissions

NWT Emissions

Inventories prepared by GNWT and Environment Canada show emissions vary from year to year, but tend to average at about 1,500 Kt (Figure 4). Total emissions from the NWT in 2000 were 1,410 Kt. They rose to 1,540 Kt by 2005. Emissions fell to 1,230 Kt in 2009, the most recent year complete data is available, during the recent economic downturn.

Figure 4: NWT Emissions Trends (1999-2009)



Source: Environment Canada, National Inventory Report, 1990 to 2009

NWT emissions vary on an annual basis depending on a number of factors, including emissions from off-road diesel for large construction projects or aviation fuel for exploration activity. A decline in these activities in the last few years corresponds with a drop in emissions. Emissions are expected to increase as these activities resume and the economy regains strength.

The NWT accounts for less than 0.2 percent of Canada's total annual GHG emissions. However, on a per-capita basis, the total emissions from all activities in the NWT equalled over 27.9 tonnes of emissions per person per year for 2009/10. This remains higher than the national average of 21.7 tonnes per person per year. Higher per capita emissions in the NWT are attributed to the long distances between communities, an energy intensive resource industry and long, cold winters.

The breakdown of sources of NWT emissions derived from internal GNWT data is shown in Figure 5. The largest source of emissions in the NWT, at almost 437 Kt, is from electrical generation for remote mines and communities. Transportation and space heating, at 365 Kt and 378 Kt respectively, also contribute significantly to emissions in the NWT.

Figure 5: NWT 2009/10 GHG Emissions by Sources

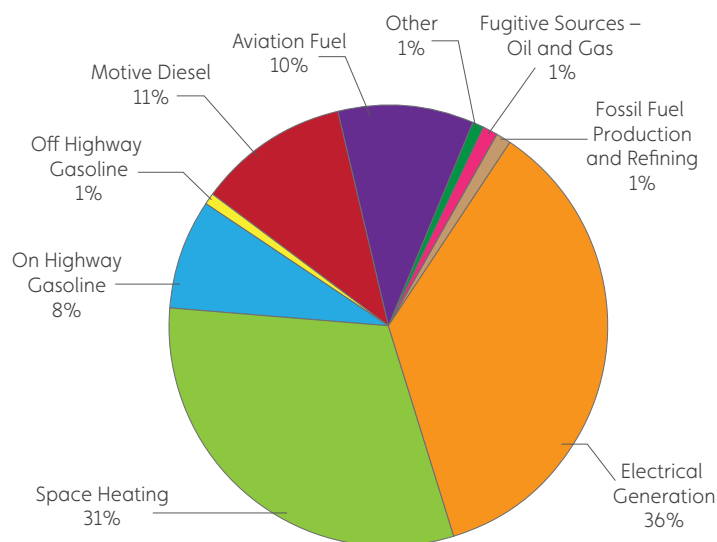


Photo Credit: GNWT

Forecasting NWT Emissions

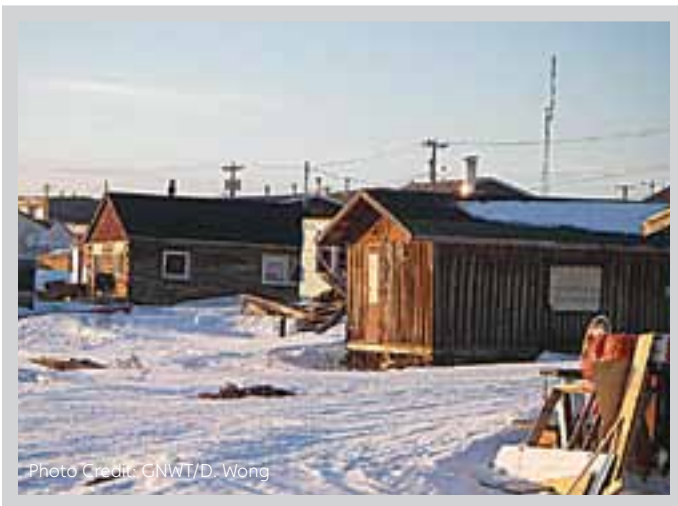
NWT emission forecasts were prepared by M. K. Jaccard and Associates, Inc. (*Assessing Emission Reductions from Potential Climate Policies in the Northwest Territories*, MKJA, March 2011). MKJA used forecasts of expected economic or physical output for each economic sector (e.g., population growth and the number of new homes needed, or fuel for transportation of people and goods) to develop a reference case (business as usual) forecast through to 2030. New resource development projects were included in the forecast for 2020, if the project had applied for at least initial stages of regulatory approval. Forecasts included a linear increase for these industrial projects through to 2030. Assumptions in the report were developed in conjunction with the GNWT and reflect a combination of GNWT and publicly available data sources.

The reference case forecast (Table 1) starts in 2010 at 1,778 Kt, much higher than actual emissions measured in 2009 (1,230 Kt). The difference arises because the economic model used to prepare the emission forecast focused on long-term trends.

The reference case was part of a larger study that provided a benchmark for assessing the effectiveness of proposed climate policies and actions. Economic growth assumptions used for this forecast are considered an aggressive or optimistic scenario.

Table 1: Northwest Territories Greenhouse Gas Emission Forecast (Reference Case)

	Units	2010	2015	2020	2025	2030
Demand Sectors						
Residential	Kt CO ₂ e	81	79	77	74	70
Commercial	Kt CO ₂ e	258	275	315	316	328
Transportation	Kt CO ₂ e	763	1,070	1,230	1,316	1,425
Mining Sector	Kt CO ₂ e	94	126	192	221	252
Supply Sectors						
Electricity Generation	Kt CO ₂ e	467	655	1,001	1,615	1,804
Oil and Gas	Kt CO ₂ e	115	87	273	1,133	1,122
Total	Kt CO₂e	1,778	2,292	3,089	4,675	5,000



NWT Greenhouse Gas Emissions

The reference case forecast assumes the economy grows rapidly to show how high maximum emissions could be during the next two decades without any climate change policy initiatives or actions. Under this scenario, NWT emissions from fossil fuels would be 5,000 Kt by 2030, an increase of 3,221 Kt more per year. Rapid growth in the mining and natural gas sectors could result in emissions from the NWT increasing to three times higher than they are now during the next two decades.



Getting Results in Every Sector

The 2011-2015 Strategy for the NWT (2011-2015) builds on actions taken across the NWT and sectors of the economy to encourage greenhouse gas emissions reductions and energy efficiency. This section provides a sector by sector review of current, ongoing and proposed actions contributing to control NWT greenhouse gas emissions.

Electricity Supply

In 2009, 677 Giga Watt hours (GWh) of electricity were generated in the NWT. About 47 percent of the total production was utility generated. Figure 6 shows electricity generation in 2009 by fuel for both utility and non-utility generation. In 2009, diesel accounted for 45 percent of generation (37 percent from industry and eight percent from utility). Hydroelectricity accounted for 35 percent, while natural gas generation made up the remaining 20 percent (16 percent utility and four percent from the oil and gas sector).

Figure 6: Electricity Generation by Fuel, 2009

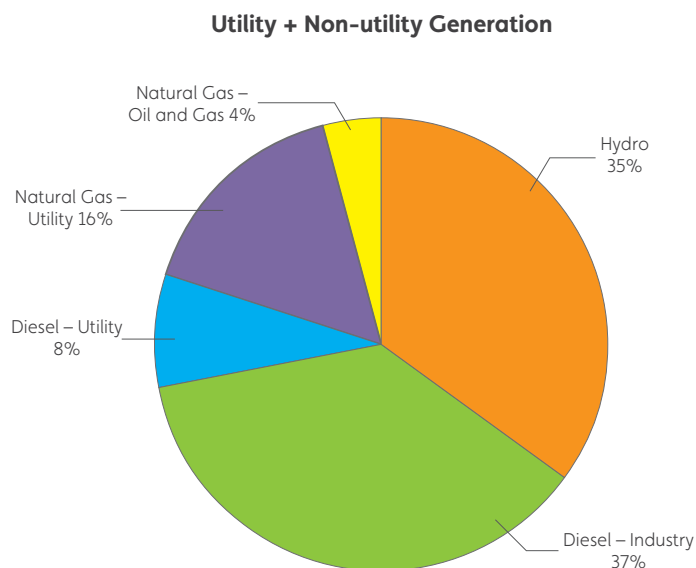


Photo Credit: GNWT/D. Brosha

Getting Results in Every Sector

Anticipated growth in the mining, residential, commercial and oil and gas sectors and electricity demand are projected to more than triple between 2010 and 2030. Almost half of this growth is expected to come from the Mackenzie Gas Project (Table 2). Given these projections, there will be a need to expand generation capacity in the NWT.

Table 2: Electricity Growth in the Northwest Territories (Peta Joules)

	2010	2015	2020	2025	2030	2030
Summary for Northwest Territories	2.6	3.1	4.8	7.7	8.3	70

Getting Results

The GNWT and industry partners have prepared a number of focused plans for increasing renewable electrical generation capacity in the NWT, including hydro, wind, solar, geothermal and biomass power.

