

City of Prince George

Energy and Greenhouse Gas Management Plan

Final Draft



Submitted to:
City of Prince George



Submitted by:
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Summary

The City of Prince George has committed to participate in the Partners for Climate Protection (PCP) program of the Federation of Canadian Municipalities (FCM). This program provides a framework for participating municipalities to define goals for greenhouse gas (GHG) emissions reductions.

This plan includes actions to be implemented at the corporate level (i.e. the municipality's operations) as well as at the community level.

Corporate Action Plan

The corporate plan is composed of 4 subject areas, with a total of seven initiatives. These are:

Subject Area	Initiatives
Community Energy System	Initiative 1: Implement Phase 1 of the Community Energy System (Municipal Buildings)
Energy Efficiency in Civic Buildings and Facilities	Initiative 2: Evaluate and Implement Energy Reduction Opportunities for Civic Buildings
	Initiative 3: Build all new municipal buildings to High Energy Efficient Standards
Vehicle and Machinery Fleet	Initiative 4: Implement a Consolidated Fleet Energy Reduction Plan
	Initiative 5: Continue to evaluate and implement bio-based fuels
Municipal Operations and Demonstrations of Leadership	Initiative 6: Incorporate Energy Conservation and GHG reduction in Utility Operations.
	Initiative 7: Advance Energy Efficiency through municipal practices and "in-reach"
	Initiative 8: Promote Energy Efficiency in Purchasing Decisions.

A baseline inventory of energy and GHG emissions for the year 2002 and Business-As-Usual (BAU) forecast (to 2012) have been previously developed¹. Using these forecasts, and an assessment of the reductions possible from the defined actions, an alternative forecast was defined - called the "Energy Plan" forecast (Table SUM-1).

This forecast indicates that through a reduction plan, municipal operations could reduce GHG emissions by just over 10% by 2012 compared to 2002. This forecast is shown graphically in Figure SUM-1. A proposed target of a 10% reduction has been proposed.

¹ For this work the BAU scenario for both the corporate inventory and the community inventory were modified slightly.

Table SUM 1: Summary of Potential Corporate Plan GHG Reductions

Activity Area		GHG Emissions or Reductions
2002 Baseline Emissions	(t CO ₂ e)	7,080
2012 BAU Emissions	(t CO ₂ e)	7,765
Energy Plan Forecast: Reductions from BAU Scenario	(t CO ₂ e)	-1,420
2012 Energy Plan Emissions		6,345
Change from 2002 to 2012	(t CO ₂ e)	-735
	(%)	-10.4%

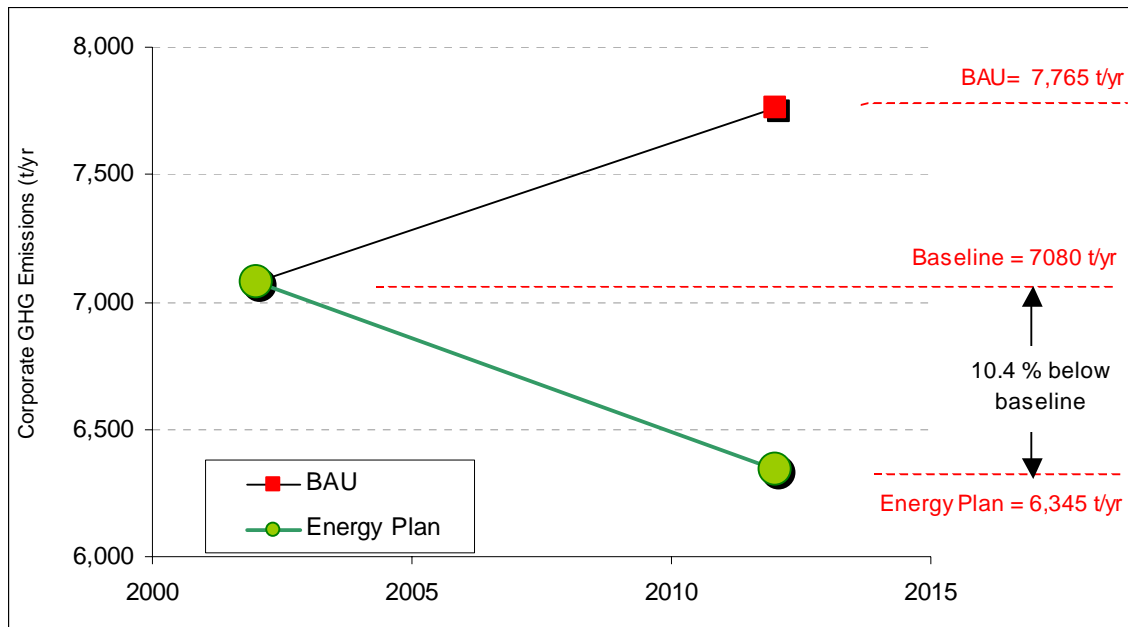


Figure SUM-1: Forecasted Corporate GHG Emissions: BAU and Action Plan

PROPOSED TARGET: The municipality will target to reduce corporate (i.e. municipal operations) greenhouse gas emissions by 10% from 2002 levels by the year 2012.

Community Action Plan

The community plan is composed of 5 subject areas, with a total of 12 initiatives. These are:

Subject Area	Initiatives
Improve the Energy Efficiency of Buildings and Facilities	Initiative 9: Endorse the BC Energy Efficient Buildings Plan Targets Initiative 10: Encourage Energy Efficiency in the Residential Buildings Initiative 11: Encourage Energy Conservation in the Commercial, Institutional, and Light Industrial Sectors Initiative 12: Support Industry to Reduce Energy Consumption and GHG Emissions
Reduce Transportation Consumption and Emissions	Initiative 13: Promote Transportation Alternatives Initiative 14: Advance the Transit Plan Objectives Initiative 15: Reduce Unnecessary Fuel Consumption in the Community
Encourage Energy Efficient Land Use Planning	Initiative 16: Encourage Use Smart Growth Principles to Guide Land Use Planning Initiative 17: Incorporate Energy Considerations into Planning Documents
Energy Supply	Initiative 18: Implement Phase 2 of the Community Energy System Initiative 19: Encourage Alternate Energy Supply Systems
Outreach and Engagement of Residents and Businesses	Initiative 20: Develop and Implement a Stakeholder Outreach Campaign

Similar to the corporate plan, a baseline inventory for the year 2002 and a Business As Usual (BAU) forecast to 2012 was previously compiled. Combined with the reduction opportunities identified, the forecasted GHG emissions are shown in Table SUM2.

This forecast indicates that through a reduction plan, the community could reduce GHG emissions by about 1.6 % by 2012 compared to 2002, in spite of continued growth in the community. This forecast is shown graphically in Figure SUM-2.

Table SUM 2: Summary of Potential Community Plan GHG Reductions

Activity Area	GHG Emissions or Reductions
2002 Baseline Emissions	1,237,000
2012 BAU Emissions	1,352,420
2012 Reduction Plan Emissions	1,216,920
Plan Emissions Compared to 2002 Baseline (t)	-20,080
(%)	-1.6 %

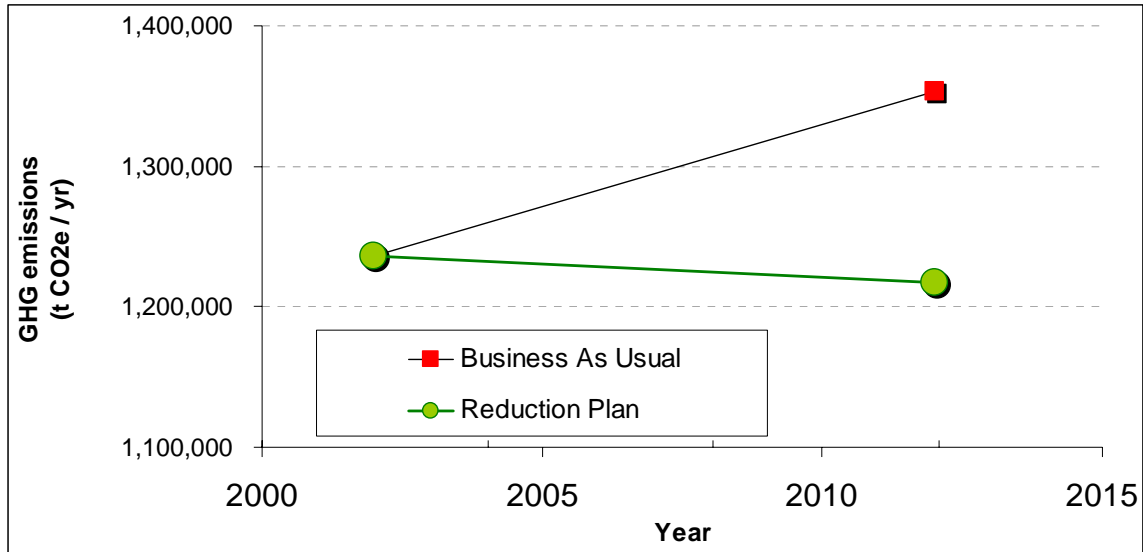


Figure SUM-2: Forecasted Community GHG Emissions: Modified BAU and Action Plan

PROPOSED TARGET: The municipality, working with funding and implementation partners and the community will target to reduce community-wide GHG emissions by 2% from 2002 levels by 2012.

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1 Introduction

1.1 Climate Change and Greenhouse Gas Emissions

Human activities - primarily the burning of fossil fuels - are resulting in increased concentrations of carbon dioxide and other greenhouse gases (GHGs) in the atmosphere. These excess GHGs accelerate the heat trapping 'greenhouse effect' within the atmosphere, and contribute to global climate change. The effects of climate change include disruptions to our climate and weather systems, with resulting impacts to the natural systems that humans rely upon. These changes are expected to occur within a few decades, and some researchers believe the effects are already observable.

The Kyoto Protocol

The Kyoto Protocol is an international agreement to manage greenhouse gas emissions. Canada is signatory to the agreement, which came into force in 2005. In the agreement, Canada has committed to reducing its total emissions of greenhouse gases to 6% below 1990 levels, by the year 2012.

The Partners for Climate Protection Program

Climate change is a global issue, yet addressing it will require countless local actions worldwide. To this end, the Federation of Canadian Municipalities (FCM) has developed the Partners for Climate Protection (PCP) Program to guide municipal governments towards reducing GHG emissions. The PCP program defines a process for municipal governments to quantify their GHG emissions and then to develop and implement action plans that can achieve emissions reductions.

The PCP program consists of five milestones:

1. Conduct a baseline emission analysis for municipal operations and the community.
2. Establish GHG reduction targets for both municipal operations and the community.
3. Develop a local action plan outlining action items to reduce energy use and greenhouse gas emissions from municipal operations and throughout the community.
4. Establish a program to implement action items that will reduce GHG emissions.
5. Continue to monitor, verify, and report GHG reduction achievements and amend the action plan accordingly to reflect new strategies.

Over 125 municipalities from across Canada have joined the PCP program including 39 in BC². Prince George Council initially expressed its support for the PCP program in

² see www.fcm.ca

2002³. The City has recently completed a baseline GHG emissions inventory⁴ (Milestone 1), and Council received the report with tentative targets in 2006⁵.

The majority of the PCP participating municipalities in BC are in the process of collecting baseline information or developing their management plans (Milestones 1, 2, and 3). A few have begun implementing their plans⁶.

1.2 Corporate and Community GHG Emissions

GHG Emissions Reduction Plans address a municipality's GHG emissions, including both corporate (municipal operations) and community sources.

- **Corporate GHG emissions** result from the energy consumption and solid waste generated during the delivery of municipal services and operation of facilities. Primary sources are: i) the combustion products from natural gas and liquid fuels, ii) the indirect emissions created during the generation of consumed electricity, and iii) the decay products of waste generated by the municipality.

The uses associated with these emissions are building operations (heat and lighting), vehicle fleet operations, and infrastructure operations (water, wastewater, and solid waste). Many actions that can reduce corporate emissions are within the powers of municipal Council and staff.

- **Community GHG emissions** result from all the energy consumption activities within the community. For most urban areas, the primary sources are the combustion products from natural gas and liquid fuels, and the indirect emissions created during the generation of consumed electricity. There will also be GHG contributions from the decay products of waste generated by residents.

Uses associated with this energy consumption are primarily water and space heating, transportation, and electricity consumption. Actions that can reduce community emissions are partially within the influence of municipalities, but also require actions by other levels of government and the citizens at large (which can often be assisted or encouraged by the municipality).

