Northwest Territories Power Corporation

Greenhouse Gas Report

October 2001

NORTHWEST TERRITORIES POWER CORPORATION

Table of Contents

Message from our President and Chief Executive Officer

We are pleased to submit our Northwest Territories Power Corporation (Corporation) report to the Voluntary Challenge and Registry (VCR) Inc. We submitted our first Action Plan to the VCR in 1999 and received Gold Champion Level Reporter status for reporting on our GHG emissions. Since our last reporting, however, our organization has undergone a significant change. Up until March 2001, we generated and distributed power throughout both the Northwest Territories (NWT) and Nunavut. As of April 1, 2001, however, the newly created Nunavut Power Corporation became Nunavut's new power provider. Now that division of the Nunavut and NWT Power Corporations is complete, we are reaffirming our commitment to reporting and establishing a new baseline of emissions generated only from facilities in the NWT.

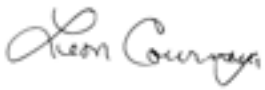
In 2000/01, the Corporation produced 61,145 Tonnes of $C0_2$ equivalent GHG emissions. A total of 385,883 MWh were produced last year to meet customer demand and included both Corporate and purchased power generated from diesel, natural gas and hydro sources. Our 2000/01 emissions were a successful 47% decrease from 1990/91 (Baseline) levels.

Leon Courneya
President and CEO

Although the Corporation has been successful in decreasing our greenhouse gas emissions below the 1990 Baseline levels and the Corporation's internal target levels of 10 per cent below 1996/97 levels, the Corporation will strive to further reduce emissions. Through programs to increase Corporate-wide fuel efficiency, reduce our own station service demands, promote public awareness to reduce customer demands and carryout research into alternative sources of power generation, we will continue to reduce our production of greenhouse gases.

We recognize our responsibility to provide environmentally sound power generation to our unique northern communities. Through regular reporting to the VCR, we will monitor our progress in reducing greenhouse gas emissions and annually assess our success and initiatives to reduce greenhouse emissions in the north.

Yours truly,



Leon Courneya
President and Chief Executive Officer

1.0 Introduction

Global Climate Change is one of the paramount issues affecting society today. The natural blanket of greenhouse gases that warms the earth is negatively affected by a number of human activities, including the burning of fossil fuels. These activities have increased the concentrations of greenhouse gases and the atmosphere's ability to retain heat by enhancing the natural greenhouse effect.

It is believed by modern scientists that the effects of global warming will be most strongly felt in higher-latitude zones, including Canada's Arctic. Some of the effects of global warming on northern ecosystems include melting permafrost, invading southern forests, increases in water body temperatures, changes to natural migratory routes and altered regional weather patterns. All of these effects would have major implications on the lives of northern residents.

The Northwest Territories Power Corporation (Corporation) provides electricity, either wholesale or retail, to all but three communities in the Northwest Territories (NWT). Greenhouse gas (GHG) emissions produced by all sources in the Northwest Territories, including power generation from fossil fuels, represent only 0.2% of Canada's national emissions.[1] Although the Corporation has already reduced GHG emission levels below the Kyoto goal of 6% below 1990 levels, we are committed to continued operations that, where feasible, will maintain or further reduce our GHG emission levels.

The Voluntary Challenge and Registry (VCR) Program challenges Canadian business and government to voluntarily limit and reduce GHG emissions. In 1999 the Corporation submitted to the VCR and was awarded Gold Champion Level Reporting Status. The following report is our 2000/01 submission to the VCR, illustrating our continued commitment to regular reporting and initiatives to reduce GHG emissions.

1.1 New Action Plan Submission

The Northwest Territories Power Corporation is a Crown corporation wholly owned by the Government of the Northwest Territories. The Corporation was created in 1988 when the Territorial Government purchased shares of the federally owned Northern Canada Power Commission. At that time, the Corporation generated and delivered power to 54 communities in both the NWT and Nunavut. In November 1999, after several years of study and negotiation, the Government of Nunavut decided to form its own utility, the Nunavut Power Corporation (NPC). From April 1, 1999 to March 31, 2001 the Corporation operated in Nunavut under a Transition Agreement covering that period. On April 1, 2001 the NPC assumed responsibility for power generation and delivery in Nunavut.

Today, we are the primary power producer in the Northwest Territories. We distribute electricity to the end-use consumer in 26 communities, and supply electricity on a wholesale basis to two distributing utilities, that in turn retail electricity to customers in the Yellowknife and Hay River areas. As a Crown corporation, we have a mandate to operate as a viable business enterprise.

Due to division of the Corporation into NWT and Nunavut assets and the work involved in transferring uninterrupted power generation duties to the new Nunavut Power Corporation, we were unable to complete our report to the VCR for the 1999/00 fiscal year. Now that division of the Nunavut and NWT Power Corporations is complete, we are reaffirming our commitment to reporting and establishing a new baseline of emissions generated only from facilities in the NWT.

[1] Northwest Territories Greenhouse Gas Strategy. 2001. Resources, Wildlife and Economic Development

1.2 Corporate Commitment and Internal Practices on Climate Change

The Corporation operates within a Corporate Strategic Plan that was developed in 1999 and is reviewed annually by Senior Management and the Board of Directors. The following initiatives are outlined in the Strategic Plan to maintain or further decrease our production of GHG emissions:

- We will reduce GHG emissions on a per kilowatt hour basis by 10% from 1996/97 levels in 10 years. **We have already achieved this target and will continue, where feasible, to maintain or further decrease our production of GHG emissions**;
- We will endeavour to increase our supply-side energy efficiencies. By increasing our use of technology such as the Internet, Turtle meters, more fuel efficient engines, Programmable Logic Controllers (PLCs) and more efficient street lights, we will reduce our costs, improve plant efficiencies and reduce GHG emissions;
- We will also strive to increase our own energy efficiencies through efforts to decrease station service at our plants and offices and increase the utilization of residual heat within our own facilities;
- We will develop residual heat projects in as many communities as economically feasible. While this does not directly reduce our GHG emissions, by reducing the volume of fuel required by a remote community, the overall energy (derived from fossil fuels) required to transport fuel to the community is reduced;
- We will assist in the development of natural gas infrastructure independently and in joint ventures to ensure a supply of gas for power generation and to decrease the production of GHG emissions;
- We will pursue additional hydro opportunities for the NWT and strive to provide additional hydro for the mines;
- We will monitor the development of alternate technologies such as wind and solar power generation and fuel cells; and
- We will encourage conservation of energy through customer education programs. Through demand-side energy conservation, we reduce the amount of energy required by customers. Especially in our remote communities, this results in less diesel fuel burned to meet community electricity demands. There is an added, indirect, GHG savings to reducing diesel fuel consumption in remote communities. The less fuel required in the community translates into GHG emissions reductions transporting fuel to that community.

We also participate in the national climate change process outside of direct Corporate initiatives to reduce our own contributions to Canada's GHG emissions. Our Environmental Department was actively involved in the development of the NWT Greenhouse Gas Strategy by participating in the Working Group and Steering Committee.