The Northwest Territories Energy Plan and the Energy Priorities Framework

Actions identified in the Energy Plan (2007) and the Energy Priorities Framework (2008) focused on the replacement of imported fossil fuels. The NWT Energy Report (2011) provides an overview of energy development, generation and use in the NWT and a summary of the energy programs, projects and initiatives undertaken by the GNWT during the past four years. Work completed to date in these areas is the foundation for most of the future development outlined in this sector.



Photo Credit: GNWT

Northwest Territories Hydro Strategy

A draft Northwest Territories Hydro Strategy is being prepared by the Department of Industry, Tourism and Investment (ITI) to guide the activities of the GNWT and the Northwest Territories Hydro Corporation (NT Hydro) in tapping the NWT's tremendous potential of over 11,000 megawatts (MW). It considers mini-hydro projects, medium and large-scale hydro in both short and long-term planning. A number of planning principles have been identified. As well, the Hydro Strategy places a priority on projects which support the development of an integrated transmission grid.

The Hydro Strategy focuses on four strategic areas of priority: Preparing for Hydro Development; Protecting our Environment; Financing Future Hydroelectric Projects; and Policy Initiatives. Actions have been identified in each area to ensure that hydro development proceeds in a manner that reflects the values and aspirations of NWT residents and maximizes the benefits associated with hydro development.

The Northwest Territories Power Corporation

The Northwest Territories Power Corporation (NTPC) is the primary power producer in the NWT. It operates 28 power systems to meet a total electrical load of 65 MW. NTPC's facilities include hydroelectric, diesel and natural gas generating plants as well as transmission systems and isolated electrical distribution systems. NTPC provides power directly to customers in 25 communities and wholesale power to other utilities serving customers in the Yellowknife and Hay River areas.

NTPC has been very successful in reducing emissions from its operations. In 2010/11, NTPC produced 67 Kt of greenhouse gases, a decrease of 51 percent from 1990/91 levels (baseline).

Ongoing actions to further reduce GHG emissions include:

- increasing the use of available technologies and more fuel-efficient diesel gensets to improve plant efficiencies and reduce electricity consumption within its own facilities;
- pursuing additional hydro and natural gas generation opportunities;
- monitoring and researching the development of alternative power generation technologies such as wind, solar power and hydrokinetic turbines; and
- encouraging energy conservation through customer education programs.

Based on its hydro generation forecast to 2014/15 and its GHG reduction measures, NTPC expects its emissions during this period to remain at approximately 67 Kt per year.

Net Billing Pilot Program

A net billing system is now in place to allow NWT utilities to compensate customers for supplying renewable energy power into the electrical grid.

In April 2010, NTPC and Northland Utilities submitted a joint proposal for a two-year net billing pilot project to the Public Utilities Board (PUB), with the support of the Department of Environment and Natural Resources (ENR). In September 2010, the PUB approved the net billing pilot program for the period of September 1, 2010 through April 30, 2013.

The pilot program tests the feasibility and logistics of utility customers operating small-scale renewable energy self-generation projects connected to community power distribution grids in the NWT.

The net billing pilot program permits renewable energy generation projects, including solar panels and wind turbines. There is a five kilowatt (kW) limit for an individual project with a 50 kW limit in total for the entire project. Both utilities are currently purchasing power at the avoided cost of generation.

Northwest Territories Hydro Corporation

Created in 2003, NT Hydro is responsible for identifying and developing hydroelectric resources and implementing of key aspects of the draft NWT Hydro Strategy.

Development of hydroelectric resources will reduce the NWT's dependence on fossil fuels and significantly reduce greenhouse gas emissions. NT Hydro is also working to gain a detailed understanding of the hydro potential in the NWT. While the hydro potential of large river basins is already known, additional study is needed for other areas. Developing this understanding will help NT Hydro and its Aboriginal partners determine where future projects may be developed.

The Tlicho Investment Corporation is leading work on the La Martre River Falls hydro project and a detailed feasibility study on a proposed 13 MW project is underway.

New development scenarios for the Taltson basin are being investigated. The feasibility study for the La Martre River Falls hydro project will be completed in 2011, but both Taltson and La Martre River projects have to find markets for power in order to secure financing for construction.

Development of new hydro power projects has the potential to significantly reduce the NWT's greenhouse gas emissions, especially if future industry partners can use clean hydro power instead of diesel generation. Development of the La Martre River Falls project will displace diesel generation in the community of Whati and eliminate 70 Kt of emissions annually during the 60 to 100 year lifespan of the project.

A 25 kW hydrokinetic turbine is being tested in the Mackenzie River in Fort Simpson.

Hydrokinetic turbines have a smaller environmental footprint than traditional hydroelectric technology. The turbine is attached to a pontoon which floats on the water, with the turbine suspended below. A power cable runs underwater from the turbine to a connection point on-shore which interconnects with NTPC's existing distribution system. The equipment can only operate on open water and must be installed and removed from the river each year.

Challenges to this power generation technology include the regular need for heavy equipment, limiting its application in smaller remote communities. The operation can also be a challenge in rivers where a large amount of debris is present.

Despite these challenges, early performance data indicates that the turbine performs as promised. The Fort Simpson pilot unit will be tested for a second season.

Getting Results in Every Sector

Wind Energy

ENR has been working in partnership with ITI, Aboriginal Affairs and Northern Development Canada (AANDC), NTPC and the Aurora Research Institute (ARI) to assess wind resources in the NWT, and establish a plan of action to develop wind power in the NWT since 2003.

Wind resource monitoring is centred on the "Pre-feasibility Analysis of Wind Energy for Inuvialuit Region in Northwest Territories" Report completed by ARI in March 2003. This report recommended measuring the wind resource in the Beaufort Sea communities of Ulukhaktok, Sachs Harbour, Tuktoyaktuk and Paulatuk. In 2010, monitoring was completed and ARI confirmed sufficient wind resources existed in these communities to proceed with economic analysis.

Further wind monitoring has been initiated at Norman Wells, Thor Lake, Wekweeti and, most recently, at the Giant Mine site in Yellowknife. Two years of data is generally required to assess the wind resource in a location.

In 2007, the Remote Community Wind Energy Conference was held in Tuktoyaktuk to provide community leadership with economic, environmental and technical information about wind energy. Since 2008, the GNWT, AANDC and an Inuvialuit-owned company have advanced feasibility studies for a 300 kilowatt wind installation in Tuktoyaktuk. Economic pre-feasibility studies have been completed for Ulukhaktok, Paulatuk and Sachs Harbour.

Solar Electric

Although the cost per watt is still relatively high compared to traditional forms of generation, solar photovoltaic (PV) panels are extremely dependable, have low operation/maintenance costs and a long lifespan. The cost of this technology has been declining for years and solar panels are now widely used all around the world. In the NWT, solar PV panels are successfully used in remote 'off-grid' battery-based systems to reduce fuel use.

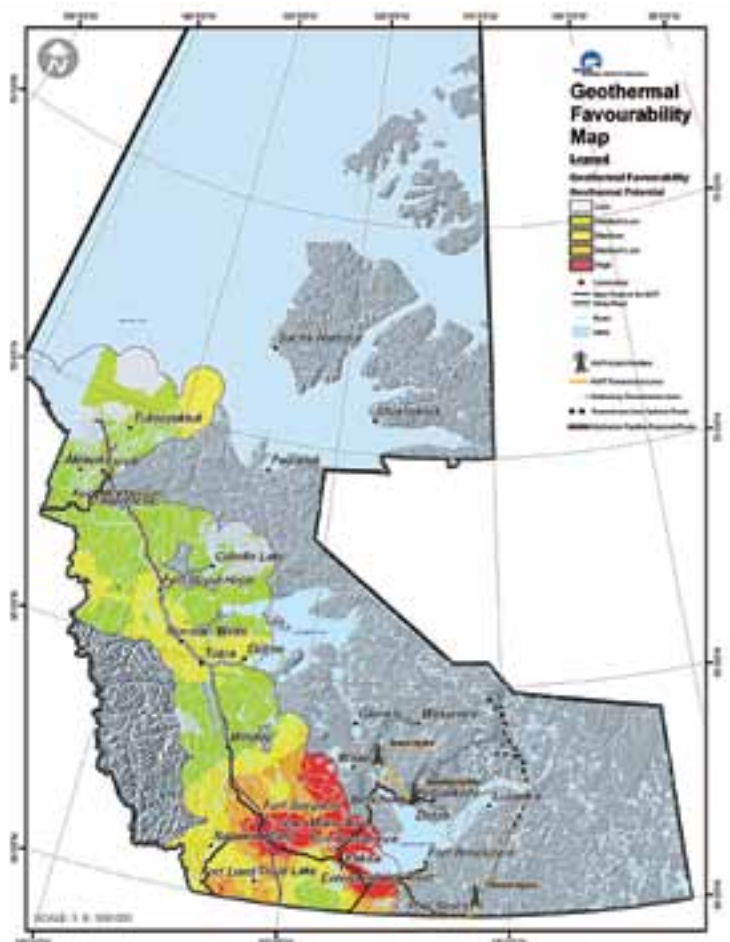
As costs come down, grid-interconnected solar technology is becoming more common in the NWT (five installations between 2000-2009 and six between 2010-2011). As a result of this increased activity, a Solar Energy Strategy is being developed.