1.3 Links between Energy Planning and GHG Planning

The majority of GHG emissions are the result of combustion of fossil fuels. As a result, a reduction of GHGs is directly linked to reductions in fossil fuel consumption. As well, since some component of electricity is generated from coal or natural facilities, there is a certain amount of CO₂ 'imbedded' within the consumed electricity. This is accounted for by the GHG intensity of the electricity.

³ www.city.pg.bc.ca/cityhall/minutes/2002/2002_07_29.pdf

⁴ Hyla-ICLEI, 2005, Energy and Greenhouse Gas Emissions Inventory and Reduction Targets, prepared by Hyla Environmental Services and ICLEI Energy Services, December 2005.

⁵ See: www.city.pg.bc.ca/cityhall/minutes/2006/2006_07_10.pdf

⁶ BC municipalities that have started on milestone 4 include City of North Vancouver and Whistler.

In BC, the majority of electricity is generated from hydro-electric facilities and so our electricity has a low GHG intensity⁷. A consequence of this is that efforts to reduce electricity consumption do not achieve large reductions in GHGs while efforts to reduce fossil fuel consumption achieve relatively larger reductions in GHGs (per GJ of reduction).

It is useful to implement a GHG emissions reduction plan within the context of a broader Community Energy Plan (CEP). This allows all forms of energy to be valued as resources worth considering and does not limit the focus to maximizing GHG reductions⁸.

1.4 Plan Objectives and Purpose

This plan is intended to:

- Provide a road map towards achieving reductions in energy use and GHG emissions for the Prince George corporate operations as well and the broader community.
- Define a list of actions that can be implemented by 2012.
- Establish proposed targets for GHG reductions in accordance with the milestone structure of the PCP program.

The plan will meet the Milestone 3 requirements of the PCP Program.

⁷ For example, the GHG intensity in BC is about 35 tonnes of CO₂e per GWh of electricity (one of the lowest in the country). The Canadian average is in the range of 400 to 600 t/GWh. In Alberta the intensity is about 1000 t/GWh.

⁸ As an extreme example, a plan focused only on GHG reduction might suggest that all heating be transitioned from natural gas and fuel oil to electricity. A plan focused energy would consider reducing the demand for heating, then identifying appropriate energy sources.

2 Local Context

2.1 Location and Climate

Prince George is located in the northern region of British Columbia. The city resides at the bottom of the Nechako Plateau and is situated at the confluence of the Fraser and Nechako Rivers. Figure 1 provides a map of Prince George's location. The region is at the junction of Highway 97 (north-south) and Highway 16 (east-west), 786 km north of Vancouver and 739 km west of Edmonton, Alberta.

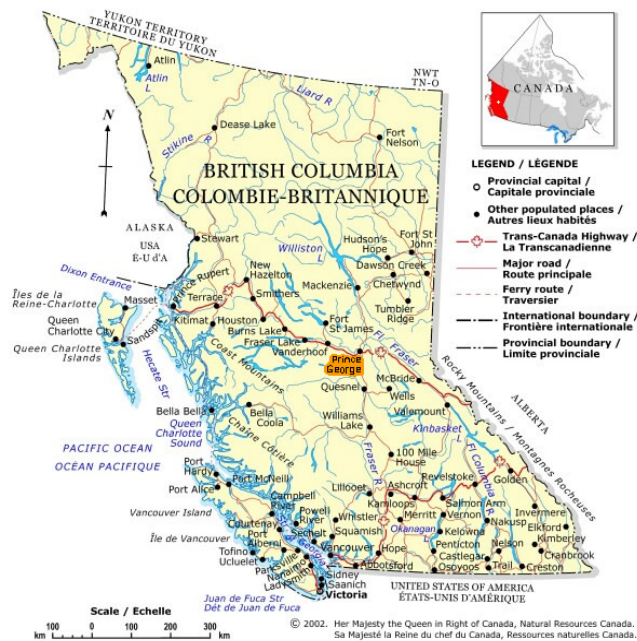


Figure 1: Location Map of Prince George within BC

Prince George is a northern interior city. It experiences cold winters and mild summers. A comparison of the relative heating and cooling requirements for a selection of Canadian cities is shown in Table 1. Prince George has substantial requirement for winter heating - comparable to many Canadian cities. However, it has little or no requirement for summer time cooling as shown by the low number of cooling degree days.

Of particular interest for air quality is that the City is located in a localized 'bowl' along the confluence of two rivers. Certain climatic conditions results in trapping of exhaust and stack emissions in this area and have resulted in episodes of poor air quality.

Table 1: Comparison of Annual Heating / Cooling Requirements in Selected Canadian Cities

Location	Heating Degree Days (Annual) ⁹	Cooling Degree Days (Annual)
Prince George	4,728	40
Vancouver	2,926	44
Whitehorse, YK	6,811	8
Edmonton, AB	5,708	28
Toronto, Ont	4,066	252

2.2 Population and Growth

The 2001 population is estimated at 75,568 (see Table 2). While the population had decreased by 3.1% from 1996 to 2001, the current long range population projection for Prince George predicts a 16% increase in population between 2002 and 2012 - equating to about a 1.5 % annual increase¹⁰.

Table 2: Summary Information for Prince George Municipality

Item	Value
Land Area (sq km)	316
Population 2001 (persons)	75,568
Population Density 2001 (persons / sq km)	229
Population 2005 (persons)	77,148
Population Growth 2001 - 2005 (total %)	+ 2.1
Projected Population growth 2002 to 2012 (total %)	16%
Residential dwellings 2001 (number)	27,605

Sources: a) BC Stats, b) Stats Canada, c) Milestone 1 Baseline Report

2.3 Economy

The economy in Prince George is driven by the primary and secondary forest industry sector. As of 2004, there were 14 sawmills and three pulp mills in the region and several within the city. There is a range of support services, as well. The city is the major center of northern BC and hosts a university and two community colleges.

Historically, the economic conditions in Prince George have been linked to the business cycles for forestry and wood products. As will be discussed in Section 4, these industries are major consumers of energy within the community.

⁹ A heating degree day is the number of days that the temperature is below 18 degree C, multiplied by the temperature below 18. For example 2 days at 5 deg is 2*(18-5) = 26 degree days. Similarly cooling degree days are the days and temperature above 18deg C.

¹⁰ BC Stats predicts an increase of 11.3% in population for the Fraser-Fort George Regional District during the same time period.

3 Framework for Municipal Involvement in Energy and GHG Management

3.1 The Challenge

Supply and management of energy resources is not within the historical domain of municipalities. Utility companies, building codes, vehicle standards, etc. are all regulated at higher levels of government. The legislated role of municipalities in energy management is limited¹¹. There are some instances where municipalities have had direct involvement in energy - typically in the provision of energy supply. These have developed for historical reasons and are usually limited in scope to providing an energy utility service. These often cannot address the issue of end user conservation and efficiency.¹²

However, municipalities do have the ability to exercise some influence through their land use controls (zoning, development permits, etc.). Though these powers are limited, they can influence both long- and short-term measures for energy management. A discussion of these is provided in the following sections.

In general however, the avenues typically available to municipalities to influence energy consumption are leading by example, 'encouragement', and using incentives.

3.2 Municipal Tools

- **Official Community Plans:** The Official Community Plan (OCP) establishes a framework for directing future growth and land use in the City. The OCP is a high level guidance document that provides guidance to lower-level, more functional documents such as development permit guidelines. Some municipalities have included language in their OCPs, to direct energy efficiency in buildings and site design. These are typically soft requirements (e.g., using language such as "should" or "is encouraged") and are not fixed requirements.
- **Development Permit Guidelines:** Development permit guidelines are derived for specific sub-areas of the city and describe the desired nature of development for that area - often specifying the character and form of buildings. Energy efficiency is not historically included, though there are some examples whereby high standards have been established for specific developments (UniverCity at SFU, Burnaby, and Dockside Green in Victoria). Some municipalities use voluntary "development checklists" to encourage the development community to consider additional (non required) components in a development).
- **Zoning and re-zoning:** Municipalities are limited in their ability to require extras (like high energy efficiency standards) from property owners and developers who operate within the established building codes, land use codes,

¹¹ A useful summary of municipal tools for energy efficiency in buildings is contained at: www.bcclimateexchange.ca/index.php?p=caee.

¹² Examples include ownership of an electricity distribution company (e.g. City of New Westminster, City of Calgary) and ownership or operations of a heating or cooling utility (e.g. City of North Vancouver district energy corporation).

and zoning regulations. However, re-zoning is a process in which a property owner requests a change to a designated land use, and the planning review process can work with the owner to further advance municipal objectives defined in the OCP. Through this collaborative process, re-zoning creates an opportunity to encourage desired development.

3.3 Council Priorities

City Council has defined a list of priorities for its 2005-2008 term. These priorities provide direction to staff on a range of measures that they want staff to pursue. While they do not have regulatory weight, they provide support for actions and can be used to support program budgeting - particularly for the corporate actions. The current Council priorities are summarized in Table 3.

Table 3: Council Priorities 2005 - 2008

Theme	Priority
1) Grow our Economy	<ul style="list-style-type: none"> - Encourage Economic Diversification. - Facilitate Inland Port Development - Market our Community - Grow our Tax Base
2) Build Effective Infrastructure	<ul style="list-style-type: none"> - Replace the Cameron Street Bridge - Effectively Manage our Assets - Expand and Renew our City Facilities - Improve the Regional Transportation System - Construct the Community Energy System
3) Follow Best Possible Corporate Practices	<ul style="list-style-type: none"> - Encourage Corporate Efficiencies - Follow Corporate Best Practices - Provide City Staff with the Knowledge and Tools to do their Jobs - Plan for Staff Succession
4) Encourage Health and Well-being	<ul style="list-style-type: none"> - Address Issues of Safety - Sustain, Protect and Enhance the Environment - Properly Service the Growing Seniors Population - Encourage a Full Service Cancer Clinic for the North
5) Support Community Renewal	<ul style="list-style-type: none"> - Revitalize our Downtown - Effectively Address the Mountain Pine Beetle Infestation

Source: www.city.pg.bc.ca

3.4 Potential Energy Management Partners

Federal Government

For several years, the Federal Government had developed a number of programs for assisting the implementation of energy efficiency in the buildings sector. This included: the EnerGuide for Houses (EGH), a program of energy evaluations that provided cash grants to homeowners for achieving improvements in energy efficiency; the Commercial

Building Incentive Program (CBIP) which provided assistance in the development of energy efficient new commercial buildings; and the EnerGuide for Existing Buildings Program, to assist in upgrades to existing buildings.

These former programs have been formally cancelled. However, recent announcements of the Federal ecoENERGY Retrofit Assistance Programs, indicates that some similar style of program will be re-established.

BC Energy Plan (2007)

The Provincial Government announced its new energy plan on February 27, 2007¹³ titled “BC Energy Plan: A vision for Clean Energy Leadership”. This plan addresses issues of electricity generation, conservation, oil and gas production, and biofuel and biomass energy sources. The implementation of the plan will be laid out in the future the elements of the plan include a strong focus on energy conservation (including support for the BC Energy Efficient Buildings Plan -see below), and support for biomass energy sources including wood fibre energy recovery.

BC Energy Efficient Buildings Plan

The Provincial Government has developed an “Energy Efficient Buildings Plan” to advance the energy efficiency of buildings in the province. The plan targets existing and new buildings in the detached, multi-family, and commercial sectors. Implementation of the plan to date has included a pilot project of energy audits and grants modeled on the EnerGuide for Houses Program. The provincial program is currently piloting incentives for multi-unit and commercial buildings.

To assist in appropriate policy development the Community Action on Energy Efficiency (CAEE) program has been launched. The CAEE provides seed funding for communities to study or evaluate policy measures that encourage energy conservation.

Prince George Air Quality Management Plan

Prince George’s Air Quality Management Plan (AQMP) was developed in response to poor air quality within the City and exceedances of air quality objectives within the city. The plan identifies actions to improve the air quality and is in the implementation phase.

The AQMP does not address energy or GHGs directly. However, it represents a model of a cooperative process whereby many stakeholders can work together to achieve better air quality. This is in contrast to a classical regulatory approach whereby only the regulated discharges are governed, and often independent of each other.

Energy Utilities

BC Hydro through its Power Smart programs has committed to conservation as a viable source of new electricity capacity. The City has already participated in several Power Smart programs.

For natural gas conservation initiatives, Terasen and Direct Energy both have some initiatives targeting natural gas consumers, such as energy audit assistance and/or some incentives for demand reduction (e.g. high efficiency boiler upgrades).