1.3 Management System

Our GHG emissions are monitored at the most senior levels of the Corporation; the Board of Directors and the President and CEO. The Minister responsible for the Corporation is also kept advised of major issues regarding the Corporation, including our GHG programs. Beginning in 1998/99, our VCR submission became the method of analysing and monitoring our success in GHG reductions. Corporate data from the Environmental, Financial and Engineering departments is compiled, analysed and reviewed at a management level to generate the VCR report. The President and CEO reviews the report prior to submission to the VCR. Once submitted, the Corporation's status on GHG emissions is reported to both the Board of Directors and the Minister.

The President and CEO and the Board of Directors also review and approve any GHG initiatives through the annual capital and financial plan process as well as the annual review and approval of the Corporation's Strategic Plan.

External verification of Corporation data, including fuel consumption and generation statistics, are annually reviewed and confirmed by the Auditor General.

Through the Public Utilities Board (PUB) review process, all aspects of our operations, including our GHG initiatives and their associated costs and benefits, are reviewed publicly and by the PUB.

2.0 Base Year Quantification

Canada has made a commitment, under the Kyoto Protocol to reduce its greenhouse gas emissions by six percent below 1990 levels by the year 2012. In keeping with this initiative, the Corporation utilized its 1990/91 fiscal year to create a Baseline of emissions against which to compare subsequent years.

2.1 Baseline Quantification

In 1990/91, the Corporation produced 114,710 Tonnes of $C0_2$ equivalent emissions. Table 1 illustrates our 1990/91 emissions according to GHG type. Hydro, diesel and purchased natural gas generation accounted for 61%, 37% and 2% of our total generation, in 1990/91, respectively. Figure 1 illustrates our generation according to source and Table 2 illustrates our GHG emissions according to generation source.

In 1990/91, the Corporation did not own any natural gas generating facilities. All the natural gas generation emissions were indirect emissions resulting from the purchase of natural gas generation in Norman Wells.

Table 1. Baseline Emissions Estimates by Gas Type

	Tonnes			
Fiscal Year	$C0_2$	CH_4	N_20	Total Emissions
1990/91	109,400	243	5,067	114,710

Figure 1. Power Generation by Source for 1990/91 (Baseline)

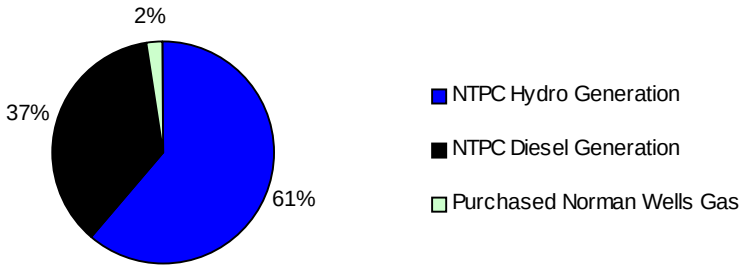


Table 2. Baseline GHG Emissions by Source

	Direct Emissions		Indirect Emissions	
Fiscal Year	Diesel Generation (Tonnes)	Natural Gas Generation (Tonnes)	Natural Gas Generation (Tonnes)	Total Emissions (Tonnes)
1990/91	109,400	0	243	**114,710**

2.2 Direct and Indirect Emissions

Direct GHG emissions result from the combustion of fossil fuels to generate electricity. Only generation from our Corporation owned diesel and natural gas facilities are considered direct emissions.

Indirect emissions are those created or saved by operations not under our direct control but which we affect through our business decisions. These include emissions from purchased natural gas generated power and emissions saved as the result of residual heat projects provided to buildings not owned by the Corporation.

2.3 Emissions Calculations

Greenhouse gas emissions to date have been calculated using the Corporation's actual fuel consumption data for the periods covering 1990/91 to 2000/01. Combusted fuel is then converted to GHG emissions using the emissions factors provided in the *1999 VCR Registration Guide* (VCR Guide) as follows:

Table 3. Emissions Factors by Gas Type

Source	$C0_2$	CH_4	N_20
Natural Gas Industrial Boiler	1,880 g/m3	0.048 g/m3	0.02 g/m3
Diesel Motor	2,730 g/l	0.26 g/l	0.40 g/l

When measurements of greenhouse gases are expressed as carbon dioxide equivalents, the following equivalency factors provided in the VCR Guide were utilized:

Table 4. Carbon Dioxide Equivalency Factors

Greenhouse Gas Type	Factor
CO_2	1
CH_4	21
N_20	310

Emissions produced from oil-fired furnaces in Corporation owned housing, Corporation office buildings, etc. are not reported. Due to the low volume of Corporation owned vehicles (61 in total), GHG emissions produced from vehicles are also not included in this report.

Forecasted emissions are based on our annual Load Forecast. Future power generation for 2001/02 to 2006/07 is divided by three-year weighted averages for plant efficiencies. This method of forecasting incorporates previous year improvements to fuel efficiencies, upgrades to streetlights and transmissions lines and reductions to station service to forecast additional years. Average hydro generation (assuming normal precipitation levels) was used to determine the amount of diesel generation required for those communities where diesel generation supplements hydro generation.

3.0 Greenhouse Gas Emissions

Diesel combustion for the production of power generation is our major source of GHG emissions. Since 1990, diesel generated emissions have accounted for an average 96% of our total GHG production. The following section illustrates our GHG production and how our efforts to reduce our reliance on diesel generated power have successfully reduced our overall production of GHG emissions.

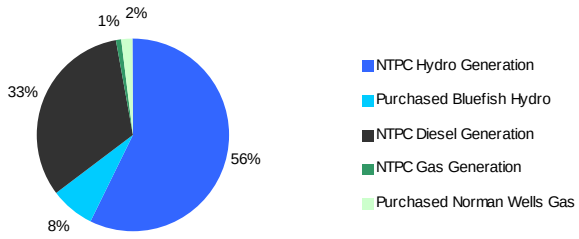
3.1 Power Generation

The Corporation operates 31 power plants in 27 communities, including the standby diesel generation facilities within the two hydro systems and the Inuvik natural gas generation system. The Corporation's facilities include hydroelectric, diesel and natural gas generation plants, transmission systems, and numerous isolated electrical distribution systems. The Corporation also owns and operates alternative energy assets used for the supply of residual heat and wind generation. We also purchase GHG-free hydroelectric power from Miramar Mining Company Bluefish Hydro generating station (Bluefish) and natural gas generated power in Norman Wells.

These systems serve a population of approximately 42,000 people located in an area of 1.171 million square kilometers. Approximately 67% of the population lives in the North and South Slave regions while the rest of the population resides in small communities widely dispersed throughout the Northwest Territories. The total electrical load is approximately 65 MW with isolated power systems having generating capacities ranging from 59.6 MW at Snare/ Yellowknife to 190 kW at Colville Lake. As these systems are isolated and unconnected, each must be planned for and operated independently.

The following graph shows our average power generation by source from 1990/91 to 2000/01.

Figure 2. Average Power Generation by Source from 1990/91 to 2000/01



Since 1990, the Corporation has been maximizing hydroelectric power generation through improved operations, major changes to our hydroelectric infrastructures and purchasing excess hydroelectricity from Bluefish Hydro.

In the absence of hydro generation, we opt for natural gas generated power that produces fewer GHG emissions per kilowatt of power than diesel. In 1999, we transformed one of our largest diesel facilities, the Inuvik plant, into a natural gas facility and we also purchased natural gas generated power in Norman Wells.