It will provide a plan for the GNWT to work with communities, businesses and industry to direct the use of solar technologies and build experience with solar energy systems.

Geothermal

Geothermal technology makes use of high temperatures found deep below the surface of the earth. Hot water at more than 100° C can be pumped to the surface to power electrical generators and district heat systems. A geothermal favourability map for the NWT was prepared in 2010. The map shows this resource is available in the southern NWT at depths of three to four kilometres, which is shallow enough to provide economic development potential.

The GNWT and NT Hydro are currently working to develop a demonstration project in Fort Liard. Project proponents, Acho Dene Koe and Borealis Geopower, have received a funding commitment of \$8 million from the federal government,



if the project is developed. Detailed engineering and feasibility work is underway. The project will reach a key decision point in March 2012 – whether to proceed to the costly drilling stage.

The City of Yellowknife is working to develop a district heat system, which will use warm water at more than 30° C pumped from abandoned mine tunnels. This source of geothermal heat will be upgraded to hotter temperatures with biomass boilers to provide heat to large buildings in the downtown core.

The work underway on the Fort Liard Project will provide the basis for expanding efforts to other locations and communities in the NWT. Fort Providence, Fort Simpson and Hay River all have geothermal potential. Geothermal technology is already proven and being used in many countries across the world. This technology will be an important part of the NWT renewable energy portfolio in the future.

Buildings and Energy Efficiency

Even if no additional action is taken, we expect our buildings to use less energy in the future because of ongoing improvements in energy efficiency driven by high fuel costs. These improvements are estimated to be 21 percent and six percent for households and commercial buildings (businesses and GNWT facilities) respectively between 2010 and 2030. This will result in slower territorial emission growth during the next two decades, at about one percent per year. These trends are more pronounced for households than commercial buildings.

Overall emissions from commercial buildings are expected to rise because there will be more floor space needed in response to increased activity in the mining and oil and gas sectors.

Table 3: Projected Greenhouse Gas Emissions for Residential and Commercial Buildings, if No Action is Taken

Summary for Northwest Territories					
	2010	2015	2020	2025	2030
Residential	81	79	77	74	70
Commercial	258	275	315	316	328

Getting Results

Arctic Energy Alliance

The Arctic Energy Alliance (AEA) has played a key role in implementing energy efficiency initiatives under the Greenhouse Gas Strategy since 2001. NWT residents, organizations or businesses contemplating making the switch to more energy efficient practices often need specific advice from a third party. They might also need help in developing their plans and putting them into action. AEA provides advice and practical support for those who want to become more efficient or switch to more renewable resources. This work results in the lowering of barriers to the adoption of renewable energy alternatives and allows:

- NWT residents and organizations to have more confidence in their decisions to use energy-wisely;
- more functioning, good quality energy efficient upgrades and renewable energy systems to be installed; and
- for learned behaviour to be passed down through generations, and within families, resulting in a growing legacy of energy-wise citizens.

Rebates for Energy Efficient Upgrades

Rebates for energy efficient appliances are currently available for residents through the Energy Efficiency Incentive Program and for businesses through the Commercial Energy Conservation and Efficiency Program.

These financial incentives result in:

- immediate monetary savings for businesses and residents of the NWT, making living in the NWT more affordable;
- NWT suppliers and installers becoming familiar with, and stocking, energy efficient equipment as their standard practice; and
- learned behaviour being passed down through generations, and within families and trades, resulting in a growing legacy of energy-wise citizens.

Getting Results in Every Sector

ecoENERGY Retrofit – Homes Program

AEA is the delivery agent for the ecoENERGY Retrofit – Homes program (originally EnerGuide for Houses and New Houses). The program was designed by Natural Resources Canada to determine the quality of the housing stock in Canada and to give homeowners information and incentives to renovate their homes for energy efficiency.

The GNWT has provided funding to AEA to ensure that the ecoENERGY Retrofit – Homes program is available to all residents no matter which northern community they live in. The program has been highly successful in the NWT, where the combination of harsh climate and high fuel prices make space heating a major expense for homeowners.

Northwest Territories Housing Corporation (NWT HC)

The NWT HC continues to support the Energy Plan and the Greenhouse Gas Strategy through the following key initiatives:

EnerGuide 80 (EGH 80):

- The EGH 80 score is the minimum rate for high efficiency under the ecoEnergy Efficiency Initiative standard, set by Natural Resources Canada.
- In 2008, the NWT HC adopted the EGH assessment methods to evaluate energy efficiency of its homes. The NWT HC has conducted over 200 home energy evaluations, representing approximately 10 percent of its existing housing inventory. This established an energy efficiency benchmark. The information will be used in the development of a Retrofit Strategy to improve the energy efficiency of existing housing in the future.
- If the NWT HC were to implement the recommended upgrades from 210 evaluation reports, a total of 705 tonnes of GHG could be reduced. This represents a cost savings of \$390,000 annually.
- All new housing designs will adhere to the minimum rate (EGH 80) for high efficiency.
- The NWT HC has developed a logo, referred to as "ecobuilt80plus", to illustrate a measure of design and construction quality in the area of energy efficiency and sustainability.
- The NWT HC is working to bring the public housing units slated for major retrofits as close as possible to the EGH 80 rating.

Northern Sustainable Housing Project

- The NWT HC partnered with the Canadian Mortgage and Housing Corporation on the design and construction of a northern sustainable housing project. The main energy performance goal for this project was to obtain an EGH rating of 85 or higher, or 50 percent better than the Model National Energy Code for Houses (NMECH). The design includes a highly efficient building enclosure and the use of thermal and photovoltaic solar panels, which help reduce operating costs and GHG emissions.
- The duplex will be monitored for 12 months by Canadian Mortgage and Housing Corporation upon completion so the actual operating cost savings and emission reductions can be measured.

Homeowner Renovations (CARE):

- The NWT HC has identified the need for energy efficient upgrades to private housing. Funding is available to qualified homeowners, through the Contributing Assistance for Repairs and Enhancements (CARE) program, for renovations, including energy efficiency upgrades.
- The NWT HC developed, and delivers, a home maintenance and repair course for clients who want to access funding or want to learn about maintenance. A significant portion of the course focuses on energy conservation.

High Performance Heating Systems:

- High efficient heating systems (Monitor and Weil Mclean appliances) are installed in NWT HC units and are proving to be cost effective.



ecoEnergy Retrofit Plan:

- Under the GNWT's ecoEnergy Retrofit Plan, the NWTHC will spend \$1 million by March 31, 2012, to complete energy upgrades on 28 public housing units.

Alternate Energy Sources – Solar and Biomass:

- Solar hot water heating systems are in use in a number of South Slave district communities.
- Photovoltaic and solar hot water panels will be installed on the Northern Sustainable Housing Project to help supplement energy consumption and costs. Six months after construction is completed, the housing project will be monitored for 12 months. Once monitoring is complete, an analysis of the systems and their cost effectiveness will be conducted.
- The NWTHC is exploring and looking for opportunities to introduce biomass systems into housing projects.

Design Review:

- The NWTHC design division is currently developing a design review aimed at developing a more efficient building enclosure to help achieve and/or exceed its current energy standard targets. The new building enclosure designs are expected to be incorporated into construction drawings for the 2012/13 construction season.

Department of Public Works and Services (PWS)

Capital Asset Retrofit Fund

The capital asset retrofit fund is used to upgrade existing GNWT buildings, which are not energy efficient. The program helps the GNWT reduce building operating costs and greenhouse gas emissions in the NWT. The GNWT owns more than 100 buildings built before 1980. Without retrofits, these assets will continue to deteriorate and cause operation and maintenance costs to rise.

Data collected through energy benchmarking, infrared thermal scanning, preliminary technical evaluations, energy consumption monitoring, mechanical and electrical system analyses, detailed energy audits, technical status evaluations, facility condition assessments, and other on-site or background research is used to select optimum buildings for energy upgrades/retrofits.

Upgrades/retrofits reduce energy consumption and greenhouse gas emissions as well as operational maintenance costs in GNWT assets.

Good Building Practices for Northern Facilities

PWS maintains its own building specification guide, the "Good Building Practice for Northern Facilities" (GBP). The second edition was released in 2009. It incorporates many aspects of good building design from Natural Resource Canada (NRCan) and provides special requirements and guidelines for building design in the North. These guidelines were developed through PWS's experiences with designing and constructing numerous buildings in the North.

PWS uses NRCan's energy-efficiency standards (i.e. Eco-Energy Validation Program) as a minimum standard during the design and construction of both new and renovated GNWT buildings. All PWS projects, above a certain size and complexity, are to be designed and built to the Eco-Energy Validation Program as a minimum requirement.

PWS also participates in national energy-related code development committees, with one representative on each of the following: Canadian Commission on Building and Fire Codes; Building Energy Codes Collaborative; and Model National Energy Code for Buildings (MNECB) Revision Committee. PWS is also involved in the Public Infrastructure Engineering Vulnerability Committee (PIEVC), which deals with the impact of climate change on northern engineered infrastructure, and the Building Technology Transfer Forum (BTTF), which shares new technology information across many jurisdictions.