¹³ <http://www.energyplan.gov.bc.ca/>

3.5 Past and Current Energy Management Activities in Prince George

Municipal (Corporate) Initiatives

The City has already engaged in a variety of activities to reduce energy consumption within its own operations. Recent and current projects include:

- Retrofits in nine municipal buildings addressing lighting, system controls, pony motors, variable speed drives and refrigeration optimization. These were performed in conjunction with BC Hydro's Power Smart program. Energy savings = 929,608 kWh; GHG reductions = 31.6 t CO₂e annually.
- e.Points Bonus project (earned by achieving at least a 5% reduction in energy intensity in one year) was used in early 2004 for a library lighting upgrade. Energy savings = 159,673 kWh; GHG reduction = 5.4 t CO₂e annually. In the year ending March 2005, the City also earned \$32,875.24 in e.Points (resulting from a 5.09% reduction in consumption). This will be used in 2007 for energy improvements.
- Funding of an Energy Manager position (in cooperation with BC Hydro) was arranged in 2006 to improve the energy performance of civic facilities. The City expects to contract for this work in 2007.
- Streetlight dimming demonstration project to May 2006. Savings for the pilot area (75 lights) estimated at 25% of consumption.
- Participation in the BC Hydro's Traffic Light Program (converting incandescent traffic signals to LED) in early 2004. Energy savings = 314,285 kWh / year; GHG emissions reduction = 10.7 t CO₂e / year.
- Recently, the City embarked on a Bio-diesel Program, which will see B5 (mixture with 5% bio-diesel) and B20 (20% mixture) deployed in municipal vehicles.

Community Initiatives

Within the community, the City and others have implemented actions to reduce the community's overall energy consumption. These actions include:

- An upgrade to the Transit system launched in 2004. Funded by an additional funding commitment from council, this resulted in an 18% increase in service hours and has resulted in ridership increases of 10% to 15% each year since it was implemented.
- A new biomass fuelled turbine at Prince George Pulp and Paper. Estimated at almost \$100 million dollars it will use locally available biomass to generate electricity (60 MW) and steam for mill processes.

4 Energy Consumption and GHG Emissions

A baseline inventory of both community and corporate GHG emissions was developed in 2005.¹⁴ This was done in accordance with Milestone 1 of the FCM Partners for Climate Protection protocol.

The inventory defined energy consumption and GHG emissions for a baseline year 2002. As well it presented a forecast of consumption and emissions to 2012 based on a population growth extrapolation of consumption.

This section presents the baseline and forecast from the Milestone 1 report, as well as a recommended modified forecast being proposed for this plan.

4.1 Corporate Baseline 2002

A summary of the corporate greenhouse gas emissions by segment is summarised in Table 4. The total corporate GHG emissions in 2002 were estimated at 7,080 tonnes. Buildings and vehicles represent the largest components of the baseline.

Table 4: Corporate Emissions Baseline (2002)

Sector	Energy Use [GJ]	Approximate Value [\$]	Total eCO ₂
Buildings	65,500	\$1,545,000	4,540
Vehicle Fleet	21,250	\$300,000	1,470
Streetlights	16,690	\$562,000	120
Water and Sewage	52,870	\$791,000	420
Solid Waste (Corp)	--	--	540
Total	156,330	\$3,200,000	7,080

Source: Milestone 1 Energy Baseline¹⁵ “Value” is approximated and not derived from utility data.

A breakdown of both the energy consumption and GHG emissions is shown in Figure 2. The differences between the energy pie chart and the GHG pie chart are the result of the different energy sources used. Specifically, electricity in BC has a low GHG ‘content’ because it is mostly made from hydroelectricity. As a result - energy consumption that uses electricity (pumping, streetlights, etc.) results in relatively less GHG emissions than fossil fuel sources (e.g. vehicle fuels). Buildings use a mixture of both fossil fuels and electricity, but typically use natural gas for space and possibly domestic water heating.

¹⁴ Hyla-ICLEI, 2005 [add title of baseline report]

¹⁵ Note that the baseline was not reviewed or verified for this work.

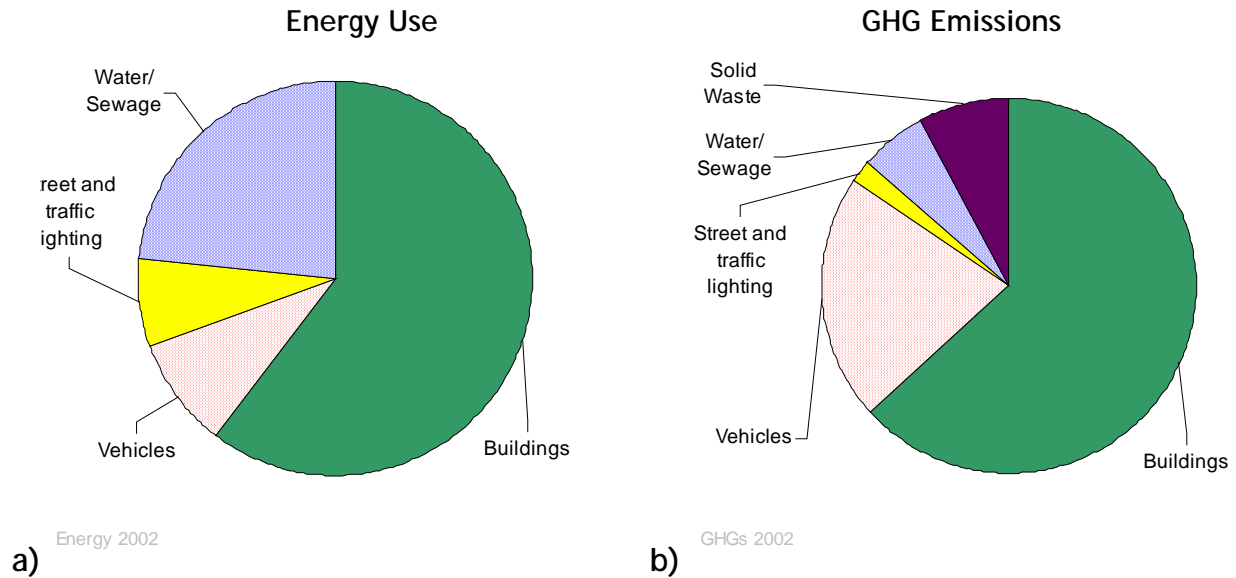


Figure 2: Breakdown of Prince George Corporate Energy Use and GHG Emissions by End Uses

(a) Energy Use and (b) Corresponding GHG Emissions

4.2 Corporate Forecast to 2012

The corporate GHG Business-As-Usual (BAU) forecast derived in the Milestone 1 report is presented in Table 5. The basis for the forecast is scaling all consumption and emissions according to the projected population growth from 2002 to 2012 (estimated at 1.5% annually = 16% from 2002 to 2012). Based on this forecast, corporate GHG emissions will be 7,765 tonnes per year.

It is likely that this methodology overestimates the future consumption and GHG emissions since not all municipal functions will grow in direct proportion to population¹⁶. A ‘modified’ business as usual scenario has been derived which increases some municipal energy requirements / GHG emissions in proportion to population (water and sewage, waste generation) and estimates other services to grow at half of the rate of population growth (e.g. vehicle fleet, streetlights, building consumption)¹⁷.

A summary of the Baseline and forecast GHG emissions is shown in Table 5.

¹⁶ For example: 1) City Hall energy consumption is unlikely to change drastically as population increases. 2) For municipal services, the fleet usage might not be expected to increase in proportion to population. 3) Recreational facilities may experience higher usage resulting in more showers, longer operating hours, etc. but would not require any different energy for swimming pool water heating, or ice rink refrigeration.

¹⁷ Setting the growth of these services at half the rate of population is arbitrary, and mainly intended to temper the original BAU forecast to a more reasonable level.

Table 5: Corporate GHG Forecast

Sector	2002 Baseline (t CO ₂ e)	2012 BAU Forecast (t CO ₂ e)
Buildings	4,540	4,925
Vehicle Fleet	1,470	1,590
Streetlights	120	130
Water and Sewage	420	490
Corporate Waste	540	630
Total	7,080	7,765

Source: BAU Forecast modified from the Milestone 1 Energy Baseline

4.3 Community Baseline 2002

A summary of the energy use and greenhouse gas emissions by end users segment is summarized for community emissions in Table 6. A breakdown of both the energy consumption and GHG emissions is shown in Figure 3. Observations that can be made about the baseline are:

- Residential energy consumption is only about 12% of the total community emissions. Most of the consumption that generates GHG emissions is usually related to either space heating or domestic hot water heating.
- Industry and the commercial sector each consume a little over a third of the total community energy. While the inventory is not able to discern the specific uses within those sectors, it is expected that a large portion be related to industrial and commercial activities - and not simply to building requirements (space or hot water heating, etc.). This energy consumption is somewhat 'less discretionary' and cannot be easily targeted through building envelope and heating upgrades.

Table 6: Community Emissions Baseline (2002)

Sector	Energy Use		Total eCO ₂	
	GJ	% of total	tonnes	% of total
Residential Buildings	3,701,000	13.3	144,000	11.7
Commercial Buildings	9,417,000	33.9	432,000	35.0
Industry ¹⁸	11,370,000	40.9	405,000	32.8
Mobile / Transportation	3,278,000	11.8	224,000	18.1
Community Waste	--	--	32,000	2.6
Total	27,766,000	100	1,237,000	100

Source: Milestone 1 Energy Baseline¹⁹

Note: Numbers may not add up due to rounding

¹⁸ Industrial consumption does not include the Northwood pulp mill. At the time the inventory was created, Northwood was classed as a Large Final Emitter (LFE), for which a regulatory framework was being developed. As a result LFE's have often been excluded from the voluntary PCP program, even though they may be located within municipal boundaries. Currently, all climate change regulation is under going revision.

¹⁹ Note that the baseline was not reviewed or verified for this work.

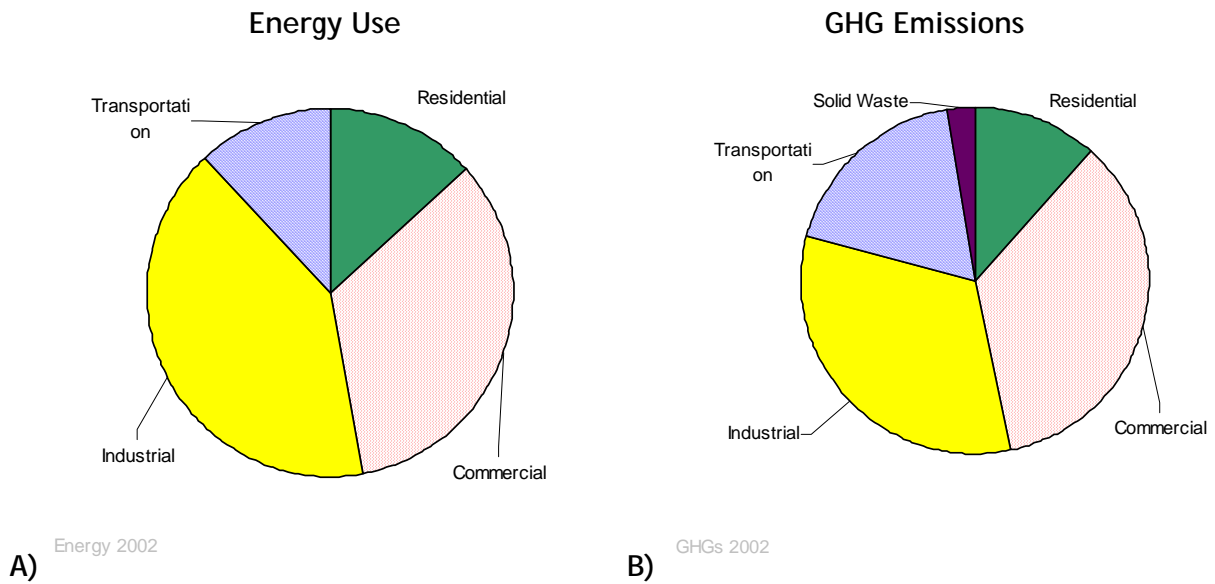


Figure 3: Community Energy Use and GHG Emissions by End Users

(A) Energy Use and (B) Corresponding GHG Emissions

4.4 Community Forecast to 2012

The community GHG Business-As-Usual (BAU) forecast derived in the Milestone 1 report is presented in Table 7.