Through changes to our operating infrastructure and purchasing less GHG intensive generation sources, we have been able to maintain our diesel-generated power at approximately 16 per cent per year. However, from year to year, the Corporation's GHG emission levels are driven predominantly by the amount of hydroelectric power produced to service customer demand. Any deficiency in demand, which cannot be met by hydro generation, is offset by diesel generation at both our Snare and Taltson hydro systems. This means that in low water years, we produce more diesel-generated power because we are unable to generate sufficient hydropower due to lack of water. Low water years also affect our ability to purchase additional hydropower from Bluefish Hydro. If Bluefish Hydro is unable to produce sufficient power for Miramar Mines, then the Corporation meets the additional power requirements through diesel generation.

Table 5. GHG Emissions Produced Relative to Generation Source

	Direct Emissions		Indirect Emission	
Fiscal Year	Diesel Generation (Tonnes)	Gas Generation (Tonnes)	Gas Generation (Tonnes)	Total Emissions (Tonnes)
1990/91	113,273	0	1,437	114,710
1991/92	107,213	0	1,453	108,667
1992/93	109,476	0	1,463	110,939
1993/94	114,250	0	1,542	115,792
1994/95	156,440	0	1,533	157,972
1995/96	158,395	0	1,366	159,761
1996/97	103,592	0	1,294	104,887
1997/98	87,237	0	1,444	88,682
1998/99	80,407	0	1,452	81,859
1999/00	51,512	6,511	1,360	59,382
2000/01	48,681	11,122	1,341	61,145
2001/02	49,867	11,778	1,390	63,034
2002/03	61,094	12,462	1,385	74,940
2003/04	58,034	12,667	1,408	72,109
2004/05	60,960	12,825	1,419	75,205
2005/06	63,869	12,969	1,428	78,266
2006/07	66,843	13,141	1,439	81,423

3.2 Fuel Consumption

The Corporation's consumption of diesel fuel for generation purposes, our major source of GHG emissions, has decreased dramatically over the years. From 1990/91 to 2000/01, diesel consumption by the Corporation has decreased by 56%. Diesel fuel consumption has decreased for a number of reasons including reduced industrial sales and demand, increased diesel engine efficiency, hydro generation and other initiatives undertaken by the Corporation. Our decreased reliance on diesel-generated power has allowed us to reduce our diesel-generated emissions from 113,273 tonnes in 1990/91 to 48,681 tonnes in 2000/01.

The Corporation has also increased its consumption of less GHG intensive natural gas. Previous to 1999/00, the Corporation's only source of natural gas generated electricity was purchased power in Norman Wells. Following the conversion of our Inuvik diesel plant to natural gas, our natural gas generated power increased on average from 2% to 6% as a product of our total annual power generation. Thus, the Corporation produced small amounts of both direct and indirect natural gas generated power GHG emissions.

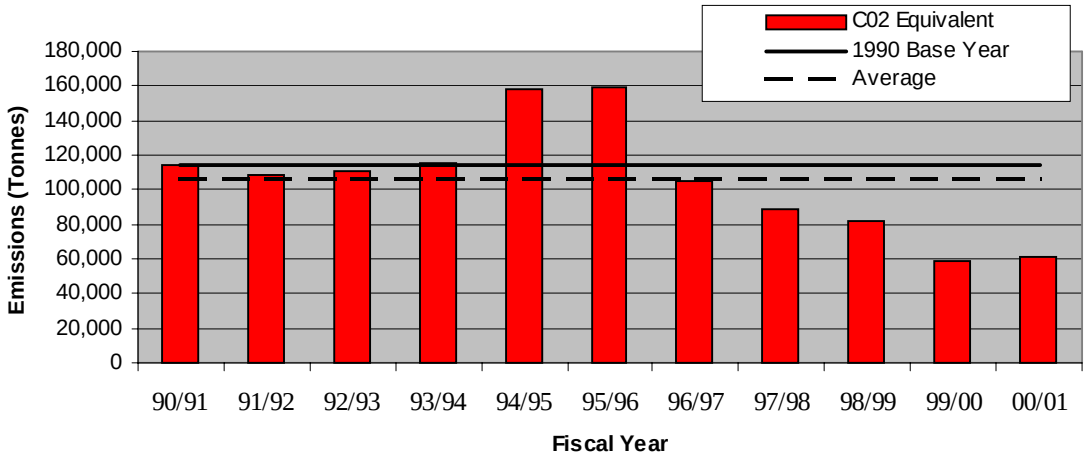
3.3 Actual Emissions

In 1990, the Corporation produced the equivalent of 114,710 tonnes of carbon dioxide emissions. At that time, 37% of the Corporation's total electricity generation was derived from diesel sources, 2% from gas generation and 61% from hydro generation.

Since that time, the Corporation has made significant changes to its generating infrastructures, which have dramatically reduced the overall production of GHG emissions.

Since 1990, the Corporation has achieved an average annual GHG emissions reduction of 4% per year. The Corporation's GHG emissions have decreased well below the 1990 Baseline levels except for the 1994/95 and 1995/96 years. These years were unusually low water years that necessitated the increase in diesel generation in order to augment hydroelectric generation to meet customer demands. In average and above average water level years, the Corporation was successful in maintaining GHG emissions levels well below target levels.

Figure 3. Total CO_2 Equivalent Emissions Between 1990/91 to 2000/01



The dramatic decrease in emissions in 1996/97 was not only the result of higher water levels from the previous two years. Even with additional water available for hydro generation, in a business-as-usual scenario, the Corporation would have still exceeded the 1990 Baseline in 1996/97. Generation for 1996/97 actually exceeded 1994/95 generation, however, the GHG emissions produced from that generation were significantly lower. This dramatic reduction in GHG emissions was the result of purchasing above average amounts of hydro generated power from Bluefish Hydro and undertaking significant changes to our own Snare Hydro infrastructure.

Firstly, in 1996/97, the Corporation entered into an agreement with the Dogrib Power Corporation to operate and maintain a hydro generating station on the Snare River System. The Snare Cascades Hydroelectric Station is the first wholly owned First Nations facility in Canada. The station has an output of approximately 3.3 MW and has been on-line since mid 1996/97. Since connecting to our Snare Hydro system, the Cascades station has produced approximately 15 per cent of the total Snare Hydro generation per year.

Snare Cascades is utilized to provide power into the Snare/Yellowknife System. The energy generated by the Snare Cascades Station provides power that would otherwise have to be supplied utilizing diesel generators at the Yellowknife Power Plant. Since its start-up, Snare Cascades has produced approximately 132 GWh and displaced the consumption of approximately 35.5 million litres of diesel fuel (based on an average diesel efficiency of 3.72 kWh/l in Yellowknife). This equates to a reduction of 101,676 tonnes of GHG emissions.

Also in 1996/97, an additional generating unit was installed at the Snare Rapids Hydro Facility. Since its installation, this unit has displaced approximately 4.1 million litres of diesel fuel (based on an average diesel efficiency of 3.72 kWh/l in Yellowknife) and approximately 11,880 tonnes of CO_2 equivalent GHG emissions.

Our 1996/97 hydro developments and purchase of additional hydropower from Bluefish Hydro resulted in a 17% increase in hydro generated power and a corresponding 17% decrease in diesel-generated power.