Getting Results in Every Sector

Biomass Heat for Government Facilities

PWS' familiarity with biomass technology in the North has grown. The first two projects, started in 2007, have shown tremendous potential for returns on investments. PWS has begun to implement biomass projects solely funded by the GNWT. This allows the GNWT to maximize operational savings with project payback periods varying between four and eight years, depending on the price of fuel oil.

PWS' biomass successes include: Kalemi Dene School – N'Dilo; Chief Jimmy Bruneau School – Behchoko; St. Joseph School – Yellowknife; Legislative Assembly Building – Yellowknife; Highways Maintenance Garage – Hay River; PWK School and Community Recreation Complex – Fort Smith; Thebacha Campus College – Fort Smith; Central Heating Plant – Hay River, which services Harry Camsell School, Princess Alexandra School, École Boreale and Diamond Jenness School and Trades Shop; and Fort Smith Health Centre.

The 10 biomass projects already implemented account for approximately 11 percent of the space heating needs of government assets, excluding Yellowknife District 1 and 2 schools. These projects generate annual cost savings of approximately \$692,000 and displace a total of 9.4 Kt of greenhouse gas emissions annually.

PWS will maintain its strong focus on biomass technology and continue to assess the potential for high value biomass boilers and complete projects where economical.

Solar Thermal Heating

These systems absorb heat from the sun in enclosed solar collector panels. The heat is transferred through a heat exchanger and stored in an auxiliary hot water tank. This pre-heated water feeds into the standard hot water heater for the household water system. A solar hot water system can offset over 50 percent of annual hot water heating costs. The technology is relatively simple, robust and effective in northern climates, where hot water can be produced during the spring, summer and fall seasons.

Solar hot water retrofits on existing buildings have been demonstrated to reduce monthly energy bills. However, these systems are most cost effective when incorporated into the design of new buildings. Unobstructed south facing walls

and rooflines are important in maximizing all types of solar technologies. Building orientation needs to be considered during the design phase of new buildings.

In 2011/12, ENR is working with communities to install solar hot water systems at public swimming pools in Fort Providence, Tulita, Norman Wells and Aklavik. Solar hot water systems have been installed at Fred Henne and Reid Lake Territorial Parks, retirement centres in Hay River and Fort Providence and a number of public housing complexes.

Biomass Energy Strategy

The NWT Biomass Energy Strategy was released in February 2010. This Strategy guides increased and sustainable local harvest of wood in the NWT. It will also help guide the actions of GNWT departments with respect to the development of biomass energy systems. The harvest and use of wood for heating and electricity across the NWT will create local jobs and stimulate innovation around this abundant resource.

Biomass is a key component in a future low-carbon economy in the NWT. As a renewable energy, biomass energy will diversify our energy supply chain and move us another step closer to achieving our emission reduction targets.

Many successful wood pellet installations have already been implemented throughout the North and South Slave regions of the NWT. Fifteen public buildings have been converted to biomass for heat energy and more installations are underway. The learned experience with biomass technology and implementation is allowing the GNWT to optimize the design and construct projects more cost effectively.



Photo Credit: GNWT

The GNWT, through AEA, provides incentives to residents and businesses for conversions to wood pellet heating appliances. AEA has also completed several studies promoting the use of wood pellets in communities and undertaken several actions to implement the biomass strategy, such as providing workshops in communities.

Private industry has been pivotal in northern biomass energy development. A number of private firms have installed multiple wood pellet boilers for both government and private consumers. These companies continue to promote and facilitate the use of biomass energy this growing sector.

Forest Management

ENR is developing and planning for the supply of local wood harvests and wood fuel access through forest resource assessments. For example, the Deh Cho Forest Resource Assessment reports how much wood could be sustainably harvested in the region. ENR has also done work to assess the right conditions required for the successful competition of NWT forest products as viable free-standing businesses against southern competitors.

Natural Sinks and Sources

ENR is working to assess the carbon status of forests in the NWT. Globally, about 80 percent of the measured increase in atmospheric greenhouse gas levels is attributed to fossil fuel burning. The remaining 20 percent is attributed to land use changes and deforestation. For this reason, forest management has become an important consideration in reductions of global greenhouse gas emissions. While forests in NWT are currently considered a carbon sink (i.e. capture more carbon than they emit), future conditions (such as large forest fires) may change the NWT's forests from a sink to a source. The sink/source balance in the NWT is further complicated by uncertainties related to climate change. For example, methane (a potent greenhouse gas) is released in substantial quantities from peat bogs as permafrost melts.

Communities

Community emissions are produced from: residential, commercial and institutional buildings; electricity purchased from power utilities; local transportation; and some small scale industry. There are several ways local governments can, and have been, taking action to create sustainable communities.

Getting Results

Community Energy Planning

Community energy planning is the process a community uses to assess its energy use and energy mix and to create a more sustainable energy plan for the future. Community energy planning first started in the NWT through a partnership between the non-profit organization Ecology North and the community of Whati. The Whati Plan was completed in 2004. It led to considerable energy savings and awareness in the community, along with a community initiative to investigate the feasibility of a local mini-hydroelectric plant.

In 2004, ENR and AANDC funded AEA to provide a full-time position to coordinate community energy planning. The Department of Municipal and Community Affairs (MACA) took over funding the position in 2006/07. A second position was funded for the fiscal year 2009/10.

In 2006, the City of Yellowknife adopted a community energy plan, which encompasses all energy use within the municipal boundaries. An inventory prepared for 2004 indicated within those boundaries emissions within municipal boundaries were 376 tonnes. Yellowknife adopted targets of a 20 percent reduction within city operations and six percent reduction city-wide below 2004 levels by 2014. Preliminary tracking of emissions indicates the 20 percent target for city operations has already been exceeded.

Starting in 2010/11, MACA funding is being provided directly to the NWT Association of Communities (NWTAC) in order to support energy planning in all 33 NWT communities and work is underway on climate change mitigation and adaptation. The AEA will continue to be engaged by supporting the NWTAC and community governments in implementing energy plans, goals and strategies.

Getting Results in Every Sector

District Heat Systems

NTPC sells the residual heat created by diesel generation of electricity into small district heat systems to several communities. The Fort McPherson and Fort Liard systems include commercial and institutional heating customers. In 2009, the Fort McPherson system resulted in greenhouse gas emissions reductions of 630 tonnes. The new Fort Liard system will displace almost 200 tonnes of emissions.

NTPC is evaluating further opportunities to make economic use of these systems in other communities. Residual heat recovery can offset a large portion of the greenhouse gas emissions that would be emitted by heating fuel. There is potential, if residual heat recovery were to expand significantly, to offset a large portion of the commercial and institutional space heating requirements in some communities.

NTPC is currently working on the design of a residual heat project for two new PWS buildings located near its power plant in Inuvik. NTPC is also working with ENR and the Gwich'in Tribal Council to explore adding to the in Fort McPherson system with a biomass boiler.

The City of Yellowknife is in advanced planning stages to develop a district heat system for downtown buildings, which would be fueled primarily with wood pellets. Additional phases of the project could include additional geothermal heat from the shafts of an abandoned gold mine.

The Tlicho Investment Corporation is working with ENR to finalize plans for a biomass fueled district heat system for a cluster of office and commercial buildings in Behchoko.



Photo Credit: GNWT/W. Carpenter

Local Food Production

ITI is working with communities to expand local food production. This initiative includes:

- **Small Scale Foods Program:** Aim is to establish market gardens in 25 communities across the NWT. Once established, community garden programs will be augmented with training, upgraded equipment and ongoing support to maximize efficiencies and yields.
- **Northern Agri-Foods Program:** Aim is to work with producers in the establishment, expansion and development of land-based initiatives. The Program also targets existing commercial greenhouse operators, with funding aimed at increasing yields and efficiencies. In addition, the Program will examine the potential feasibility of non-timber forest initiatives such as birch syrup production. Finally, the Program will provide support for workshops and seminars aimed at increasing the agriculture and agri-foods knowledge base in the NWT.

Industry

Industrial activities, including mining, oil and gas exploration and development, are the NWT largest source of greenhouse gas emissions. They accounted for 44 percent of emissions in 2010. During the next two decades, these sectors are expected to play an even bigger role defining the economic and emissions profile of the NWT.

Development in the mining sector could potentially increase from 8.3 million tonnes of ore to more than 29 million tonnes by 2030. Natural gas production is also projected to increase markedly with the development of the Mackenzie Gas Project, rising to 34,002 thousand cubic metres a day by the end of the decade and remaining constant until 2030.

GDP levels are anticipated to rise 92 percent from 2005 levels by 2020 and are likely to continue to grow thereafter. Combined GDP from mining and gas in 2020 is estimated at \$4 billion (\$2,005 CDN). Jobs are also projected to increase and average salaries could rise 34 percent from 2005 levels by 2020.

This growth is expected to dramatically increase total greenhouse gas emissions from these sectors. However, there is considerable room to make improvements and efficiencies in production to reduce emissions.

Getting Results

Diamond mines in the NWT are already working to reduce greenhouse gas emissions. Northern diamond mines are relatively new operations. The first mine was constructed in the mid-1990s and the most recent in the mid-2000s. The mines incorporate many modern technologies to operate efficiently. For example, they achieve 75 percent efficiency in extracting energy from diesel fuel for electricity production as a result of capturing waste heat for their buildings.