As with the corporate forecast, the basis for this BAU scenario is scaling all consumption and emissions according to the projected population growth from 2002 to 2012. A ‘modified’ business as usual scenario has been derived which increases some municipal energy requirements and GHG emissions in proportion to population (residential buildings) and estimates other services to grow at half of the rate of population growth (industrial, commercial, transportation, waste generation).²⁰

Table 7: Community GHG Forecast

Sector	2002 Baseline (t CO ₂ e)	2012 BAU (t CO ₂ e)
Residential Buildings	144,000	167,000
Commercial Buildings	432,000	468,700
Industry	405,000	439,000
Mobile	224,000	243,000
Community Waste	32,000	34,720
Total	1,237,000	1,352,420

Source: BAU Forecast modified from the Milestone 1 Energy Baseline

²⁰ Setting the growth of these end uses, at half the rate of population is arbitrary, and mainly intended to temper the original BAU forecast. In reality, the consumption growth from the industrial and commercial sectors may be different from the population growth rate.

4.5 Implications for Plan Development

Key observations made from the corporate and community inventories and forecasts that are relevant to the plan development include:

- Corporate energy consumption includes a mix of electricity and fossil fuels. While reductions in electricity save money and are cost effective, their effect on GHG emissions reduction is relatively small.
- Corporate GHG emissions are dominated by vehicle and building energy use.
- The largest energy consumers in the community are the commercial and industrial sectors. Much of this consumption is likely, process related, and is not amenable to simply building retrofits etc. Fortunately, these sectors are large consumers and so their large energy expenses make conservation a viable efficiency activity.

5 Corporate (Municipal Operations) Action Plan

This section presents proposed plan components for a municipal operations plan. It is structured in a hierarchy of:

- Subject Area (4 main areas for activity)
- Initiatives: 1 or more major initiatives within the a subject area
- Actions: 1 or more activities to execute to fulfill the initiative.

The corporate plan includes 4 subject areas, 7 initiatives, and 13 actions.

⇒ Community Energy System

A Community Energy System that would provide heat to buildings in the downtown has been under development for several years.²¹ This system would use biomass fibre to generate hot water and distribute it to municipal buildings in the downtown area. This renewable energy source would offset the consumption of natural gas in these buildings.

The CES is really a building initiative since all the savings it achieves are in the reduced fossil fuel requirements of the connected buildings. The plan components include:

- Initiative 1: Implement Phase 1 of the Community Energy System (Municipal buildings)

⇒ Energy Efficiency in Civic Buildings

Proposed initiatives to improve the energy efficiency of civic buildings include:

- Initiative 2: Evaluate and Implement Energy Reduction Opportunities for Civic Buildings
- Initiative 3: Build all new municipal buildings to High Energy Efficient Standards

⇒ Mobile Fleet Efficiency

The city operates approximately 700 pieces of equipment including a mix of gasoline and diesel vehicles and machinery and off road and special purpose equipment. In 2002, this use accounted for 13.5% of the City's energy consumption and about 21% of the GHG emissions. Proposed Plan initiatives to improve the energy efficiency of civic buildings include:

- Initiative 4: Implement a Consolidated Fleet Energy Reduction Plan
- Initiative 5: Continue to evaluate and implement bio-based fuels

²¹ Several variations have been conceived - either as a stand-alone system or in conjunction with other facilities in the City. One, well studied scenario includes a stand-alone heat plant (burning wood waste) and a distribution system developed in two phases. The first phase of distribution would serve six municipal buildings and the Regional Hospital in the downtown. The second phase would expand to serve other buildings in the downtown.

⇒ **Municipal Operations and Utility Services**

Utility services - water, sewage, streetlights and the waste generated at municipal facilities - accounted for 45% of the corporate energy consumption and resulted in only 7.6% of the municipalities GHG emissions. Proposed Plan initiatives to improve the energy efficiency of civic buildings include:

- Initiative 6: Incorporate Energy Conservation and GHG reduction in Utility Operations.
- Initiative 7: Advance Energy Efficiency through municipal practices and “in-reach”.
- Initiative 8: Promote Energy Efficiency in Purchasing Decisions.

Forecasted Reductions

The Corporate Plan actions have the potential to reduce municipal energy consumption and GHG emissions by 26,875 GJ and 1,420 t CO₂e, respectively (see Table 8).²²

Table 8: Summary of Potential Corporate GHG Reduction

Activity Area	Potential Energy Conservation (GJ / yr)	Potential GHG Emissions Reduction (t CO ₂ e / yr)
Community Energy System (Municipal)	18,125	950
Other (non-CES) Energy Efficiencies in Civic Buildings	9,625	100
Vehicle and Machinery Fleet	2,125	160
Municipal Operations	TBD	210
Total	26,875	1,420

Note: Different energy reductions (electricity, natural gas, fuel) achieve different levels of GHG reduction per GJ of energy savings.

GHG Emissions Forecast

The Corporate Action Plan has the potential reduce the City’s GHG emissions from a forecasted 7,765 t CO₂e in a 2012 business as usual scenario to 6,345 t CO₂e under the reduction plan scenario. This is a reduction of 735 t CO₂e (10.4 %) below the 2002 baseline. Given the precision of the data it is reasonable that a 10% target is appropriate.

²² In this estimate, switching to the bio-based community energy system is considered to reduce fossil fuel energy consumption for space heating and not to reduce electricity.

Table 9: Summary of Corporate GHG Forecasts

Activity Area		GHG Emissions
2002 Baseline Emissions	(† CO2e/yr)	7,080
2012 BAU Emissions	(† CO2e/yr)	7,765
2012 Reduction Plan Emissions	(† CO2e/yr)	6,345
Reduction Plan Emissions		
Change from 2002 to 2012	(† CO2e/yr)	-735
	(%)	-10.4 %

Proposed Target

The municipality will target to reduce greenhouse gas emissions from corporate (i.e. municipal) operations by **10% from 2002 levels by the year 2012.**

5.1 Community Energy System

Initiative 1: Implement Phase 1 of the Community Energy System (Municipal Buildings)	
Description	The City, alone or in conjunction with partners establishes a community energy system to provide heating to six buildings in the downtown core. [NB: This initiative is under going continued revision, as of fall 2006]
Actions	A- 1: The City will work to ensure the implementation of Phase 1 of the community energy system.
Responsibility	For components operated by the City, responsibility would reside with the Utilities Division.
Implementation Considerations	A historic obstacle for building this system has been to establish appropriate financing. Past efforts have studied both public and private participation in the construction and ownership of the system. Operation of the system by City staff may require increased staffing levels or upgrading or modification of some position's training and certification requirements.
Benefits	Phase 1: Municipal Buildings (not including hospital): Energy Savings: 5,035 MWh (18,125 GJ) annually. GHG Reductions: 950 tonnes of CO ₂ e.

5.2 Energy Efficiency in Civic Buildings and Facilities

Initiative 2: Evaluate and Implement Energy Reduction Opportunities for Civic Buildings	
Description	The City will conduct energy audits of civic buildings to identify energy reduction opportunities. The City and BC Hydro have funded an Energy Manager position who will be tasked with reviewing the energy consumption at Civic facilities. Notwithstanding the retrofits already completed, additional opportunities may include: <ul style="list-style-type: none"> • Optimizing the use of building automation systems. This will build upon the PowerSmart and city-initiated projects completed to date. • Building envelope retrofits, including glazing, insulation and air tightness, • Heating ventilation and air conditioning equipment upgrades, and • Domestic hot water systems.
Actions	A- 2: Develop and implement an energy audit program with a goal to assessing all municipal buildings for retrofit opportunities by 2008. A- 3: Update or develop energy tracking and management systems to allow for effective analysis and reporting of energy consumption by the municipality. A- 4: Implement identified building retrofit for municipal buildings.
Responsibility	Energy Manager, Civic Facilities Manager
Implementation Considerations	For buildings within the CES service area, audits and retrofit business cases should be evaluated in consideration of the implementation of the CES - either to coordinate construction, or to define appropriate business cases. Costs:

Initiative 2: Evaluate and Implement Energy Reduction Opportunities for Civic Buildings	
	<ul style="list-style-type: none"> • Audits generally range from zero-cost walk through reviews to several thousand dollars for a full engineering audit. Typical costs are in the range of \$0.10 to \$0.20 per square foot. • Mechanical and electrical system retrofits range from \$3 - \$5 per square foot of building space. • Building Envelope retrofits range from \$30 to \$50 per square foot of wall space. • Payback periods for typical commercial or office building retrofits are in the range of 5 to 8 years. • The energy manager will be required to conduct (or contract) the audits, evaluate the results, prepare a budget item and business case for actions, and manage the retrofit. <p>Reductions in energy consumption for buildings serviced by the CES are savings in heating energy for building use.</p>
Benefits:	<p>Estimated reductions 15% reduction in overall building electricity usage, 5% estimated reductions in natural gas consumption in buildings (exclusive of buildings connected to the CES, the CN Centre, and the Aquatic Centre.²³)</p> <p>Full building retrofits may achieve more than this on a single building but not all buildings will have a sufficient business case for retrofits.</p>

Initiative 3: Build all new municipal buildings to High Energy Efficient Standards	
Description	<p>The City commits to build all major new buildings to high levels of energy efficiency. At a minimum, these would be designed to meet the BC Energy Efficient Buildings Plan target for new commercial buildings to exceed the Model National Energy Code for Buildings by 25% (the Federal CBIP standard).</p> <p>An option also exists to define this as a "Green Building" Standard. Green buildings as defined by the LEED or BuiltGreen rating systems are energy efficient but also include other sustainable features such as water conservation, indoor air quality, and materials management.</p>
Activities	A- 5: Require all new buildings greater than 500 m ² (approx 5382 square feet) to meet the BC Energy Efficient Buildings Plan Target for new construction.
Responsibility	Civic Facilities Manager, Energy Coordinator, Purchasing
Implementation Considerations	This action is consistent with the BC Energy Efficient Building Plan Targets. Implementing these standards will not only potentially reduce building energy consumption by 25%, but it could also qualify the City for funding through the BC Community Action on Energy Efficiency. ²⁴
Benefits	New building energy consumption will be up to 25% less than a standard building.

²³ Note that since the baseline inventory year, is 2002, upgrades recently performed through PowerSmart will be captured within this goal.

²⁴ The Community Action on Energy Efficiency (CAEE) is a funding program that assists municipalities willing to adopt the BC Energy Efficient Building Plan Targets with funding for energy, GHG and air quality management plans and projects. The CAEE program is sponsored by Natural Resources Canada, the British Columbia Ministry of Energy, Mines and Petroleum Resources (MEMPR), the Ministry of Environment (MOE), the Ministry of Community Services (MCS), and the Fraser Basin Council.

5.3 Vehicle and Machinery Fleet

Initiative 4: Implement a Consolidated Fleet Energy Management Strategy	
Description	<p>The City will undertake a comprehensive fleet management program focussed on reducing energy consumption and greenhouse gas emissions. Components of such a program might include:</p> <ul style="list-style-type: none"> • Driver training to increase awareness about efficiency and energy conservation actions (e.g., idling reduction). • Vehicle "Right Sizing" and Energy Efficient Vehicle Purchasing • Data Collection and Monitoring • Energy Conserving Maintenance and Operation of Vehicles
Actions	<p>A- 6: Evaluate an appropriate system for fleet management and evaluate the potential benefits of joining the <i>Fleet e3</i> program.</p> <p>A- 7: Implement (or revise existing) fleet management systems and training with the objective of reducing energy consumption.</p>
Responsibility	Fleet Services, Purchasing
Implementation Considerations	<p>Several programs have been established to guide fleet managers in the process of developing and implementing management programs. These include:</p> <ul style="list-style-type: none"> • 'Fleet Smart' developed by Natural Resources Canada. It uses education and driver and staff training to reduce consumption. Results can typically be a 10% reduction in fuel consumption and GHG emissions. This program does not include extensive monitoring and assessment processes. • Fleet e3 is a program developed by the Fraser Basin Council and Fleet Challenge BC. This program was officially launched November 15, 2006. This system includes three levels of membership ranging from information sharing only, to fleet audits, to a benchmarking and rating system.
Benefits	<p>Energy Savings: Estimated as 10 % of fleet consumption (2,125 GJ annually)</p> <p>GHG Reductions: 159 tonnes of CO₂e.</p>

Initiative 5: Continue to evaluate and implement bio-based fuels	
Description	The City will continue to demonstrate, evaluate, and promote the use of bio-based fuels through the use in the municipal fleet.
Actions	<p>A- 8: Assess the applicability and availability of ethanol fuel blends at the time of the next fuel purchase contract.</p> <p>A- 9: Continue efforts to implement the use of bio-diesel within the municipal vehicle fleet.</p>
Responsibility	Fleet Services, Purchasing
Implementation Considerations	<p>Implementation of a bio-diesel program may be affected by climatic issues relating to storage. In 2006, the Supply Services Division initiated the implementation of a bio-diesel program and is working to contract with a suitable supplier.</p> <p>Bio-diesel has been found to be not suitable for vehicles more than 20 years old.</p>

	This should not affect any of the frequently used vehicles or equipment in the municipal fleet.
Benefits	It is estimated that a B20 blend can result in up to a 15% reduction in GHG emissions per litre of fuel consumed. Bio-diesel and ethanol fuels also have air quality co-benefits in that they result in cleaner burning engines and so have reduced emissions of common air contaminants.