1999/00 was the Corporation's most successful year since 1990 at reducing GHG emissions. The success in this year can be attributed to our previous hydro developments, high water levels allowing us to maximize our hydro generation and the 1999 retrotrofit of one of our largest diesel plants, Inuvik, from diesel to natural gas generation.

In 1997, the Corporation was approached by the Inuvialuit Petroleum Corporation to discuss the possibility of utilizing natural gas to generate electricity in Inuvik. By the end of 1997, the two parties had an agreement to supply natural gas to our Inuvik Power Plant. By September of 1999, we had installed two natural gas gensets and ancillary heat recovery equipment totalling 10MW of Combined Heat and Power (CHP).

Since September of 1999, natural gas has been utilized to produce approximately 80% of Inuvik's electrical power requirements. Diesel generation is still utilized to supplement natural gas generation while the gas engines are out of service, when there is a loss of gas supply, or for peaking purposes. Natural gas has been utilized to produce approximately 43,000,000 kWh of electricity since September of 1999. This equates to approximately 11.3 million litres of diesel fuel not being consumed nor being transported to site.

Table 6. GHG Emissions by Gas Type

Fiscal Year	$C0_2$ (Tonnes)	CH_4 (Tonnes)	N_20 (Tonnes)	Total Emissions (Tonnes)	Percent Change from 1990/91	Emission Intensity
1990/91	109,400	243	5,067	114,710	0%	31%
1991/92	103,640	230	4,796	108,667	-5%	29%
1992/93	105,807	235	4,898	110,939	-3%	28%
1993/94	110,436	245	5,111	115,792	1%	28%
1994/95	150,640	336	6,997	157,972	38%	39%
1995/96	152,338	340	7,083	159,761	39%	37%
1996/97	100,030	222	4,634	104,887	-9%	25%
1997/98	84,591	187	3,904	88,682	-23%	21%
1998/99	78,088	173	3,598	81,859	-29%	22%
1999/00	56,939	115	2,329	59,382	-48%	15%
2000/01	58,815	112	2,218	61,145	-47%	16%
2001/02	60,646	115	2,273	63,034	-45%	16%
2002/03	72,023	139	2,777	74,940	-35%	19%
2003/04	69,335	133	2,641	72,109	-37%	18%
2004/05	72,293	139	2,773	75,205	-34%	19%
2005/06	75,217	146	2,903	78,266	-32%	20%
2006/07	78,235	152	3,037	81,423	-29%	20%

Emissions intensity is a product of the CO_2 equivalent emissions produced in relation to our total power generation from all sources. As diesel generated power is our major source of GHG emissions, the lower our emissions intensity percentage the more successful we are at meeting our power generation demands from other sources.

3.4 Forecast Emissions

The Corporation's average forecasted GHG emissions are 35% below the 1990 Baseline levels for the period of 2001/02 to 2006/07. Emissions are trending slightly upwards for those years, although still remaining significantly below 1990 levels. Increases in demand is the primary factor driving the slight upwards trend. Customer demand is expected to increase from 392,298 MWh in 2001/02 to 404,966 MWh in 2006/07. Load forecasts for that time period predict this increase based on anticipated demands from increased commercial developments in the NWT.

Figure 4. Forecast CO_2 Equivalent Emissions as a Product of Total Generation

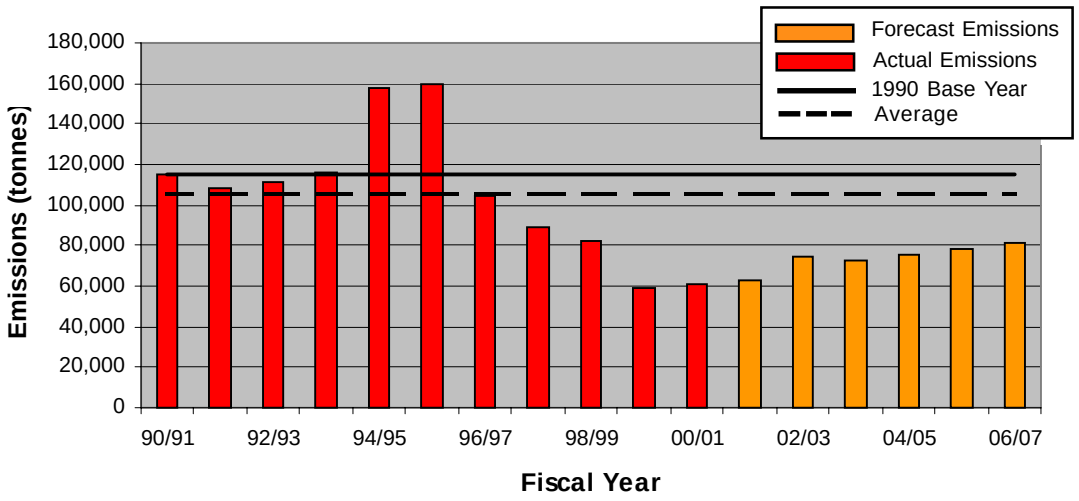
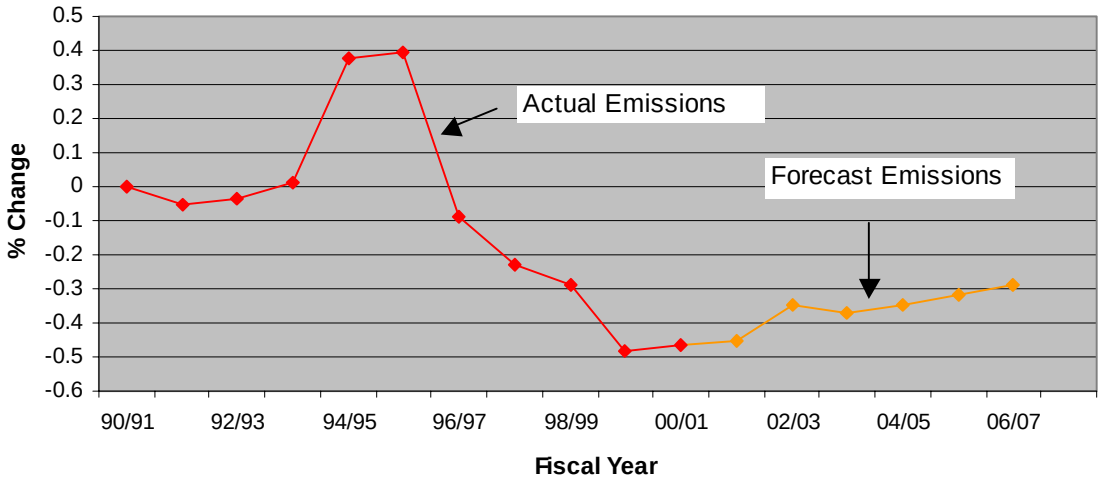


Figure 5. GHG Emissions Per Cent Change Relative to the Baseline



As the amount of hydro generation greatly affects our GHG emissions in any given year, it is important to realise that the forecasted hydro generation is based on a long-term average water level allowing production of 177,000 MWh of hydropower per forecasted year. Therefore, depending on the actual amount of water available for hydro generation in each forecasted year, actual emissions will vary regardless of initiatives taken to reduce GHG emissions. Thus, as we have had high water years for the last few years, our GHG emissions forecast will appear to increase although in actuality they may not.