Operating mines in remote locations adds significant costs in buying annual inventories ahead of time, in transporting supplies over ice roads every winter and in storage infrastructure. These built-in incentives to use resources more efficiently result in a mining sector which leads Canada in energy efficiency.

BHP Billiton Diamonds Inc., Diavik Diamonds Inc. and De Beers Canada all report on their energy use and their greenhouse gas emission management plans for activities in the NWT through the Mining Association of Canada's "Towards Sustainable Mining" initiative.

BHP Billiton filed an action plan for reducing greenhouse gas emissions at their Ekati Diamond Mine with Canada's Climate Change Voluntary Challenge and Registry Inc. In addition to reporting annual emissions, BHP Billiton's award-winning action plan established a greenhouse house emissions intensity improvement target of five percent between 2002 and 2007, per unit of production. The BHP Billiton's Ekati Diamond Mine exceeded that target and realized a reduction of 32.7 percent in emissions intensity. BHP Billiton continues to seek improvements at the Ekati Diamond Mine and has targeted a six percent reduction in energy use from 2006 and three percent reduction in greenhouse gas emissions from 2006 by 2012.

The GNWT continues to encourage and support the use of renewable energy in the industrial sector. About \$17 million in territorial, federal and crown corporation funds have been spent during the past seven years on a proposal to expand the current Taltson hydroelectric facility by up to 56 MW to supply hydro power to mines in the slave geological province. The proposed partnership between the NWT Métis, the Akaitcho

Territory Government and NT Hydro could replace up to 100 million litres annually of imported diesel, with corresponding emission reductions of 273 Kt.

The tremendous amount of engineering and environmental work on the Taltson watershed led to an environmental assessment of the proposed project by the Mackenzie Valley Environmental Impact Review Board. This process, nearing completion, has been put on hold while the business case undergoes further review.

At the same time, diamond mines have initiated work on renewable energy projects for their operations. De Beers Canada has been collecting wind speed data since September 2008 to determine the viability of constructing a wind farm at its Snap Lake Mine. A scoping study to determine the feasibility of integrating wind power at Snap Lake was completed in December 2010 and was based on 15 months worth of data. The report showed wind power integration at Snap Lake would have a small net impact on the net present costs. It recommended the collection of wind data should be extended to provide a 36 month data set that would be more reliable.

In 2011, Diavik Diamond Mines produced a business plan to install nine megawatts of wind capacity to offset diesel consumption at its mine site north of Yellowknife. If approved, construction would begin in 2012. Diavik Diamond Mines is working with Deton Cho Earth Energy to evaluate the installation of wind turbines near Yellowknife.

At present, the NWT has five mines in the regulatory process (Nechalacho, Nico, Avalon, Gahcho Kué and Yellowknife Gold). All these mines are currently planning to use diesel generation to meet their electrical and space heating requirements. NT Hydro will explore options to provide clean hydro power to industrial customers.

Avalon Rare Earth Minerals is investigating the use of wind energy at its proposed mine near Thor Lake. The company has also conducted an initial evaluation of using geothermal energy at its proposed Pine Point hydrometallurgical plant to produce power and heat.

Getting Results in Every Sector

Transportation

Transportation accounted for 30 percent of the NWT's greenhouse gas emissions in 2010 (Figure 5). This sector includes passenger and freight movements on territorial roads and in the air, and off-road diesel used by heavy equipment at mines and construction projects.

Road and airport networks connect our families and move the things we need. Our dependence on transportation systems is expected to grow with our population and as more wealth and jobs are created in the future.

Table 4: Growth in Million km Travelled, Passenger and Freight Transportation

	Units	2010	2015	2020	2025	2030
Demand Sectors						
Passenger Transportation	million passenger-km	1,012	1,110	1,213	1,332	1,442
Freight Transportation	million tonne-km	1,530	1,629	1,875	1,986	2,115

Getting Results

The Department of Transportation (DOT) released an environmental strategy titled "Green Light: Signalling the Department of Transportation's Commitment to the Environment." The Strategy highlights existing environmental practices and fosters a corporate culture of environmental excellence within DOT and throughout the northern transportation industry. The Strategy sets out an action plan for the short term (one to two years) and the medium term (two to five years).

Using the environmental strategy and measures to conserve energy consumption, DOT expects to:

- foster a culture of conservation within the department;
- develop measures to monitor and evaluate energy saving initiatives; and
- set an example for the transportation industry.

There are significant opportunities for DOT to reduce greenhouse gas emissions within the department and in the transportation industry as a whole. DOT has begun implementing the following actions:

- development of a Greenhouse Gas Emissions Reduction Plan;
- implementation of equipment management system to track vehicle fuel consumption and implement preventative maintenance actions;
- installation of 20 auxiliary heaters to eliminate idling of heavy equipment in the winter when not in use; and
- testing an in-stream turbine to energize the ferry camp at the NDulee crossing in collaboration with New Energy Corporation from Calgary.

The Deh Cho Bridge will also provide considerable reductions in GHG emissions. These include:

- Reduction in the consumption of 440,000 litres of diesel per year with the elimination of the Merv Hardie ferry.
- Reduction in idling with the elimination of approximately 20,000 commercial and 50,000 private vehicles waiting an average of 15 minutes for the ferry.
- Emissions cut from eliminating the construction of the ice bridge.



Photo Credit: Department of Transportation

Territorial Targets

In 2007, the GNWT adopted a target to reduce emissions from its operations by 10 percent below the 2001 emissions level by 2011. Although final emissions for 2011 are not yet available, emissions reductions resulting from conversion of government buildings to biomass indicate the GNWT is on track to meet this target.

The 2011-2015 NWT Greenhouse Gas Strategy builds on the success of the target for government operations and identifies targets for all sectors of the NWT economy.

International discussions to address climate change are focused on preventing global average temperatures from rising more than 2° C. To achieve this, scientists have advised deep cuts in global emissions need to be underway by 2020 so that by 2050 global emissions have been reduced by 80 percent.

Emissions from the NWT are an extremely small fraction of the global total. It is recognized that controlling those emissions will not prevent continued warming in the NWT. Setting territorial targets does, however, serve two purposes. First, targets will allow us to demonstrate to the international community we are serious about this issue and prepared to make our contribution to reducing the future impacts of a warming climate. Second, it makes long-term sense to develop local renewable energy businesses and prepare for a future economy where carbon-based fuels are constrained.

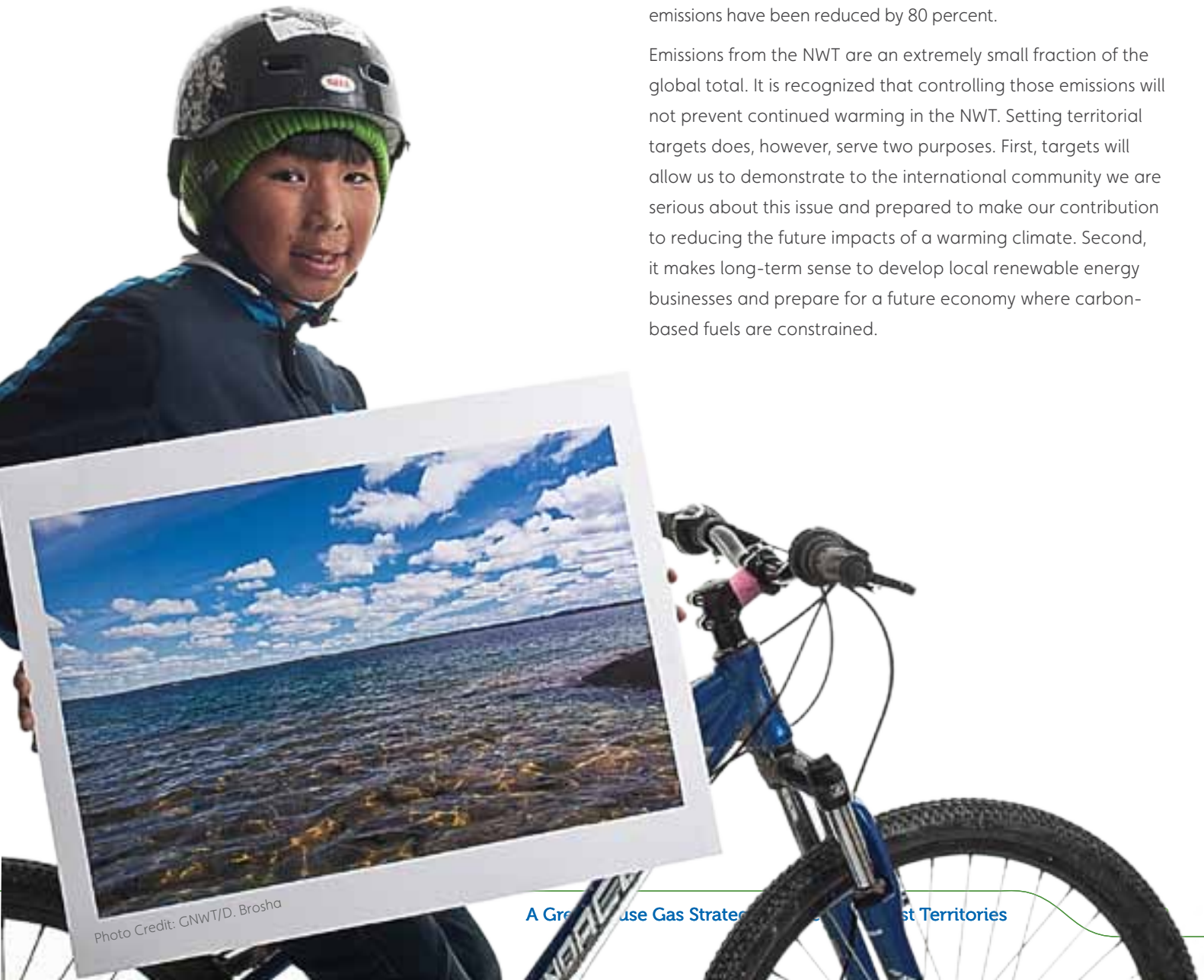


Photo Credit: GNWT/D. Brosha

Territorial Targets

NWT Greenhouse Gas Emission Targets:

- Stabilize emissions at 2005 levels (1,500 Kt) by 2015.
- Limit emissions increases to 66 percent above 2005 levels (2,500 Kt) by 2020.
- Return emissions to 2005 levels (1,500 Kt) by 2030.