5.4 Municipal Operations and Demonstrations of Leadership

Initiative 6: Incorporate Energy Conservation and GHG reduction in Utility Operations.	
Description	Utilities will work to reduce energy consumption and waste generation in order to reduce greenhouse gas emissions.
Actions	A- 10: Implement the Street Light dimming program within the community where applicable. A- 11: Complete the implementation of the energy recovery project at the WWTP to use digester gas to generate electricity with micro-turbines. A- 12: Use energy efficient system components in new infrastructure, and include the life cycle energy consumption in project evaluations.
Responsibility	Utilities Department.
Implementation Considerations	The City has completed a successful trial of a street light dimming initiative in partnership with BC Hydro. This identified that substantial electricity savings could be achieved without affecting service levels. The City should consult with the Ministry of Transportation (MoT) and encourage them to participate in expanding this initiative to include roadways within their jurisdiction. Additionally, the City and the MoT should evaluate whether street light synchronization can reduce traffic congestion at selected intersections.
Benefits	At completion, electricity savings from street light dimming could be as much as 25% of total consumption within implemented areas. Not all streets may be suitable for light dimming. Potential Energy Savings (streetlights only): 925,000 (kWh) ²⁵ Potential GHG reduction: 26 t CO ₂ e (street light dimming only)

Initiative 7: Advance Energy Efficiency through municipal practices and “in-reach”	
Description	The city works to incorporate energy reduction and GHG emission reduction into daily operations at all levels of municipal facilities. These actions demonstrate a commitment to energy conservation and GHG emission reduction.
Actions	A- 13: Develop and implement an ongoing internal (staff) program to raise awareness of energy conservation and climate change. A- 14: Promote a reduction in single occupancy vehicle use for city staff through education and trip reduction programs such as car-pooling, and summertime bike to work events.

²⁵ Assumed 25% power reduction installed in 80% of streetlights.

	A- 15: Reduce the impacts of corporate waste generation at civic facilities through diversion and reduction activities with a goal to reduce waste generation at civic facilities by 25% from 2002 levels by 2012. As well, support the regional district in efforts to capture and utilise landfill gas.
Responsibility	Utilities and Environment Divisions.
Implementation Considerations	Many of these activities can coincide with other activities such as Clean Air Day or environment day promotions.
Benefits	Energy: unknown GHGs: 160 t CO ₂ e (solid waste reduction component)

Initiative 8: Promote Energy Efficiency in Purchasing Decisions	
Description	The City endeavours to maintain the most cost effective operations possible through a consideration of both the up-front capital cost, and the long term life cycle (operating) costs of its purchasing activities. These actions result in efficient municipal operations and demonstrate a commitment to energy conservation and GHG emission reduction.
Actions	A- 16: Whenever available and suitable, the City will purchase EnergyStar rated equipment. This certification ensures that these products consume the lowest possible energy. For products without an EnergyStar rating, the City will work to purchase the most energy efficient where ever possible. A- 17: The City will continue to include a consideration for life cycle cost/benefits of energy efficient purchasing. For example, supporting to pay a purchase price premium that is offset by long-term operating cost savings. A- 18: Where appropriate, and feasible, the City will include energy conservation considerations in its purchasing criteria for tenders and RFPs.
Responsibility	Supply Services
Implementation Considerations	The Energy evaluation of small purchases (computer monitors, appliances, heating and air conditioning equipment, etc.) can be simplified through the EnergyStar standard. The value of this designation simplifies the tender and purchase of equipment. Larger procurements (e.g. a new building) may require a full business case to support a premium in capital costs.
Benefits	Energy: unknown GHGs: unknown

6 Community Energy and GHG Actions

This section presents proposed plan components for a community energy plan. It is structured in a hierarchy of:

- Subject Area (5 main areas for activity)
- Initiatives: 1 or more major initiatives within the a subject area
- Actions: 1 or more activities to execute to fulfill the initiative.

The corporate plan includes 5 subject areas, 12 initiatives, and 31 actions. The areas of activity with a description are listed below.

⇒ Energy Efficiency in Buildings

Residential buildings account for 12% of community energy consumption and GHG emissions. The commercial and industrial sectors each account for over a third²⁶ of energy consumption and GHG emissions, though much of this is likely related internal operations and not solely building operations.

These initiatives support the Provincial Government's new Energy Efficient Buildings program, which is targeting a new and existing residential buildings as well as new and existing institutional, commercial and industrial buildings. Proposed initiatives include:

- Initiative 9: Endorse the BC Energy Efficient Buildings Plan Targets
- Initiative 10: Encourage Energy Efficiency in the Residential Buildings
- Initiative 11: Encourage Energy conservation in the Commercial, Institutional, and Light industrial sectors
- Initiative 12: Support Industry to Reduce Energy Consumption and GHG Emissions

⇒ Reduce Transportation Consumption

Transportation consumes 12% of the community's energy and generates 18% of GHG Emissions. Initiatives to increase transportation efficiency are:

- Initiative 13: Promote Transportation Alternatives
- Initiative 14: Advance the Transit Plan Objectives
- Initiative 15: Reduce Unnecessary Fuel Consumption in the Community

²⁶ Please note that Northwood Pulp and Paper is not included in the energy community energy baseline and forecast. This is because at the time of the Milestone 1 inventory, it was expected that it would be classed as a Large Final Emitter (LFE) and therefore would not be included in this plan.

⇒ **Encourage Energy Efficient Land Use**

“Smart Growth” or efficient land use planning results in long term reduction of energy consumption by reducing the building requirements as well as reducing transportation usage. Initiatives defined here include:

- Initiative 16: Encourage Use Smart Growth Principles to Guide Land Use Planning
- Initiative 17: Incorporate Energy Considerations into Planning Documents

⇒ **Energy Supply**

Fostering the development of renewable energy resources within the community will raise the profile of alternative energy technologies. Renewable and alternative energy technologies produce fewer GHGs than fossil fuel energy sources and can reduce energy consumption (e.g., solar hot water heating). By reducing dependence on fossil fuels, consumers are insulated from future price increases and fuel shortages.

The following initiatives will assist the City in meeting this goal:

- Initiative 18: Implement Phase 2 of the Community Energy System
- Initiative 19: Encourage Alternate Energy Supply Systems

⇒ **Outreach and Engagement of Residents and Businesses**

Informing residents and businesses on the benefits of renewable energy and energy efficiency will motivate them to participate in CEP programs and help to ensure the success of the plan. CEP programs will be ineffective if there is a lack of awareness. This goal includes a range of programs designed to move the community forward in energy conservation. The educational programs will be designed to educate, raise awareness, and spur action, as appropriate. Initiatives include:

- Initiative 20: Develop and Implement a Stakeholder Outreach Campaign

Forecasted Reductions

Total Potential Reductions are shown in Table 10. The Community Plan actions have the potential to reduce GHG emissions by 135,000 t CO₂e (see Table 10). Commercial and industrial energy consumption are the largest consumers, therefore can effect the largest reductions. The City has the least influence over these sectors.

Table 10: Summary of Potential Community GHG Reductions

Activity Area	Potential GHG Emissions Reduction (t of CO ₂ e / yr)
Residential Buildings	9,790
Commercial Buildings and Operations	43,740
Industrial Facilities	43,940
Mobile / Transportation	24,300
Waste	8,680
Community Energy system (Phase 2)	5,050
Total	135,500

GHG Emissions Forecast

The Community Action Plan has the potential to reduce the City's GHG emissions from 1,352,420 t CO₂e (modified BAU scenario) to 1,216,920 t CO₂e, which is a reduction of 20,080 (1.6%) below the 2002 baseline (see Table 11). Given the precision of the data it is reasonable that a 2% reduction could be targeted.

Table 11: Summary of Corporate GHG Reduction Goals and Actions

Activity Area	GHG Emissions
2002 Baseline Emissions	(t CO ₂ e/yr) 1,237,000
2012 BAU Emissions	(t CO ₂ e/yr) 1,352,420
2012 Reduction Plan Emissions	(t CO ₂ e/yr) 1,216,920
Plan Emissions Compared to 2002 Baseline	(t CO ₂ e/yr) -20,080
	(%) -1.6 %

Proposed Target

The municipality, working with funding and implementation partners and the community, reduce community-wide GHG emissions by **2% from 2002 levels by 2012.**

6.1 Improve the Energy Efficiency of Buildings and Facilities

Initiative 9: Endorse the BC Energy Efficient Buildings Plan Targets	
Description	<p>The Provincial Government's new BC Buildings program has set out voluntary, cost-effective energy efficiency targets for new and existing buildings. These targets are shown in Appendix A.</p> <p>Endorsing the targets is a first step towards participating with the BC Government's <i>Energy Savings Plan</i> and <i>Community Action on Energy Efficiency</i>. Endorsement of one or more of the goals allows the participating community to access the programs which include retrofits assistance grants for single family, and audit and upgrading assistance for multi-family and commercial properties.</p>
Actions	A- 19: Endorse the Energy Savings plan targets.
Responsibility	Environmental coordinator, Energy coordinator.
Implementation Considerations	<p>If building targets are to be met by 2010, it will require immediate action by the City. Here the target completion date is set to 2012.</p> <p>A separate Council resolution may not be required as Council adoption of this plan may be considered sufficient.</p>
Benefits	By adopting the Provincial targets, the City of Prince George has the opportunity to participate in the Community Action on Energy Efficiency (CAEE) Pilot Program and residents and property owners can participate in the Energy Savings Plan (ESP).

Initiative 10: Encourage Energy Efficiency in the Residential Buildings	
Description	The city will work to encourage upgrades to existing single family homes and multi family buildings and ensure that new homes are built to high energy efficiency standards.
Actions	<p>A- 20: Work with the Ministry of Energy Mines and Petroleum Resources to extend the Energy Savings Plan (ESP) residential program for energy retrofits to Prince George in 2007²⁷. Consider participating in the program on a cost share basis. If required, commit funding to support the subsidized audit or the grant program.</p> <p>A- 21: Consult with the home builders sector about ways to encourage the development of energy efficient (e.g. EnerGuide 80) homes.</p> <p>A- 22: Implement a discounted building permit fee to applicants making renovations to their homes conditional on them undertaking an energy evaluation/audit prior to initiating the work.²⁸</p> <p>A- 23: Develop an Energy "Labelling" initiative to include energy evaluations (or ratings) as part of Real Estate transactions.</p>

²⁷ To meet the buildings plan target (upgrades to 12% of homes) by 2012 about 600 homes per year would be required to be evaluated and upgraded. This is enthusiastic but in the same range as the former EnerGuide for houses program. For example, one delivery agent contacted indicated that about 150 to 225 upgrades and evaluations were conducted ("A" and "B" audits). [Ron will tally the other agent's numbers as well]

²⁸ This is not intended as a performance system (e.g. reward for achieving certain levels of improvements) but rather a simple enticement and awareness raising measure (e.g. \$100 discount on building permit fee if owner conducts an audit). Note that the homeowner would carry a portion of the audit cost and not be fully refunded by the discount. The intention is to raise awareness of energy retrofit opportunities at a time when a homeowner is commencing renovations.

Responsibility	Environmental Coordinator, w/ Planning Department.
Implementation Considerations	A discounted permit fee is allowable (under the LGA and Charter) as long as other permit fees are not required to be raised to levels that exceed service rendered as a result of this discount. A municipal fee is paid for the service rendered and should not be perceived as unreasonable revenue generation. A discounted permit fee for energy efficiency could open the door for requests for discounts for other purposes.
Benefits	Target: To reach the BC buildings plan targets by 2012. Specifically to: Reduce energy consumption in 12% of single family buildings by an average of 17% (an overall reduction in single family residential consumption of 2%) Achieve an EnerGuide rating of 80 for all new homes built by 2012. These would use an average of 30% less energy than a standard home.