We have currently spent approximately two million dollars investigating the feasibility of additional hydro developments on our existing Snare Hydro system. We are actively pursuing a joint venture with the Dogrib First Nation to provide hydro power in support of economic development in the NWT. To date, these activities primarily included mining developments.

When natural gas becomes more readily available to northern communities, we will consider the economics and GHG reduction benefits of retro-fitting existing diesel power plants to natural gas.

Past projects which have resulted in GHG reductions are reflected in our forecasted emissions for the period between 2001/02 and 2006/07. Using techniques such as three-year weighted averages for fuel efficiencies and using the most recent year's data to forecast future years, captures trends which result in GHG reductions and represents them in future forecasts. This is how we develop our "Business-As-Usual" forecasts to include existing efforts to improve our supply-side management through improved diesel engine efficiency programs, reduce station service, upgraded streetlights and reduce line losses from transmission and distribution systems.

Any significant deviations from our business-as-usual forecast, like new hydro or natural gas generation projects, are not accounted for in forecast numbers.

We are implementing education programs aimed at improving demand-side management through decreasing customer demand this year. The benefits of this program cannot be predicted this early in the venture. However, we will monitor and report on our progress in future reports.

As the Corporation has successfully decreased its emissions below the 1990 baseline and our own internal target of 10% below 1996/97 levels, we feel our business-as-usual forecast, capturing improved trends in our existing initiatives, is sufficient for the time being. Any major changes to our operating infrastructure will be undertaken if they represent an economic benefit as well as a savings in GHG reductions.

4.0 Results Achieved and Measures to Achieve Targets

The Corporation has successfully reduced GHG emissions through a number of programs since 1990/91. The following section describes individual initiatives that have contributed to GHG reductions and/or their impacts on future reductions.

Table 7. Cumulative Emissions Savings from all Initiatives Since 1990/91

1990/91 to 2000/01	CO_2 Equivalent Reductions					
	PLC and/or Engine Installation	Residual Heat	Station Service	Alternative Generation/ Fuels	HPS Streetlights	Total
	12,173	8,200	6,004	393,739	454	**420,570**

The Corporation is continuously trying to improve its overall efficiency. By improving our operating efficiency, the Corporation reduces its reliance on fossil fuels to generate and distribute energy to its customers. The benefits of improving efficiency reaches beyond the Corporations direct emissions.

The vast geographic area and remoteness of the region means that significant resources and energy must be expended in order to transport fuel to each of the Corporations' sites. If the Corporation can reduce the volume of fuel it requires, it also reduces the overall energy (derived from fossil fuels) required to transport the fuel to site. All of the Corporations' sites have fuel delivered via truck tanker or tug and barge.

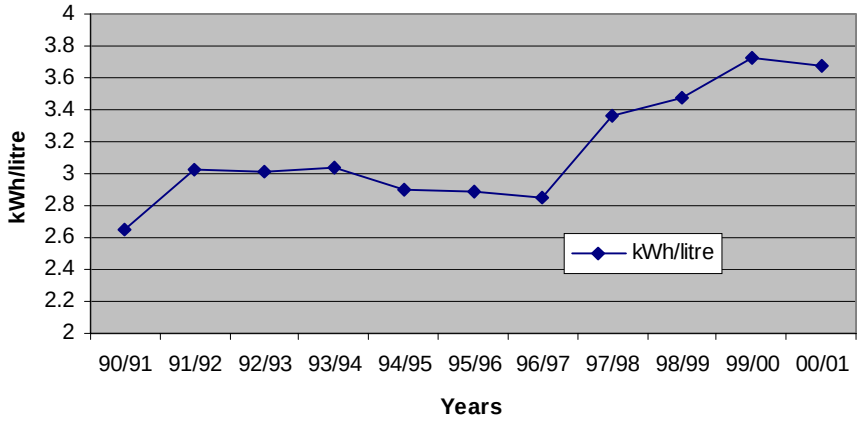
Examples of individual projects undertaken by the Corporation to reduce its dependence on fossil fuels and reduce GHG emissions follow below.

4.1 Fuel Efficient Engine Upgrades

In recent years, diesel engine technology has improved the overall fuel efficiency of engines while reducing emissions. Engine selection analysis is based primarily on life-cycle costs. The most significant of those life-cycle costs is fuel. Fuel accounts for 85-90% of the capital and operating costs of a diesel genset over its life. Therefore it is extremely important to the Corporation to replace its aging equipment with the most fuel-efficient units that are available.

Some examples of improved fuel efficiency are illustrated below:

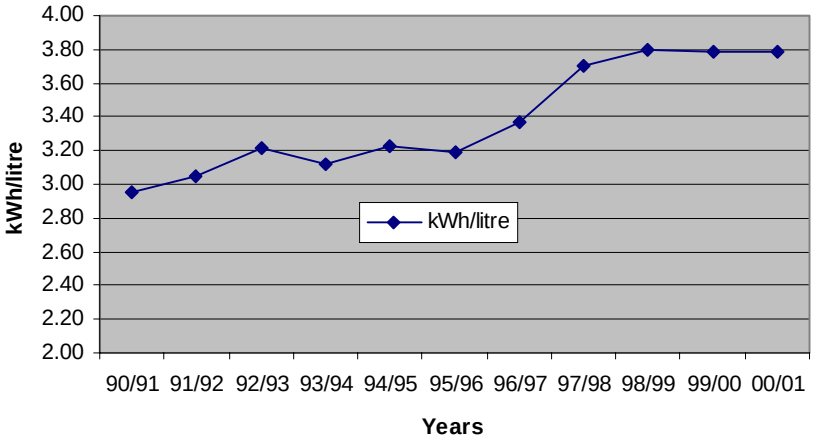
Figure 6. Wrigley Power Plant Efficiency from 1990/91 to 2000/01



Wrigley

The Wrigley power plant was operating at a relatively low efficiency up until 1996/97. At that time a new electronically fuel injected engine was installed in the plant. An immediate improvement in fuel efficiency was achieved. This is illustrated in the figure below. The fuel efficiency has increased approximately 22% on average over the past 4 years. This translates into approximately 256,000 litres of fuel not being consumed and CO_2 equivalent emissions reduction of 733 tonnes.

Figure 7. Lutsel K'e Power Plant Efficiency from 1990/91 to 2000/01



Lutsel K'e

A new electronically fuel injected genset was installed at the Lutsel K'e plant in February 1997. Prior to this, the plant was operating at a relatively low efficiency (3.16 kWh/litre). Operation of the new genset improved efficiency dramatically within the first year. The plant efficiency has now levelled out at an average of approximately 3.79 kWh/litre. This is an improvement of approximately 19% since 1997. A fuel consumption reduction of approximately 275,000 litres has been realised since the new genset was installed. This represents a GHG emission reduction 788 tonnes of $C0_2$ equivalent emissions.

The following table illustrates the PLC and/or engine upgrades that have been undertaken since 1990/91.