These targets recognize increasing demand for energy in the NWT from new mining or oil and gas projects will result in increased emissions until renewable energy alternatives can be planned and implemented. Overall growth in energy demand will depend on how quickly new projects are developed. Emissions from this growth can be controlled if efficient systems and renewable energy generation are developed.

Before 2015, implementation of this Strategy will result in action being taken in every sector to improve efficiency and develop renewable energy alternatives. It is anticipated this combined action will result in emissions reductions at least equivalent to emissions increases from new development activities.

After 2015, action will continue to be taken in every sector, but emissions are still projected to continue growing as economic growth, including the Mackenzie Gas Project, proceeds. Continued development of new renewable energy sources can help slow the growth, but emissions are forecasted to peak after 2020 before enough new renewable energy can be developed to meet the growth in energy demand.

After 2020, enough hydro, biomass, wind, solar and geothermal energy is expected to be installed to reduce the use of diesel by a growing economy in the NWT. National and international approaches to address climate change will also evolve and more sustainable transportation systems will be possible.

Although these territorial targets do not call for an overall reduction in NWT greenhouse gas emissions by 2030, they do represent a substantial reduction in greenhouse gas emissions from the reference case prepared by MKJA. The 2015 target of 1,500 Kt is 34.5 percent below the reference case; the 2020 target of 2,500 Kt is 19 percent below the reference case; and the 2030 target of 1,500 Kt is 70 percent below the reference case.



Sector Goals for 2015



Photo Credit: GNWT/D. Brosha

In order to stabilize emissions at 2005 levels by 2015, the NWT will need to attain:

- An overall 10 percent improvement in energy efficiency; and
- A minimum of 10 percent renewable energy content in new power systems required for increased demand.

Getting Results in Every Sector described the range of actions all sectors have been taking, and are planning to take, to reduce greenhouse gas emissions. Actions for 2011-2015 are summarized in Appendix 1. These actions were evaluated for their potential to reduce greenhouse gas emissions (*Assessing Emission Reductions from Potential Climate Policies in the Northwest Territories*. MK Jaccard and Associates, 2011). Based on this analysis, energy efficiency and renewable energy goals were identified for electricity supply, buildings and transportation to help focus actions necessary to meet NWT greenhouse gas emissions targets.

Electricity Supply:

- By 2015, improve the emissions intensity of the electricity generation by 10 percent.
- By 2015, increase the renewable energy supply by 12 Mega Watts.

Achieving Our Goals

The development of renewable generation capacity to displace diesel offers a significant opportunity to reduce emissions. While current renewable system costs are high, expensive fuel costs (mainly expensive diesel fuel) and expected cost reductions in renewable technologies make renewable energy development a feasible and practical solution to rising emissions and energy costs.

Sector Goals for 2015

If implemented, current proposals for improving generation efficiency and increasing renewable electrical generation capacity, specifically hydro, wind, solar, geothermal and biomass power, are expected to take us:

- 87 percent of the way to our 2015 emissions intensity goal; and
- 77 percent of the way to our 2015 renewable energy capacity goal.

The achievements of our 2015 goals will set the stage for the transition to a low-carbon future and to see substantial emission reductions. After 2015, renewable energy projects become even more significant contributors to greenhouse gas reductions.

Buildings:

- By 2015, improve the emissions intensity of residential buildings by 25 percent.
- By 2015, improve the emissions intensity of commercial and institutional buildings by 10 percent.
- By 2015, increase the capacity of biomass heat in residential buildings by 100 percent.
- By 2015, increase the capacity of biomass heat in commercial and institutional buildings by 100 percent.

Achieving Our Goals

Actions to improve emissions intensity in NWT buildings include application of EGH 80 standards to new homes and 25 percent better than Model National Energy Codes for new buildings, installation of solar thermal water systems and continued rebates through the Energy Efficiency Incentive Program to encourage purchase of energy efficient appliances.

Increasing the use of biomass in NWT buildings will be supported through the implementation of the NWT Biomass Energy Strategy. This includes facilitating the conversion of furnaces and boilers in households, business and GNWT facilities to cord wood and wood pellets and supporting the development and retrofit of conventional heating systems to combined biomass heat and power systems.

Planned actions to increase renewable energy and energy efficiency for residential and commercial buildings could take us:

- 65 percent of the way to our 2015 emissions intensity goal for residential buildings;

- 68 percent of the way to our 2015 emissions intensity goal for commercial buildings;
- 65 percent of the way to our 2015 renewable energy goal for residential buildings; and
- 90 percent of the way to our 2015 renewable energy goal for commercial buildings.

Achieving our 2015 goals will result in a greater adoption of energy efficient construction techniques, energy efficient appliances and alternative heating technologies as they become the norm for builders and suppliers.

Transportation:

- By 2015, improve the emissions intensity of our passenger transportation fleet by 10 percent.
- By 2015, increase the renewable fuel content of our passenger transportation fleet by five percent.

Achieving Our Goals

Rising fuel costs will drive energy efficiency improvements and emission reductions in the personal transportation sector. For example, in response to the rising price of gasoline in the last decade, the number of registered hybrid vehicles in the NWT increased from one in 2004 to 22 in 2008.

The federal government is expected to implement a proposed National Vehicle Emission Standard mandating all 2012 to 2016 model year passenger vehicles meet an average greenhouse gas intensity target, which rises to 250 grams CO₂/mile (equivalent to 35.5 miles per gallon) in 2016. By 2015, the federal government is expected to mandate a renewable content of five percent in gasoline used for personal transportation (to rise to 10 percent by 2030). Engine modifications are not required at this level of mixing.

It is unclear if the proposed federal regulations for a two percent renewable fuel content in diesel fuel and heating oil would work in our cold climate. The federal government has committed to understanding the technical feasibility of this requirement before it is brought into force.

These federal regulations and the rising costs of gasoline could take us:

- 90 percent of the way to our 2015 emissions intensity goal; and
- 100 percent of the way to our 2015 renewable fuel goal.

Framework for the Future



Photo Credit: GNWT/D. Brasha

A wide range of policies and initiatives are being considered and/or adopted in other Canadian and international jurisdictions to encourage greenhouse gas emission reductions.

The GNWT will continue to investigate options to determine which of these approaches will effectively promote action and minimize costs on households and businesses while moving us further along the shift to a low-carbon economy. Three policy options already being used in other jurisdictions are outlined below.

Carbon Pricing

A carbon price is a way to encourage less use of fossil fuel like gasoline, oil, diesel and natural gas and to encourage use cleaner energy sources when they are available. It also puts a cost on greenhouse gas emissions so businesses and individuals releasing greenhouse gas emissions into the atmosphere pay for some of the damage it causes.

Carbon pricing can be done in several ways, but the two main options are a carbon tax or a cap and trade system.

Carbon Tax

A carbon tax is an environmental tax levied on the carbon content of fuels. A carbon tax has been introduced in British Columbia. Revenues from a carbon tax can either be returned to taxpayers (i.e. revenue neutral) or used to support programs.

In 2010, a revenue options roundtable was held with stakeholders from business, not-for-profit, labour, community and Aboriginal government organizations, which included a discussion on the use of a revenue-neutral carbon tax to reduce greenhouse gas emissions. Roundtable participants generally supported the principle of a carbon tax, however, they also agreed more research on carbon taxes and their impacts on the NWT were needed.

Framework for the Future

In early 2011, a study was undertaken to investigate the impacts of carbon pricing and potential emission reductions in the NWT (*An Exploration into the Impact of Carbon Pricing in the Northwest Territories*, MK Jaccard and Associates, 2011). The study looked at a wide range of carbon pricing policy options for the NWT and evaluated the likely impacts of these policies during the next 20 years.