Initiative 11: Encourage Energy conservation in the Commercial, Institutional, and Light Industrial Sectors	
Description	The institutional ICI sectors are encouraged to reduce energy consumption through building and process audits and reviews.
Actions	A- 24: Evaluate whether the tax exemption bylaw system currently used to encourage downtown revitalization could be used as a model for encouraging energy efficiency. For example, an exemption could be granted if a certain energy performance criteria were met. (NB: Conducting this evaluation could be funded through the CAEE policy project as per Initiative 8). A- 25: Promote green building design guidelines in the commercial sector through training, workshops, and interaction with the local construction sector. This can help to connect property or BOMA BC's Go Green program. A- 26: Promote the Energy Savings Plan's "Existing Small ICI Program" to link potential participants with program funding (free audits and retrofit assistance).
Responsibility	Energy Manager, Environmental Coordinator, Planning Department
Implementation Considerations	While commercial operations represent about a third of energy and GHG emissions, much of this consumption is likely for production operations and not space heating and building systems. Much of that consumption cannot be targeted for reduction through building energy management.
Benefits	Assumed a total reduction of 8% of consumption (based on achieving a building operations reduction of 3% and other process and activity reductions of 5%).

Initiative 12: Support Industry to Reduce Energy Consumption and GHG Emissions	
Description	The City will seek out ways to consult with the industrial sector to encourage energy conservation. Wherever possible, the City will support their efforts to reduce energy.
Actions	A- 27: Continue communication with the industrial sector to ensure that all possible municipal opportunities to assist in energy conservation are being explored. Challenge the industrial sector to implement energy reduction measures by 10% from 2002 consumption levels by 2012.
Responsibility	Environmental Coordinator

Implementation Considerations	<p>The City has a limited influence over the energy-related activities of industries; therefore the action described here is supportive. It is difficult for the municipality to influence energy use in the industrial sector.</p> <p>Many industrial operations are substantial energy consumers and are already well engaged in energy conservation.</p>
Benefits	<p>Industrial users are 40 % of energy consumption and 30% of GHG emissions. A 10% reduction equates to 4% and 3% of the entire community energy and GHG emissions.</p>

6.2 Reduce Transportation Consumption and Emissions

Initiative 13: Promote Transportation Alternatives	
Description	<p>A large proportion of commuters travel to work in single occupancy vehicles (SOV). In this action, the City of Prince George will promote alternatives to SOV travel by improving transportation alternatives through developing infrastructure for cycling and walking.</p>
Actions	<p>A- 28: Encourage vanpool, car pool, and other trip reduction measures in the community. Use soft incentives such as preferential or discounted parking.</p> <p>A- 29: Work with large end destinations (UNBC, community colleges, mills, etc.) to create parking and transportation strategies that support non-SOV commuting.</p> <p>A- 30: Continue to support the GO GREEN Commuter Challenge. The City will target new participants from the business community beginning with the 2007 Challenge. The winning business/company will be the one with the highest percentage of employees commuting in a sustainable way during Clean Air Day (June, annually) as part of Environment Week.</p> <p>A- 31: Work to ensure that the Cycle Network Plan Recommendations are implemented.</p> <p>A- 32: Develop a non-motorized transportation plan to increase walking and cycling paths and corridors.</p>
Responsibility	<p>Transportation Division, BC Transit</p>
Implementation Considerations	<p>Transit is perceived as a source of transportation used primarily by those without access to a vehicle either due to financial considerations or inability to operate a motor vehicle. It may be difficult to encourage change.</p>

Initiative 14: Advance the Transit Plan Objectives	
Description	<p>In the past several years the transit system has invested in improved service and the system was redesigned in 2003. The City committed additional funding resulting in an 18% increase in operating hours. Ridership has risen steadily with year over year increases (through additional city funding) and has experienced ridership increases of 10-15% annually.</p>
Actions	<p>A- 33: Continue to support the goals outlined in the City's Transit System Strategic Marketing Plan.</p>

	A- 34: Encourage and advocate for the successful implementation of a U-Pass program with UNBC students.
Responsibility	Transportation Division
Implementation Considerations	There exists a portion of the community who are not willing to consider alternative modes of transportation. To attract those not currently using the service there may be some special event and promotional activities to entice new riders. The recent history is grounds for optimism, as transit use has increased by 40% in the past three years. This initiative has demonstrated that increases in service levels do result in increased ridership.
Benefits	To be determined.

Initiative 15: Reduce Unnecessary Fuel Consumption in the Community	
Description	The City will work to reduce unnecessary consumption through implementation of bylaws, policies, or voluntary measures that encourage a reduction in vehicle fuel use.
Actions	A- 35: Expand the anti-idling area to encompass the downtown core. A- 36: Develop an education program to promote reduced idling at common pick-up / drop-off locations such as schools, recreation centers, etc.
Responsibility	Developed by the Environment Division.
Implementation Considerations	Education is a key component to achieving voluntary compliance. Informing drivers of the benefits of turning off the vehicle will assist in achieve bylaw compliance.
Benefits	Targeting a 10% reduction from the implementation of all community measures for mobile source reductions. This initiative also addresses vehicle exhaust (air quality) concerns outlined in the Prince George Air Quality Management Plan.

6.3 Encourage Energy Efficient Land Use Planning

Initiative 16: Encourage 'Smart Growth' Principles in Land Use Planning	
Description	The City of Prince George will evaluate and apply the principles of "Smart Growth" in its land use planning activities. The overall theme of these strategies is to encourage development density and incorporate mixes of land-use, to create communities that are more compact, provide a variety of services, and reduce automotive dependency. Benefits may also include reduced per capita costs for infrastructure servicing by the municipality ²⁹ .
Activities	A- 37: Encourage "Smart Growth" principles in new developments.
Responsibility	Long Range Planning Division, Current Planning and Development Division
Implementation Considerations	<p>This action, like other long term planning activities, will bear results over many years. Results will be achieved in energy end uses such as residential energy consumption and transportation consumption.</p> <p>The application of these types of activities will also require consideration of the climate and activities of Prince George. Many Smart Growth initiatives originate from milder climates or more densely populated regions. Specific considerations that may have to be included include</p> <ul style="list-style-type: none"> - climate - walking for transportation is limited during the winter, and municipal design may require certain land-use pre-requisites (e.g. snow storage, specific road design, etc.); - activities - much of the work and recreation in Prince George is based around the outdoors and resources. As such people may desire larger land for homes, businesses and equipment. <p>Factors which favour the implementation of Smart Growth principles include:</p> <ul style="list-style-type: none"> - an increasing retirement and senior population who might be willing to live in denser, more-easily connected neighbourhoods; - an expanded student population as a result of UNBC who can increase the use of shared accommodation and secondary suites; - recent improvements in the transit system which supports smart growth -style development. <p>"Smart Growth" can be a nebulous term and would require some clarification. The base principles are high level and there may be more detailed research to determine how to implement them into the planning process. As well, it may be necessary for the planning department to develop some definitions and guidance principles to the community.</p>
Benefits	<p>Small quantifiable benefits within the time frame of the 1st CEP timeframe (2012), however it may be possible to define one or two high profile developments to the community within that time frame.</p> <p>Longer term benefits include energy use reductions, but also other community benefits.</p>

²⁹ Note that 'Smart Growth' is a concept but has also been formalized through an organization of the same name that has defined a set of Smart Growth principle (www.smartgrowth.org/about/principles/default.asp).

Initiative 17: Incorporate Energy Considerations into Planning Documents	
Description	<p>Create policy in the forthcoming OCP that acknowledges community-wide energy conservation as a desired objective for the city. This can be initiated in the review of the Official Community Plan (OCP) being initiated in 2007. From the OCP, these principles can be incorporated into neighbourhood plans and development area guidelines.</p> <p>Implementing these principles will be an evolutionary process³⁰. "On-the-ground" implementation might include encouraging green buildings or innovative renewable energy sources, evaluating neighbourhood plans, enhancing the downtown core, and potentially a reviewing the existing Urban Development Boundary.</p>
Actions	A- 38: Learn from the Community Action on Energy Efficiency (CAEE) and review sample text for potential inclusion in OCP and other planning department documents.
Responsibility	Long Range Planning Division
Implementation Considerations	<p>In general, municipalities have limited authority for defining energy efficiency in buildings as these are addressed through provincial and federal building codes. However, other municipal activities can promote energy efficiency. Through the Community Action on Energy Efficiency (CAEE) many communities in BC are exploring these types of document changes.</p> <p>Land use changes are important areas within municipalities and require the involvement of many stakeholders. Any land-use changes that might be affected by policy or development changes must be thorough reviewed by the public, affected stakeholders, and council.</p>
Benefits	Long term gradual reductions in per household residential energy consumption.

³⁰ Many communities in BC are currently working to define their role and jurisdictional tools in this area (see www.bcclimateexchange.ca/index.php?p=caee).

6.4 Energy Supply

Initiative 18: Implement Phase 2 of the Community Energy System	
Description	The city will work to expand the Community Energy System (CES) to the second phase once Phase 1 has been commissioned.
Actions	A- 39: Ensure that any future development in the CES service area is 'retrofit' ready for the CES development. A- 40: Work with funding and operating partners to ensure that the system advances to Phase 2.
Responsibility	All City departments.
Implementation Considerations	Although the CES will displace natural gas, it will also produce some particulate at the energy centre. Best available control technology should be included in the design.
Benefits	Phase 2: Connections to other buildings in the service area. Energy Savings: 26,800 MWh (96,500 GJ) annually GHG Reductions: up to 5050 tonnes of CO ₂ e).

Initiative 19: Encourage Alternate Energy Supply Systems	
Description	In this action, opportunities for renewable electricity generation projects will be explored. In particular, the City will encourage the regional government to use the landfill gas capture system for beneficial use. Opportunities to conduct pilot projects in renewable electricity generation should be explored. Funding for pilot projects may be available from provincial and federal agencies. Initiation of a pilot project would contribute towards the "Demonstrate Municipal Leadership".
Activities	A- 41: Explore with the Regional District to identify a strategy to maximize the recovery and beneficial use of recovered landfill gas. A- 42: Promote and encourage the application of Ground source Heat Pumps in new or retrofitted buildings.
Responsibility	Environment, Regional District of Fraser-Fort George.
Implementation Considerations	Landfill gas is currently flared. Options are being explored to transport gas to various facilities. Technology is well established for GSHPs in Canada and the US. Suppliers, and qualified contractors may not be available within the area.
Benefits	To be determined

6.5 Outreach and Engagement of Residents and Businesses

Initiative 20: Develop and Implement a Stakeholder Outreach Campaign	
Description	<p>The City will develop a public awareness campaign that builds off existing outreach efforts (water conservation education). This action will include the following elements: Newsletters and advertisements in local papers that promote successful projects within the City and other energy conservation activities; and offer energy efficiency workshops in partnership with BC Hydro and Home Depot.</p> <p>While primarily focusing on the general public, this campaign will also cross promote the other actions in this section for schools and the commercial sector.</p>
Actions	<p>A- 43: Develop core informational material - posters and brochures.</p> <p>A- 44: Develop and deliver a program to schools within PG.</p> <p>A- 45: Promote Energy efficiency to the public through home and trade shows.</p>
Responsibility	Environmental Coordinator
Implementation Considerations	<p>The success of the public awareness campaign is dependent on implementing a consistent 'branding strategy' for energy conservation in the region.</p> <p>This commitment should be considered long term and suitable long term funding should be expected.</p>
Benefits	Incorporating these two plans will ensure that GHG action measures are aligned with air quality reduction measures.

7 Alignment of Energy Plan with Council Priorities

The Initiatives of the Energy and GHG plan align with many of the council priorities. A comparison shows that both the Corporate and Community actions help to advance 14 of the current priorities (see Table 12).