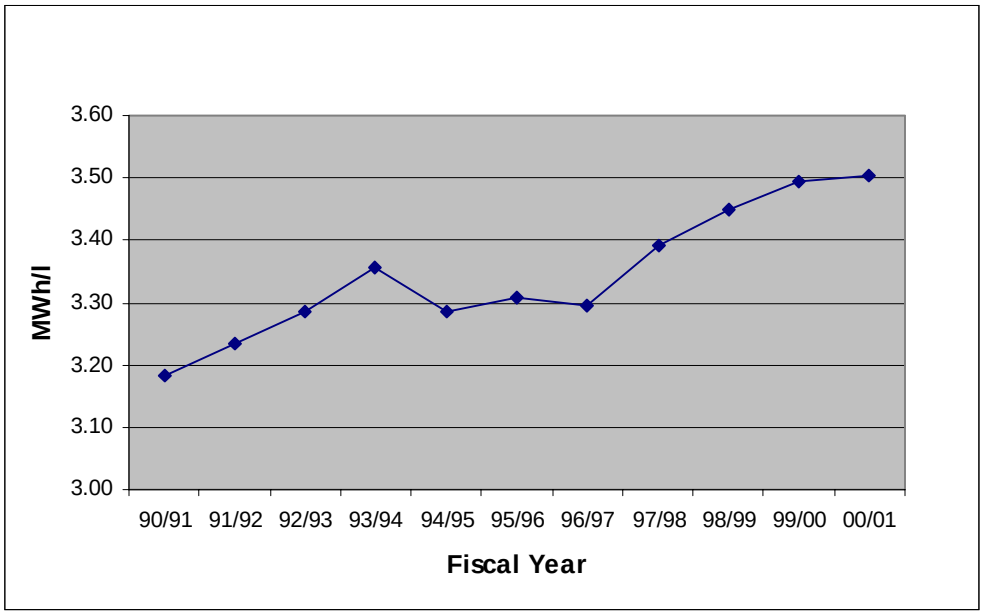
Table 9. PLC and/or Engine Upgrades from 1990/91 to 2000/01.

Year	Plant	C02 Equivalent Emissions Savings (tonnes)
1991/92	Wrigley	1,270
1992/93	Inuvik	3,600
1993/94	Fort Good Hope	232
	Tsiigehtchic	624
1994/95	Fort McPherson	581
	Paulatuk	315
1995/96	Sachs Harbour	612
1996/97	Tulita	675
	Fort Liard	300
	Colville Lake	165
	Lutsel K'e	788
1997/98	Holman	667
	Deline	648
	Wrigley	540
1998/99	Colville Lake	150
	Fort Simpson	576
1999/00	Aklavik	430
Total		**12,173**

The following graph illustrates our Corporate efficiency trend which is improving with time. The Yellowknife and Inuvik plants have been excluded from this graph as they skew the data. Yellowknife and Inuvik are two of our largest diesel generating plants, which run as backup diesel generators now in the event that hydro or natural gas generation, respectively, is unavailable. Due to the low frequency with which these plants now operate, their fuel efficiencies have decreased accordingly.

Our day-to-day operations, maintenance and capital planning are focussed on maintaining or improving our fuel efficiency. Therefore, our upward trend in fuel efficiencies are reflected in our forecasts for fuel consumption, and hence, our forecasted GHG emissions.

Figure 8. Corporate Fuel Efficiencies Excluding Yellowknife and Inuvik



4.2 Programmable Logic Controllers (PLC)

Programmable Logic Controllers automate power plant operations and help ensure that the appropriate engine is operating to most efficiently service the current loads. This contributes to improved diesel fuel efficiency. However, as it is impossible to separate PLC improvements to efficiency from those improvements gained by more efficient engine upgrades, the benefits of PLCs and new engines have been calculated together in the previous section.

To date, other than the standby plants (Fort Smith and Fort Resolution), all but three plants currently have some level of PLC automation. These remaining three plants will be automated by 2004/05.

4.3 Residual Heat Recovery/Distribution

In recent years the corporation has been a leader in a number of projects to recover and distribute waste heat from its diesel engines to external customers and for its own purposes. The Corporation is continuing to look into other opportunities where the export of residual heat makes viable sense.

Figure 9. Cumulative CO_2 Equivalent Savings From Residual Heat Projects Between 1990/91 to 2000/01

	CO_2 Equivalent Emissions Savings (tonnes)	
Plant	**Direct**	**Indirect**
Wha Ti		1,397
Fort Simpson		2,112
Fort McPherson	1,812	
Inuvik-own buildings	1,819	
Inuvik-WTP		1,060
Total	**3,631**	**4,569**

Two of our larger residual heat projects are illustrated below.

Inuvik

Concurrent with the introduction of natural gas to the community of Inuvik, the incumbent High Temperature Hot Water system utilized to temper the town's water supply, supply heat to certain buildings, and provide freeze protection of the utilidor system was decommissioned in 1999. The heat utilized for this system came from three large diesel fired boilers operated by the Corporation. When the system was decommissioned in 1999, it meant that the Corporation needed to install its own system to provide heat to its two power plant and administration buildings.

Instead of installing boilers, a residual heat recovery/distribution system was installed. The system recovered heat from the lube oil, jacket water, and exhaust gases on the two new natural gas gensets. The heat distributed to the Corporation's buildings displaces heat formerly generated utilizing diesel fuel. The combined heating requirements of the two Plants (K-Plant and EMD Plant) and the administration building is approximately 5,150,000 kWh/year. By utilizing residual heat from the gensets, the Corporation has displaced the consumption of approximately 635,000 litres of diesel fuel annually which equates to a 1,819 tonne savings of CO_2 equivalent emissions. This is a direct emissions savings for the Corporation.

The Corporation also provides heat to the Inuvik Water Treatment Plant (WTP). This heat is used to temper the water. Approximately 3,000,000 kWh of heat is exported to the WTP annually. This equates to approximately 370,000 litres of displaced diesel fuel and a savings of 1,060 tonnes of CO_2 equivalent emissions. This is an indirect emissions savings because it is WTP diesel and emissions that are displaced.

Fort McPherson

In 1997/98, the Corporation, through the auspices of Aadrii, a Corporation-First Nations joint venture, installed a residual heat recovery/distribution system in Fort McPherson. The system recovers and distributes residual heat from the jacket water and exhaust gases to a number of near by buildings. To date, the project has been a huge success. The waste heat from the engines is utilized to displace diesel fuel that would be burnt by the businesses being served. This project has resulted in indirect savings of 1,812 tonnes of CO_2 equivalent emissions.

The Corporation is currently investigating the possibility of providing residual heat to a number of community buildings in Aklavik. If this project is completed, it will displace approximately 229,535 litres of diesel fuel per year. This would equate to an indirect savings of 657,417 tonnes of CO_2 equivalent emissions.

The Corporation makes every effort to utilize heat from engines to heat our own buildings and to preheat idle engines. These projects reduce our station service by negating our need for additional heating, so GHG savings are captures in the Reduction in Station Service in the next section.

4.4 Reduction in Station Service

The Corporation is continuously investigating ways to reduce its own consumption of energy. As each remote diesel plant is unique, measures to conserve energy at each plant are investigated differently. Some of the areas identified to reduce station service at our plants include: replace in-plant electric space heating with residual heat from engine jacket water systems, replace engine electric block heaters with residual heat circuits utilizing jacket water heat from operating engine(s), replace inefficient lighting, install separate lighting circuits so that only specific lights are on at certain times, install variable frequency drives (VFD) on radiators, and install photosensors on all outside lighting.

Some of the station service reductions have also come through education and awareness. Plant personnel are made aware of ways to reduce station service. Small measures like turning off lights when plants are unattended, turning heaters down or off when not required and ensuring that any pipes or other appurtenances that require heat tracing during winter months are shut-off during spring and summer months.