The MKJA analysis indicated introduction of a carbon tax could reduce greenhouse gas emissions by 13 percent during the next two decades because it sends a price signal to trigger more energy efficiency and use of renewable energy in all sectors. The study also concluded at the same time:

- The economy would continue to grow, but not quite as fast.
- The amount of money people have for household expenses and personal items would not change very much.
- Household and industry energy costs would not change very much.
- Salaries would continue to rise, but not quite as fast.
- The economy would become more energy efficient.
- Fuels like oil, gasoline and diesel will be more expensive.
- Prices will go up for products using a lot of fossil fuels to make and ship.
- Cleaner fuels and products made with less energy will not be as expensive.
- Businesses will have an incentive to sell products and services that use less energy and produce less greenhouse gas emissions.
- People who take actions to save energy (such as driving less, putting more insulation in their home and choosing more energy efficient appliances and vehicles) would pay less carbon tax and purchase less fuel.

A considerable amount of work would be needed before a carbon tax could be contemplated. Designing a revenue neutral system, to provide the appropriate price signals, would need to address:

- the fiscal impact on government programs and services;
- the impact on the general economy, both the overall economy and specific industries; and
- the specific socio-economic impact on communities, especially remote communities.



Cap and Trade

Cap and Trade is a market-based approach used to control greenhouse gas emissions by providing economic incentives for achieving reductions. A central authority (usually government) sets a limit or cap on the amount of a greenhouse that can be emitted. The cap is allocated or sold to firms in the form of emissions permits, which represent the right to emit or discharge a specific volume of carbon. Firms are required to hold a number of permits (or carbon credits) equivalent to their emissions. The total number of permits cannot exceed the cap, limiting total emissions to that level. Firms needing to increase their emission permits must buy permits from those requiring fewer permits. This transfer of permits is referred to as a trade.

Advantages of a cap and trade system to achieve emission reductions in the industrial sector include:

- Gives companies more flexibility in achieving emission reductions at the lowest cost possible.
- Sets clear limits – traditional approaches often focus on emission rates or require the best available technology, but do not always require that specific environmental goals be met.
- Tends to speed up innovation and accelerate greenhouse gas reductions by putting market mechanisms behind the effort.
- A proven way of meeting absolute emission targets at the lowest cost by letting the market decide where the most economically feasible reductions will occur.



There are several active trading programs for greenhouse gases. The largest is the European Union Emission Trading Scheme. A North American cap and trade system is expected to be in place sometime between 2015 and 2020. In this scenario, large final emitters in the NWT would be subject to a federally imposed and controlled cap and trade system. Currently, the federal government defines large final emitters as sources greater than 50 kilotonnes per year for mandatory emission reporting purposes.

Alberta has established its own cap and trade program through regulations to control emission intensity of industry within the province. The Alberta system includes the creation of a carbon offset program. British Columbia and Quebec have joined the Western Climate Initiative, which is establishing a cap and trade system, including a carbon offset market.

Analysis by MKJA concluded a cap and trade system would not be efficient if it was confined to the NWT alone. Joining a regional initiative could provide some flexibility for the NWT to participate in trading emission offsets and credits in a larger market.

Renewable Portfolio Standards

A renewable portfolio standard provides governments with a mechanism to increase renewable energy generation using a cost effective, market-based and administratively efficient approach. A renewable portfolio standard requires electric utilities to supply a specified minimum amount of customer

load with electricity from eligible renewable energy sources. Standards could also be applied to industries generating their own power or by ensuring industries access power from utilities subject to a renewable portfolio standard.

The goal of a renewable portfolio standard is to stimulate market and technology development so, ultimately, renewable energy will be economically competitive with conventional forms of electric power. Governments create renewable portfolio standards because of the energy, environmental and economic benefits of renewable energy and, sometimes, other clean energy approaches, such as energy efficiency and combined heat and power.

A renewable portfolio standard creates market demand for renewable and clean energy supplies. Currently, governments in North America and around the world with renewable portfolio standards requirements mandate by law that between four and 30 percent of electricity be generated from renewable sources by a specified date.

Because it is a market-based program, a renewable portfolio standard has several operational benefits. It:

- Achieves policy objectives efficiently and at a relatively modest cost.
- Spreads compliance costs among all customers.
- Minimizes the need for ongoing government intervention.
- Functions in both regulated and unregulated state electricity markets.
- Provides a clear and long-term target for renewable energy generation that can increase investors' and developers' confidence in the prospects for renewable energy.

Framework for the Future

Energy Efficiency Standards

An energy efficiency standard is a specification containing a number of performance requirements for an energy-using device, house or building and limits the maximum amount of energy that may be consumed in performing a specified task. These standards can result in higher up-front purchase costs and are rewarded by lower life-cycle operating costs and reduced greenhouse gas emissions.

As well as moving the NWT towards its aggressive emission reduction targets, these standards could significantly cut heating bills for homeowners and businesses. The savings for consumers and benefits for the environment will compound every year the new standards are in place. As our commercial building and housing stock is slowly replaced and upgraded over the long term, territorial-wide energy efficiency standards could offer great strides in energy efficiency, while ensuring the construction of new homes and businesses remains affordable for Northerners.

In 2008, the City of Yellowknife adopted a by-law that requires all new single and multi-family residential homes to follow the EnerGuide for New Houses Procedure Guidelines and achieve a minimum rating of EnerGuide 80. The rating can be achieved through a variety of measures such as using specific insulation and building materials, the installation of an energy efficient furnace, windows, doors or appliances. The City of Yellowknife and GNWT already require their new buildings to be 25 percent more energy efficient than the minimum requirements laid out in the National Building Code of Canada.



Climate Change Adaptation

The NWT is experiencing some of the most rapid climate warming on the planet, resulting in significant impacts. The NWT is vulnerable to impacts from global warming as ecosystems, people and infrastructure are all dependent on cold sub-Arctic and Arctic climates. Observed climate change impacts and preliminary responses by the GNWT are outlined in the NWT Climate Change Impacts and Adaptation Report 2008.

Climate Change Adaptation has been defined as: "Actions that reduce the negative impacts of climate change, and/or take advantage of potential new opportunities." (Definition, Natural Resources Canada)

While mitigation addresses greenhouse gas emissions causing climate change, adaptation is concerned with how we plan and adjust to changed (warmer and more variable) climatic conditions and their impacts on people, ecosystems and infrastructure.

Current GNWT action on adaptation includes:

- Determining the vulnerability of infrastructure to climate change using risk management protocols.
- Consideration of climate change adaptation in building guides to provide best practices for changing snow loads and foundations on permafrost.
 - Evaluation of new technologies such as thermosyphons to maintain permafrost under foundations.
- Increased monitoring (including climatic monitoring).
- Predicting changes in forest ecosystems.
- Establishment of a GNWT climate change adaptation committee composed of representatives from departments, working with ENR to coordinate adaptation initiatives across government.



Photo Credit: GNWT/D. Brosha

Climate Change Adaptation

- Funding workshops on climate change adaptation (i.e. communities, permafrost) and regional climate change.
- Providing funding for community adaptation plans.
- Research on landscape disturbance and hydrology, including permafrost melt.
- Sharing knowledge and best practices with Nunavut and the Yukon through the Pan Territorial Adaptation Strategy released in April, 2011.

The GNWT is developing an adaptation plan to facilitate adaptation actions across the NWT. The goal of the plan is to make sure decision makers at all levels (including government) have the information needed to incorporate climate change considerations into their actions, plans, policies and business decisions. Elements of the plan include providing climate change scenario projections, adaptation tools (i.e. risk and vulnerability analysis) and enhanced monitoring so we can detect change in our environment and have the best information to make decisions.

As part of the adaptation plan, ENR will facilitate climate change adaptation actions in the NWT by becoming a resource for climate change adaptation information. ENR will provide information to enable decision makers at all levels to incorporate climate change considerations into their activities.

Adaptation will be integrated into government operations. On the ground adaptation actions within GNWT departmental program areas will be led by departments in their respective mandates with information and advice from ENR.



Implementation

Communication and Coordination

Given the number of actions underway to reduce emissions and the different organizations involved, the GNWT recognizes communication and coordination among the groups is vital to ensure consistency and avoid duplication.

To the extent possible, the implementation of the actions in this Strategy will occur on a cooperative and collaborative basis involving a wide range of government, non-government, business and other groups. The Climate Change Network

will continue to provide communications and coordination support to the various organizations involved in greenhouse gas mitigation and other climate change activities in the NWT.

Monitoring and Reporting

The Climate Change Network will establish a website to highlight and report on progress. Detailed descriptions of actions described in Appendix 1 of this document will be updated in future web-based editions. Partners are encouraged to contact the Climate Change Network if they want descriptions of their actions included.

Review of Progress

The NWT Greenhouse Gas Strategy will continue to be a “living document” and can be revised in future years, as more information becomes available. Changes in either the national and international context, in the knowledge base (science, analysis of impacts and technological advances) or in the NWT economy will result in an update of the Strategy. Actions will need to be refined as new knowledge is gained and as new technologies and practices become available.

ENR will track progress on an annual basis and begin another review of the Strategy in 2014. A revised Strategy will be developed for release in 2015.