Table 12: Alignment of Energy Plan Actions to Council Priorities

Council Priorities		Corporate Initiative Areas					Community Initiative Areas				
		Community Energy System (Phase 1)	Energy Efficiency in Civic Buildings and Facilities	Vehicle and Machinery Fleet	Municipal Operations and Demonstrations of Leadership	Improve the Energy Efficiency of Buildings and Facilities	Reduce Transportation Consumption	Encourage Energy Efficient Land Use Planning	Energy Supply	Outreach and Engagement of Residents and Businesses	
Grow our Economy	Encourage Economic Diversification	●	○		○	●	●		●	●	
	Facilitate Inland Port Development										
	Market our Community	●	○		○	○	●	●	●	●	
	Grow our Tax Base					●	○	●	●		
Build Effective Infrastructure	Replace the Cameron Street Bridge										
	Effectively Manage our Assets	●	●	●	●					○	
	Expand and Renew our City Facilities	●	●	●	●					○	
	Improve the Regional Transportation System						●	●		○	
Follow Best Possible Corporate Practices	Construct the Community Energy System	●						●			
	Encourage Corporate Efficiencies	●	●	●	●	●				○	
	Follow Corporate Best Practices	●	●	●	●	●				○	
	Provide City Staff with the Knowledge and Tools to do their Jobs									●	
Encourage Health and Well-being	Plan for Staff Succession				●					●	
	Address Issues of Safety						○	○			
	Sustain, Protect and Enhance the Environment	●	●	●	●	●	●			●	
	Properly Service the Growing Seniors Population					●	●	●		●	
Support Community Renewal	Encourage a Full Service Cancer Clinic for the North										
	Revitalize our Downtown	○				●	●	○			
	Effectively Address the Mountain Pine Beetle Infestation										

● = Close alignment between the energy plan and the current Council priorities.
 ○ = Some alignment between the energy plan and the current Council priorities.

8 Plan Results

Corporate Action Plan

The Corporate plan is targeted to achieve a reduction of GHG emissions of 1,420 tonnes annually by 2012 from the forecasted levels. This includes the offset value of the Phase 1 of the Community Energy system. Subtracting these reduction measures from the modified BAU forecast results in an estimated GHG forecast of 6,345 tonnes (see Table 13). This is shown graphically in Figure 4.

The reductions proposed represent a 10.4 % decrease from 2002 levels. **This plan recommends that a corporate emissions reductions target be set as a 10% reduction of GHG emissions from 2002 levels by 2012.**

Table 13: Corporate GHG Action Plan Forecast

Sector	2002 Baseline (t CO2e)	2012 BAU Forecast (t CO2e)	Proposed Action Plan	
			Target Annual Reductions (t CO2e)	Forecasted Annual Emissions in 2012 (t CO2e)
Buildings	4,540	4,925		
-- CES			950	
-- Electricity			60	
-- other Natural Gas			40	3,875
Vehicle Fleet	1,470	1,590	160	1,430
Streetlights	120	130	25	105
Water and Sewage	420	490	25	465
Corporate Waste	540	630	160	470
Total	7,080	7,765	1,420	6,345

Source: BAU Forecast from Milestone 1 Energy Baseline - modified for this work.

Notes:

- 1) BAU = Business as usual scenario.
- 2) Reductions are subtracted from the forecasted 2012 BAU scenario to obtain the forecasted 2012 Action Plan emissions
- 3) CES system reductions re based on a project scoping report by FVB energy. "Building: electricity" reductions assume a 15% overall electricity reduction. "Building: other natural gas" reductions assume a reduction in 5% of building consumption after subtraction of the CES connected buildings, the Aquatic Centre, and the CN Centre.
- 4) Other reductions estimated as percentage of 2012 forecasted value. Fleet = 10%, streetlights= 20%, water and sewage = 5%, corporate waste = 25%. See Appendix A.

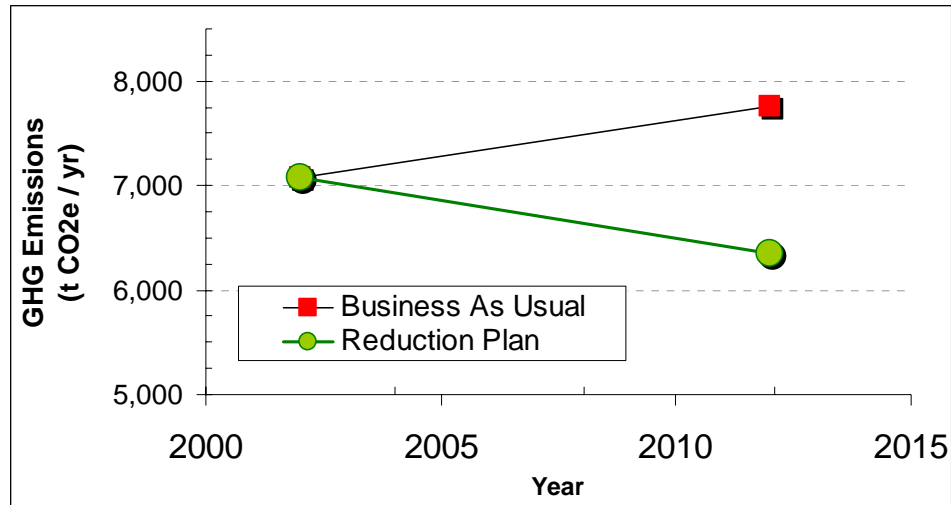


Figure 4: Forecasted Corporate GHG Emissions: BAU and Action Plan

Community Action Plan

The Community plan is targeted to achieve a reduction of GHG emissions of 135,500 tonnes annually by 2012. This includes the offset value of the Phase 2 of the Community Energy System. Subtracting these reduction measures from the modified BAU forecast results in an estimated GHG forecast of 1,216,920 tonnes (see Table 14). This is shown graphically in Figure 5. The reductions represent a 1.6 % decrease from 2002 levels.

This plan recommends that a target be set for a 2% decrease of community emissions from 2002 levels by 2012”.

Table 14: Community GHG Forecast

Sector	2002 Baseline (t CO2e)	Business as Usual 2012 Emmissions (t CO2e)	Proposed Action Plan	
			Annual Reductions (t CO2e)	2012 Emissions (t CO2e)
Residential Buildings	144,000	167,000		
-- Conservation			9,790	
-- CES (Phase 2)			5,050	152,160
Commercial Buildings	432,000	468,700	43,740	424,960
Industry	405,000	439,000	43,940	395,060
Mobile	224,000	243,000	24,300	218,700
Waste	32,000	34,720	8,680	26,040
Total	1,237,000	1,352,420	135,500	1,216,920

Source: BAU Forecast from Milestone 1 Energy Baseline

Notes: CES Emissions in 2012 are shown as negative because they are offsetting fossil fuel emissions.

BAU = Business as usual scenario.

Modified BAU = Revised BAU scenario for this report

Numbers may not sum due to rounding.

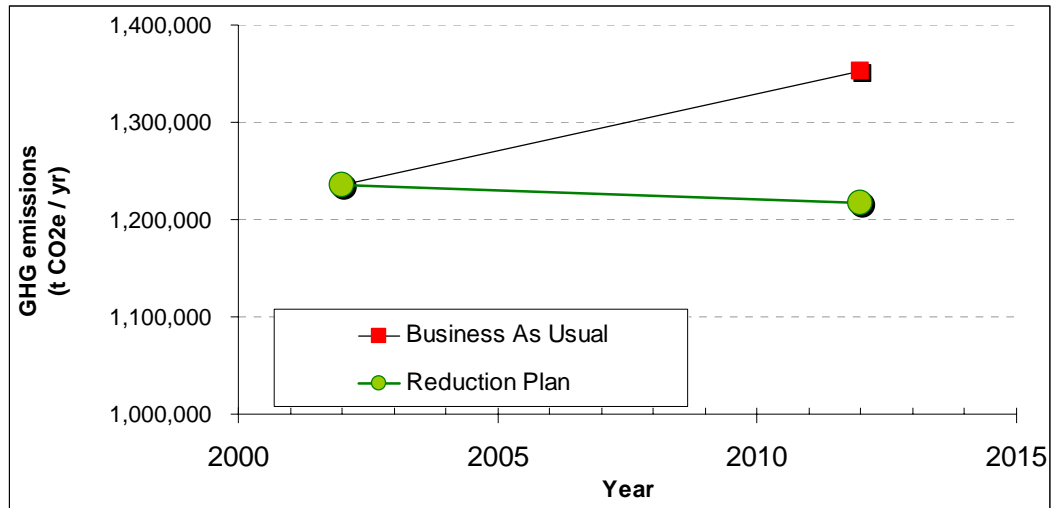


Figure 5: Forecasted Community GHG Emissions: BAU and Action Plan

9 Implementation and Monitoring

This section provides an implementation outline for the Energy and GHG Emission Reduction Plan.

9.1 Program Description

Name

City of Prince George Energy Management and GHG Action Plan

Objective

To enable the city of Prince George to achieve reductions in energy consumption and greenhouse gas emissions within both municipal operations (corporate plan) and the broader community (community plan).

Targets

Proposed targets are:

- A corporate target to reduce GHG emissions from municipal operations by 10 % from 2002 levels by 2012.
- A community target to reduce GHG emissions in the community by 2 % from 2002 levels by 2012.

Program Overview

The plan has been divided into two components representing the corporate program and community-wide initiatives. The plan's major features include:

- 1) Development of the community energy system,
- 2) Municipal action within the City's facilities to demonstrate leadership in the community,
- 3) Inclusion of energy considerations within municipal planning processes, and
- 4) Support for other activities within the community including partnering and in-kind support.

Program planning and execution will be coordinated by the city. Partnerships will be established with other levels of government as well as utilities and private sector sponsors.

Specific components of the plan will be executed by a number of departments within the city. These are defined within the action areas of the plan.

Program Coordinator

A staff member will be designated as the energy and GHG management “Program Coordinator”. This person is responsible for working with staff from many departments, to initiate activities and ensure that the annual work plan is progressing.

The execution of some items is the responsibility of the energy coordinator while others are the responsibility of other departments.

Table 15: Examples of typical Program Coordinator and Staff Responsibilities in Plan Implementation

Typical Responsibilities of Program Coordinator	Typical Responsibilities of Other Department Staff
Corporate Plan	
Establish annual work plan (in consultation with committee)	Conducting building audits
Develop internal awareness programs	Budgeting and implementing identified improvements
Publicize activities to staff through internal communications	Monitor and report on activities
Define data collection requirements and frequency. Collect, store and report on data.	Implement fleet reduction activities
Community Plan	
Make contact with other partners to promote the plan and find areas for municipal involvement.	Implement transit, cycling, and other consistent plans.
Apply for funding through various provincial and federal programs to meet the plan objectives.	Work with CES Phase 2 partners to establish and implementation timeline for these consumers.
Promote energy efficiency and awareness in the community.	
Act as a resource to the community on energy efficiency	

Program Champion / Sponsor (optional)

Some organizations assign a senior management staff person to each project as a program champion or sponsor. It is this person’s responsibility to ensure that the program is represented at the management and council levels. The City may choose to designate a staff as the Energy Plan Sponsor.

Implementation Committee (Corporate Operations)

The city may choose to establish an implementation committee for implementing the corporate plan. For the corporate (municipal operations) plan, a committee of appropriate staff responsible for buildings, fleet, and utility services is likely sufficient.

The responsibilities of this committee would include:

- Establish annual plans for defining actions towards implementing the plan;
- Demonstrate management commitment to the plan;
- Promote awareness for energy management to staff;
- Report on progress to management and council.

Meetings of this committee could be expected to be bi-monthly or quarterly.

Implementation Committee (Community Plan)

The city may choose to establish an implementation committee for providing input and oversight to the community plan. This group would specifically be comprised of partnering agencies, utility representatives, and delivery agents.

9.2 Monitoring and Reporting

A monitoring program will enable the City to assess progress towards the defined targets. Indicators, also called performance measures, help determine if the actions that have been implemented are having the desired effect and to identify where changes are needed.

The following performance measures are suggested for monitoring the progress of the Plan. These are based on the final outcome of energy and GHG emissions:

- Total corporate energy consumption (GJ/year).
- Total corporate GHG emissions (tCO₂e/year).
- Total community energy consumption (GJ/year).
- Total community GHG emissions (tCO₂e/year).

Additional indicators can be developed to define the progress towards meeting the plan activities. These are typically more representative of the means to the end. Possible indicators could include:

- # of buildings built to high energy efficiency, LEED, or BuiltGreen BC standards (buildings/year or square footage/year).
- # of energy audits conducted in the city on SF dwellings
- # of trips taken on transit
- Others as defined through program development.

Annual Reporting

It is proposed that brief annual progress reports be prepared by the program coordinator to monitor progress of implementation. The annual report will describe activities implemented in the previous year and define an annual action plan for implementing activities of the plan.

Annual reports can also be used to identify areas of change and provide an opportunity to update the plan by adding new actions or modifying existing actions.

Five Year Reporting

It is proposed that the community-wide inventory be updated every five years starting in year 2012.³¹ This will include:

- A detailed review of the activities and their success
- An updated energy and GHG baseline
- Recommendation for plan improvement.