The following table illustrates our emissions savings between 1990/91 to 2000/01 as a result of decreased station service at our plants.

Table 10. Cumulative CO_2 Equivalent Reductions for all Plants Resulting from Reduced Station Service

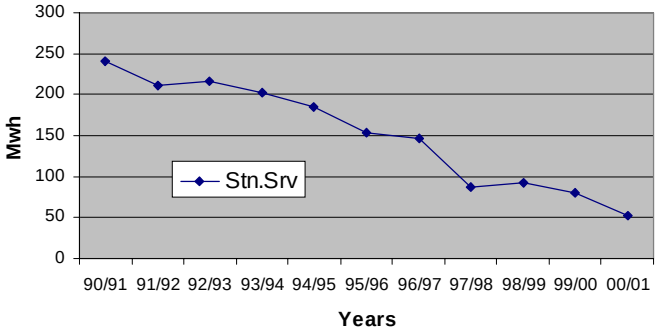
1990/91 to 2000/01	CO_2 Equivalent Reductions (Tonnes)		
	Diesel Plants	Gas Plants	Total
	1,870	4,134	**6,004**

The following are a couple of examples illustrating the reductions discussed above.

Deline

Over the years, a number of upgrades have been performed at our Deline plant including the installation of a residual heat system that displaced the existing electric space heaters in the plant and office areas. The electric block heaters were also replaced in recent years. The replacement of the block heaters alone reduced station service by approximately 40,000 kWh annually. In 1999, VFDs were installed to reduce power consumption for the radiators and to reduce noise pollution.

Figure 9. Deline Power Plant Station Service from 1990/91 to 2000/01.

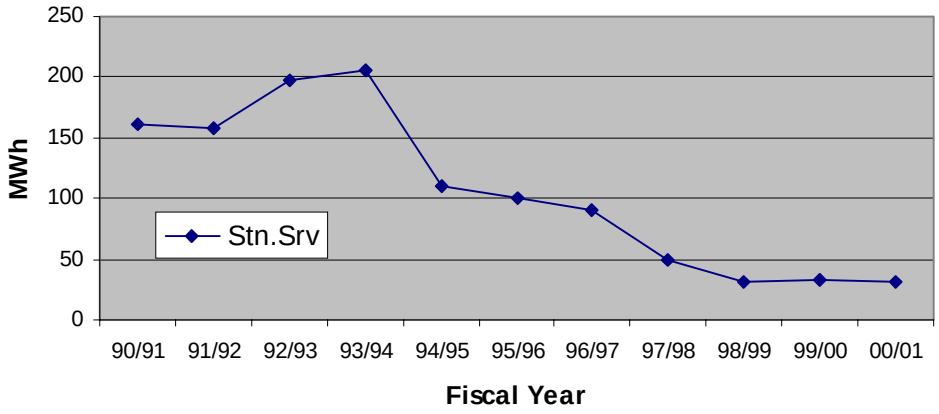


Since 1990/91, station service has decreased dramatically. Utilizing 1990/91 as a benchmark, there has been a reduction of 987,000 kWh and the reduction in fuel consumption of approximately 300,000 litres of diesel fuel or 859 tonnes of CO_2 equivalent emissions.

Wha Ti

Similar to Deline, the Wha Ti power plant has undergone a number of upgrades in recent years that have resulted in a significant reduction in station service. The installation of a residual heat system has replaced in-plant electrical space heating requirement as well as block heating for the engines. The replacement of the electric block heaters has reduced station service by approximately 40,000 kWh annually. In addition, VFDs have been installed on the radiator motors.

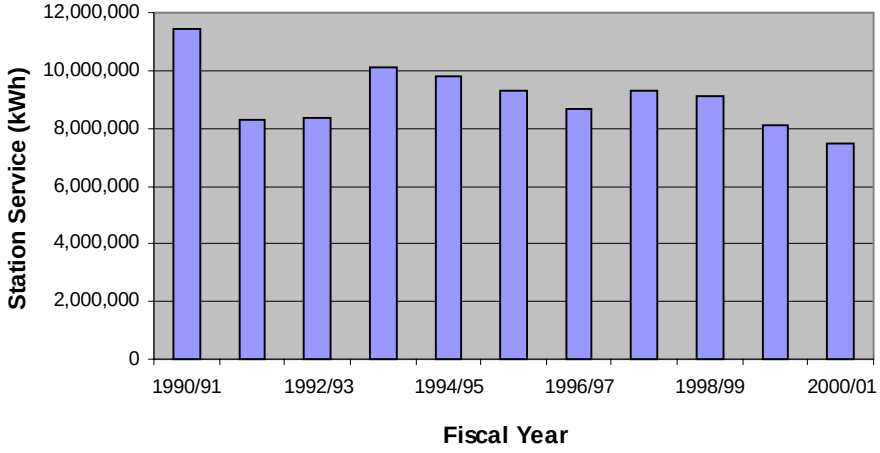
Figure 10. Wha Ti Reductions in Station Service From 1990/91 to 2000/01



Since 1993/94, station service has decreased dramatically. Utilizing 1990/91 as a benchmark, a 607,000 kWh reduction in station service has been realised. This equates to a reduction in diesel fuel consumption of approximately 200,000 litres of diesel fuel or 573 tonnes of CO_2 equivalent emissions.

Since 1990/91, the Corporation has successfully reduced our overall station service as illustrated in Figure 11. Through frequent audits of our operations and diligent efforts to implement station service reducing technologies and habits, we will continue to reduce our station service in future years.

Figure 11. Station Service for all Plants from 1990/91 to 2000/01



4.5 Alternative Generation Fuels/Methods

In recent years the Corporation has undertaken a number of initiatives to produce less GHG emissions by utilizing alternative methods or fuel sources to generate power. Some of these initiatives have involved major capital projects such as the Inuvik Gas Project and major changes to our hydro infrastructures. Simpler initiatives included the purchase of additional GHG-free hydropower. The table below illustrates our direct and indirect emissions savings through alternative generation programs since 1990/91.

These projects were discussed in detail under the Emissions section of this report.

Although additional hydro developments within our Snare Hydro system are being pursued, plans have yet to be finalized so any future GHG emissions reductions have not been factored into our forecast.