Photo Credit: GNWT/D. Brosha

Websites and References

Information on government actions linked to climate action can be found on-line at:

The NWT Energy Plan

www.nwtenergy.ca

The NWT Hydro Review

<http://www.iti.gov.nt.ca/energy/HydroReview.shtml>

The NWT Electricity Review

<http://www.iti.gov.nt.ca/energy/ElectricityReview.shtml>

Energy Priorities Framework

<http://www.iti.gov.nt.ca/energy/EnergyPrioritiesFramework.shtml>

Arctic Energy Alliance

<http://www.aea.nt.ca/>

NWT Biomass Strategy

http://www.enr.gov.nt.ca/_live/documents/content/NWT_Biomass_Energy_Strategy_2010.pdf

NWT Climate Change Impacts and Adaptation Report

http://www.enr.gov.nt.ca/_live/documents/content/NWT_Climate_Change_Impacts_and_Adaptation_Report.pdf

Energy Conservation and Alternative Energy Technologies

http://www.enr.gov.nt.ca/_live/pages/wpPages/Energy_Conservation_and_Alt_Energy_Techn.aspx

State of the Environment Report

http://www.enr.gov.nt.ca/_live/pages/wpPages/SOE_Welcome.aspx

Department of Transportation Energy Saving Initiatives

http://www.dot.gov.nt.ca/_live/pages/wpPages/GreenTransportationDeptInitiatives.aspx

NWT Power Corporation

<http://www.ntpc.com/index.html>

Pan Territorial Adaptation Strategy, 2011

http://www.enr.gov.nt.ca/_live/pages/wpPages/climate_change.aspx

An Exploration into the Impact of Carbon Pricing in the Northwest Territories. MK Jaccard and Associates, 2011.

http://www.enr.gov.nt.ca/_live/pages/wpPages/climate_change.aspx

Assessing Emission Reductions from Potential Climate Policies in the Northwest Territories: Sector-specific "wedge diagrams".

MK Jaccard and Associates, 2011.

http://www.enr.gov.nt.ca/_live/pages/wpPages/climate_change.aspx

The Climate Registry

<http://www.theclimateregistry.org/>

Appendix 1

SUMMARY OF ACTIONS – 2011-2015

Electricity Supply		
Sector Goals	- By 2015, improve the emissions intensity of the electricity sector by 10%. - By 2015, increase the renewable energy supply by 12 Mega Watts.	
Actions	NWT Energy Plan and the Energy Priorities Framework GNWT	Use these or similar policy frameworks to focus action on the replacement of imported fossil fuels through the development, generation and use of NWT energy sources.
	NWT Hydro Strategy GNWT	Finalize the NWT Hydro Strategy to ensure hydro development proceeds in a manner reflecting the values and aspirations of NWT residents and maximizes the benefits associated with hydro development.
	NWT Hydro Strategy NT Hydro Corporation	Implement key aspects of NWT Hydro Strategy.
	Improve efficiency of existing electrical generation systems NTPC	Implement planned greenhouse gas reduction measures and monitor greenhouse gas emissions.
	Net Billing Pilot Program GNWT, NTPC, Northland Utilities Ltd., Public Utilities Board	Evaluate Net Billing Program and identify future programs for customers who supply renewable energy power into the electrical grid.
	Wind Energy GNWT, Aboriginal and federal governments, NTPC, industry and ARI	Continue working in partnership to assess wind resources and develop wind power in the NWT.
	Solar Electric GNWT, NTPC, communities	Finalize Solar Energy Strategy to use as plan for the GNWT, communities, businesses and industry to direct the use of solar technologies and build experience with solar energy systems.
	Geothermal GNWT, NTPC, communities	Complete evaluation and business case for geothermal energy in Fort Liard. Work with other communities in areas of high geothermal potential to evaluate opportunities.

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	NWT Biomass Energy Strategy GNWT, communities, NTPC	Implement the Biomass Energy Strategy; increase sustainable local harvest of wood in the NWT; guide the actions of GNWT departments and agencies with respect to the development of biomass energy systems (heat and electricity).
	Managing Our Forests ENR, Aboriginal governments, communities	Conduct forest resource assessments for the supply of local wood harvests and wood fuel.
	Natural Sinks and Sources ENR, Government of Canada	Continue work to assess the carbon sink status of forests in the NWT.
Buildings and Energy Efficiency		
Sector Goals	• By 2015, improve the emissions intensity of residential buildings by 25%. • By 2015, improve the emissions intensity of commercial and institutional buildings by 10%. • By 2015, increase the capacity of biomass heat in residential buildings by 100%. • By 2015, increase the capacity of biomass heat in commercial and institutional buildings by 100%.	
Actions	Information and Advice on Energy Efficiency and Renewable Energy AEA, ENR	Provide advice and practical support for those wishing to become more efficient or switch to more renewable resources.
	Rebates for Energy Efficient Upgrades AEA, ENR	Continue providing financial incentives for energy efficiency upgrades so businesses and residents can realize immediate monetary savings; encourage NWT suppliers and installers to become familiar with and stock energy efficient equipment; create a growing legacy of energy-wise citizens.
	ecoENERGY Retrofit – Homes Program AEA, ENR	Continue delivering the ecoENERGY Retrofit – Homes program so homeowners have information and incentives to renovate their homes for energy efficiency.
	Energy Efficiency in Public Housing NWT Housing Corporation	Continue implementing energy efficiency initiatives, including: • EnerGuide 80 (EGH 80) • Northern Sustainable Housing Project • Homeowner Renovations (CARE) • High Performance Heating Systems • ecoEnergy Retrofit Plan • Alternate Energy Sources • Design Review
	Capital Asset Retrofit Fund PWS	Continue using capital asset retrofit fund to upgrade GNWT buildings which are not energy efficient.

	Good Building Practices for Northern Facilities PWS	Maintain “Good Building Practice for Northern Facilities” to provide information on special requirements and guidelines for building design in the North.
	Biomass Heat for Government Facilities PWS	Maintain a strong focus on biomass technology and continue assessing the potential for high value biomass boilers and complete projects where economical.
	Solar Thermal Heating ENR, communities	Work with communities to install solar hot water systems at public swimming pools in Fort Providence, Tulita, Norman Wells and Aklavik.

Communities

Actions	Community Energy Planning Communities	Regularly review and evaluate Community Energy Plans to assess community energy use and energy mix and identify actions for more sustainable energy use.
	District Heat Systems NTPC, communities PWS, ENR, Gwich'in Tribal Council	Continue working on design of a residual heat project for two new PWS buildings located near the power plant in Inuvik. Continue working with ENR and Gwich'in Tribal Council to explore increasing available heat in Fort McPherson system with a biomass boiler.
	Local Food Production ITI, communities	Continue working with communities to expand local food production, including Small Scale Foods Program and Northern Agri-foods Program.

Industry

Sector Goals	- By 2015, improve the emissions intensity of northern industry by 10%. - By 2015, new industrial projects have a renewable energy generation capacity of 10% for their total demand.	
Actions	GNWT Support for Renewable Energy GNWT, industry	Complete business case studies and environmental assessment of the Taltson Expansion Project. Support assessment of wind, hydro, solar and geothermal opportunities.
	Private Investment in Renewable Energy Industry	Evaluate and, where appropriate, invest in renewable energy projects to meet project energy needs. Maximize use of renewable energy in new projects and/or consider opportunities to offset increased emissions with renewable energy projects elsewhere in the NWT.
	Diamond Mine Greenhouse Gas Reduction Planning and Reporting Industry	Prepare and implement energy use and greenhouse gas emissions management plans and report annually on greenhouse gas emissions.

Appendix 1

Transportation		
Sector Goals	- By 2015, improve the emissions intensity of our passenger transportation fleet by 10%. - By 2015, increase the renewable fuel content of our passenger transportation fleet by 5%.	
Actions	Transportation Energy Saving Initiatives DOT	Continue implementing "Green Light: Signalling the Department of Transportation's Commitment to the Environment."
	Federal Renewable Fuel Standard Regulations Government of Canada	Implement proposed national renewable content of 5% in gasoline used for personal transportation.
	Federal Vehicle Fleet Emission Standards Government of Canada	Implement proposed National Vehicle Emission Standard for 2012 to 2016 model year passenger vehicles.
Framework for the Future		
Actions	Carbon Pricing GNWT	Evaluate potential for carbon pricing options to increase renewable energy generation and energy efficiency without negatively impacting the cost of living in the NWT. Assess regional cap and trade initiatives and the implications of the NWT participating in trading emission offsets and credits in a larger market.
	Renewable Portfolio Standards GNWT, utilities	Evaluate potential for renewable portfolio standards to increase renewable energy generation using a cost effective, market-based and administratively efficient approach.
	Energy Efficiency Standards GNWT	Evaluate potential for energy efficiency standards to increase energy efficiency of energy-using devices, houses or buildings without negatively impacting the cost of living or availability of housing in the NWT.
Implementation		
Actions	Communication and Coordination ENR	Expand and enhance the NWT Climate Change Network to provide communications and coordination support to various organizations involved in greenhouse gas mitigation and other climate change activities in the NWT.
	Monitoring and Reporting ENR	Establish a Climate Change Network to highlight and report on progress.
	Review of Progress ENR	Begin review of the Strategy in 2014 and develop revised Strategy for release in 2015.



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