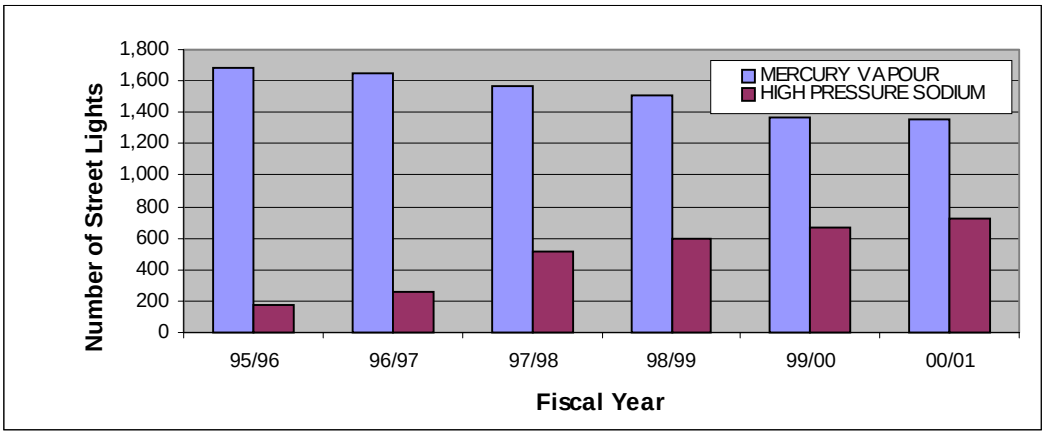
Table 11. Cumulative CO_2 Equivalent Emissions Reductions From Alternative Generation Programs From 1990/91 to 2000/01

	$C0_2$ Equivalent Emissions Reductions (Tonnes)	
Project	**Direct**	**Indirect**
Snare Cascades	101,676	
Snare Rapids G2	11,880	
Inuvik Gas Project	9,819	
Purchased Natural Gas Generation		15,686
Purchased Hydro Generation		254,678
Total	**123.375**	**270.364**

4.6 Streetlight Replacement

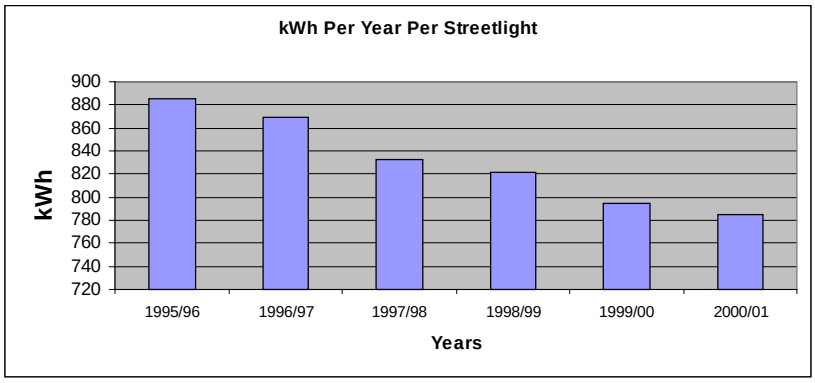
It is up to each individual community to decide whether to convert to High-Pressure Sodium (HPS) lighting from less efficient Mercury Vapour (MV) streetlights. In order to promote the program the Corporation informs the communities of the benefits to be gained from the conversion. We began converting community streetlights from MV to HPS during the 1995/96 fiscal year. Five communities, to date, have converted every streetlight in their communities to HPS. These communities include Wha Ti, Rae Lakes, Colville Lake, Nahanni Butte and Jean Marie. Fort Simpson deserves an honourable mention as only one light remains to be converted in their community. For the remainder of the communities, HPS lights are exchanged following the end-of-life of the existing MV lights. The following figure illustrates the total number of streetlights of each kind, HPS and MV, between 1990/91 and 2000/01 for all communities. Figure 12 illustrates a consistent trend showing a decrease in the overall number of HPS lights and an increase in the number of MVs over time.

Figure 12. Total Numbers of Mercury Vapour vs. High Pressure Sodium Street Lights



As the number of overall streetlights is increasing for the Corporation, in order to analyse the success of the conversion of MV to HPS lights, a comparison of kWh/yr/light is utilized. The following graph illustrates a continuous reduction of the energy expended per year per light from 1995/96 to 2000/01.

Figure 13. KWh/yr per Streetlight for all Plants from 1995/96 to 2000/01



Since 1995/96, there has been a cumulative 51,891 kWh savings in energy resulting from streetlight conversions in all northern communities within which the Corporation distributes power. GHG savings had to be calculated separately for each community depending on whether the communities were serviced with diesel or gas generated power. Those communities serviced with hydropower were not included in the calculation as it can not be determined how much energy is saved which results in displaced diesel. The following table illustrates a total cumulative savings of 454 tonnes of CO_2 equivalent emissions resulting from streetlight conversions since 1995.

Table 12. Cumulative GHG Savings from Streetlight Conversions Since 1995/96

1990/91 to 2000/01	CO_2 Equivalent Reductions (Tonnes)		
	Diesel Plants	Gas Plants	Total
	427	27	**454**

4.7 Results in Comparison to Targets

Until 1999, the Corporation did not have a definitive GHG emission reduction plan. Our internal target to reduce GHG emissions by 10% of 1996/97 levels in 10 years, was easily achieved by 1998/99. To date, we have reduced our cumulative CO_2 equivalent emissions by 430,690 tonnes. This represents an average annual reduction of 105,800 tonnes per year or an 8.5% reduction in average annual emissions relative to 1990 levels.

5.0 Climate Change Awareness

The Corporation is committed to educating employees and customers regarding energy awareness. We hope to create an awareness of energy efficiency practices and measures that can be implemented by all to ensure that the maximum benefit is derived from the electricity produced. Climate Change issues are discussed in conjunction with many of our programs to promote energy awareness and conservation. The following communication avenues are utilized to inform employees and the public of the many ways in which they can contribute to decreases in GHG production.

Our customer newsletter, **Energy@Work**, provides excellent information on many energy-saving methods that can be utilized within homes and communities to reduce energy demands. Some of the topics that we have highlighted include reducing temperatures on hot water tanks, promoting residual heat programs, the benefits of alternative power generation and programs which we as a Corporation employ to reduce GHG emissions.

We are a founding member of the **Arctic Energy Alliance** (AEA). The AEA is a not-for-profit organization established in 1997. The AEA's mandate is to help reduce the financial costs and environmental impacts associated with energy and utility services in the NWT.

In conjunction with the AEA and the local **Chambers of Commerce**, the Corporation has begun hosting a series of **Energy Management Seminars** beginning October 2001. This program will provide commercial customers with information and suggestions on how they can improve the energy efficiency of their businesses. As well, seminars called "**Energy@Home**" will be provided to employees to enhance their knowledge of energy efficiency. Workshops will display a number of energy efficiency products and display our new corporate booth that promotes energy efficiency. Together with the AEA, we are working to develop a working relationship with the Office of Energy Efficiency, which is a branch of **Natural Resources Canada**.

A "**Hot Water Temperature Card**" has been developed and circulated to customers attending the Energy Management Seminars and those wanting to learn more about energy conservation. The card allows customers to test their hot water temperatures to prevent burns and to determine if they can save energy by turning down temperatures on their hot water tanks.

The Corporation provides informative brochures to its customers. Some of the topics have included "**Understanding Costs of Running Electrical Appliances**" and "**Energy Wise North – a basic guide to energy conservation for residents of Canada's North**." These were produced to encourage customers to reduce their power consumption and understand how much electricity their electrical appliances really use.

All of our publications are available on our website at www.ntpc.com. The site also promotes one of the Corporation's objectives of working to reduce GHG emissions through reductions of customer's household energy usage.

Occasionally bill inserts are sent to customers to remind them about energy conservation. The Corporation also makes public service announcements as part of its media campaign.

Internal Communications

Periodically, the Corporation and employees use emails to remind each other to be more **energy-conscious** by turning off lights when not in use, keeping department doors and main doors closed to conserve building heat, and provide updates on what we are doing as a Corporation to reduce GHG emissions.

An employee generated **Powerline Plus** is distributed to all employees on a biweekly basis via email and our internal website. Articles include updates regarding the Corporation's GHG emissions status and various ways to conserve energy.

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