9.3 Timeline

The timeline below outlines a proposed schedule for implementation commencing in fall 2007. The program manager is responsible for the reporting and data compilation for the plan, however, the plan itself has responsibilities across many departments. A long-term intent of the plan is to increase energy efficiency in staff and the community in all activities. To this end, all departments and management would be expected to commit to include energy efficiency considerations in their daily activities.

Table 16: Energy Management Plan Timeline and Responsibilities

Tasks & Responsibility

³¹ It may be desired to update the energy consumption profile from 2002 to 2006 or 2007 in order to understand the status at the start of the plan. This documentation could be done at the 5 year review, however there may be some data collection required early to capture all the information.

	Major Activities	Program Coordinator	Staff	Management / Council
Q3 2007	Plan Finalization and approval.	--	Review and comment on draft plan	Approval of Plan
Q4 – Q1 2007 - 2008	<ul style="list-style-type: none"> - Development of a CEP launch strategy (both corporate and community). - Plan is launched. - Initial Actions (2007) are defined. - Corporate plan committee meets. - Initiate first actions from plan. 	<ul style="list-style-type: none"> - Define the Program Coordinator - Integrate with new Federal ecoENERGY initiative. - Integrate with new Provincial energy efficiency / climate change initiatives. - Seek partner funding for initiatives - Development of 2008 work plan. 	<ul style="list-style-type: none"> - Plan representatives are defined in specific departments. - All staff are informed of plan. - Coordinator and energy manager to evaluate actions for 2007 - Implementation of actions - Development of 2008 work plan. 	- Budget review and approval.--
2008 and onwards	<ul style="list-style-type: none"> - Annual energy plan activities. - Report to council on activities. - Implement actions 	- Annual activities	- Implementation coordinated through energy plan coordinator.	Receive annual reports on progress

9.4 Resource Requirements

Personnel

Municipal staff time will be required to implement and administer the plan. This includes:

- The program coordinator role is expected to be staffed from existing environment or utilities staff.
- An energy manager being hired on a consultant basis by the City (with the support of BC Hydro). This person will be responsible for implementing energy conservation upgrades within city facilities. The actions of this position directly support the execution of the corporate plan.
- Staff efforts currently devoted to implementing the community energy system will continue to be funded through existing departments.
- Other staff time (e.g. management, purchasing, fleet operations, utility services, etc.) will be expected to be provided within existing work pans.

Program Disbursements

Disbursement costs will be required to implement some components of the program. This include costs for:

- Developing outreach and education materials (websites, brochures, etc.)
- Conducting energy audits and implement identified opportunities;
- Implementing fleet management systems or data tracking
- Incremental costs for executing action items within existing systems

- Incentives programs (direct funding to recipient or for purchase and distribution)
- Foregone revenue for charge reduction based incentives

A summary of the program requirements for the Corporate and Community energy plans is provided in Table 17 and Table 18, respectively.

Table 17: Estimated Municipal Resource Requirements for Corporate Energy & GHG Plan Implementation (\$ 1000s)

	2007	2008	2009	2010	2011	2012	Total
Management and Program Development							
Program Management and reporting	Existing Staff (environment)						0
Community Energy System	Existing Staff						0
Building Upgrades Management	Existing Staff (Facilities Manager + Energy coordinator)						0
Vehicle Programs Implementation	Existing Staff (Fleet Management, Supply services)						0
Municipal Operations	Existing Staff (Utilities)						0
Disbursements							
Information (brochures, signs, etc.)	0	10	10	10	10	10	50
Community Energy System	Funded separately from Energy Plan Actions						0
Buildings: Audits and Evaluations	0	20	20	20	20	20	100
Retrofits	0	TBD	TBD	TBD	TBD	TBD	TBD
Fleet Programs (training, promotional mat's, reporting systems)	0	20	20	5	5	5	55
Corporate Program Total	0	50	50	35	15	15	165

Notes: Assumptions for calculations contained in Appendix A; TBD = to be determined, NB Some components may be funded from existing departmental budgets.

Table 18: Estimated Municipal Resource Requirements for Community Energy & GHG Plan Implementation (\$ 1000s)

	2007	2008	2009	2010	2011	2012	Total
Management and Implementation							
Program Management and reporting	Existing Staff (environment)						0
Program Components Design	Existing Staff (environment, planning and development, long range planning, transit)						0
Disbursements							
Energy Audit Incentives	0	30	30	30	30	30	150
Transportation Planning: (Evaluation)	0	30	20	20	20	20	110
(Implementation)	0	TBD	TBD	TBD	TBD	TBD	TBD
Land Use and Planning (Research)	0	25	25	25	25	25	125
Energy Supply	CES Phase 2 funded separately from Energy Plan						0
Outreach and Engagement (contract staff)	0	35	35	35	35	35	175
(Promotional events and materials)	0	20	20	20	20	20	100
Community Program Total	0	140	130	130	130	130	660

Notes: Assumptions for calculations contained in Appendix A; TBD = to be determined

9.5 Financing and Assistance

It is expected that the municipality will be required to fund staff efforts independently. However, a range of funding partnerships exists for implementing actions both within the municipality and in the community.

Table 19: Programs Available to Manage Community Emissions

	Source Funding and Partner Type				
	NGO	Regional District	Province	Federal (a)	Utility
Transportation	Canada Fleet Challenge (E3 Fleet)	Travel Choices Implementation Funds		Green Municipal Funds	
Land Use Planning	Smart-growth BC		Community Action on Energy Efficiency (CAEE)		
Residential Buildings		BC Building Code Update	- Energy Saving Plan - PST exemptions - Potential BC Energy Plan funding	ecoENERGY	- Powersmart - Terasen High Efficiency Furnace Rebate
Commercial Buildings			- Green Buildings BC - PST exemptions	ecoENERGY?	Powersmart PIP Commercial Boiler Upgrade
Energy Systems				Green Municipal Funds	

Appendix A: Calculation Methodology for Energy and GHG Emissions Reduction Estimates and Program Resources

Notes on Measuring Reductions

At the same time as efforts are underway to reduce emissions, growth and expansion in the community continue to increase emissions. The protocols encourage communities to set targets that achieve reductions below their baseline levels. That is, they are encourage to find reductions that offset the growth related emissions as well as find reduction in the baseline year emissions.

To illustrate this, the example of the City's municipal emissions budget is shown below. The 2002 (baseline year) emissions were estimated at 7080 tonnes CO₂e / year and were forecasted to grow to 7765 by 2012. Plan actions were identified that were estimated at 1,420 t CO₂e reductions by 2012.

Achieving these reductions would reduce the emissions in 2012 to 18% below their forecasted level. However, compared to the baseline level, this would be a reduction of 10.4 % below baseline.

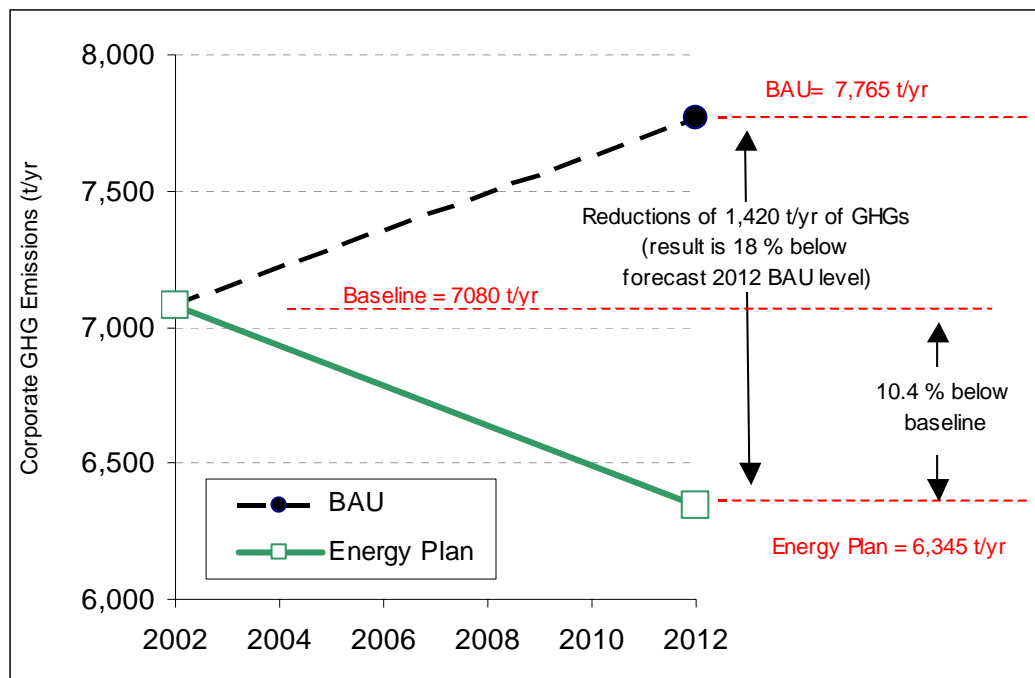


Figure A-1: Schematic representation of Tracking GHG Emissions Reductions

Corporate Plan

Section 5.1 Community Energy System (Phase 1)

The Municipal Community Energy system will offset over 29,000 MWh of heating load. The municipal component (Phase 1) of the total load is 5035 MWh (or 18,125 GJ) of offset natural gas consumption.

The total project will reduce GHG emissions by 6000 to 7000 tonnes of CO₂ equivalent. The municipal component of this (Phase 1 not counting the hospital) is about 950 t CO₂e.

Section 5.2 Civic Buildings Audits and Retrofits

These are to be determined on a building by building basis. However, typical numbers are that complete retrofits can reduce energy consumption by anywhere from 15% to 30%. Some work has already been done - focusing on electricity reduction through Power Smart.

The plan assumed that complete audits and retrofits over a 5 year period would identify and implement retrofits resulting in a 15 % reduction in overall building electricity consumption. (NB 5 % reductions have already been achieved in some buildings with the resulting award of BC Hydro ecoPoints for further conservation).

The majority of the natural gas savings will be realized in through the implementation of the community energy system. Some other buildings not connected are relatively new (the CN Center and the aquatic centre) that they might not have suitable business cases for retrofits. Finally, many of the buildings in Prince George already have reasonably tight building envelopes (e.g. double glazed glass etc.) and the economics of further upgrades (e.g. low-e windows and triple glazed glass) might be poor. To account for this the targeted natural gas consumption is the total consumption (around 82,000 GJ annually) minus the CES-related buildings consumption, minus the CN centre consumption, and minus the aquatic centre consumption leaving about 16,800 GJ of consumption. It was assumed that a 5% reduction in this consumption would be achieved through operational and retrofit actions (about 845 GJ).

Note: Heating energy savings achieved in a building that is connected to the community energy system do not achieve further GHG reductions “in this category” because those reductions are accounted for in the initiative for the CES. However reductions in electricity that are not related to the heating provided by the CES are included.

Section 5.3 Vehicle Fleet

A target value of achieving a 10% reduction in vehicle and machinery fuel consumption is proposed.

Other fleet management programs have been able to achieve reductions in the order of 10% of total fuel consumption. For example the City of Richmond has achieved a 10% reduction in fuel consumption from anti-idling activities alone. (NB: These results may not be achievable from anti-idling alone in the climate of Prince George).

Bio-diesel has been proposed for use in the fleet. The use of bio-diesel does not reduce energy consumption; however it does result in reduced GHG emissions for the same amount of fuel consumed. This is because the CO₂ from burning bio-diesel is considered “GHG neutral” because it has originated from a biological source and cycles from the atmosphere - to plants - to the biofuel - to the atmosphere. A B5 or B20 blend does achieve a small reduction in total life cycle GHG emissions.

Section 5.4: Municipal Operations and Demonstrations of Leadership

The street-light dimming project was assumed to reduce electricity consumption by 20%. That is a reduction of 25% where implemented, but the dimming lights are only installed in 80% of streetlights (assumption) due to operational reasons.

Water and sewage services are assumed to achieve a reduction of 5% of energy consumption through ongoing management.

Solid waste generated at municipal facilities is reduced by 25% through improved collection of recyclables, waste reduction promotion, and better materials management.

Community Plan

Section 6.1: Improve the Energy Efficiency of Buildings and Facilities

The reduction potential was based on achieving the target established in the energy efficient buildings plan targets. These are shown in the table below.

BC's Energy Efficient Buildings Plan Targets

Sector	Target	Target Date
New Development		
New detached single-family and row houses	Achieve EnerGuide rating of 80 in all new developments	2010
New multi-unit residential buildings	Energy performance 25% better than the MNECB	2010
New commercial, institutional and industrial buildings	Energy performance 25% better than the MNECB	2010
Existing Buildings		
Existing single-family and row houses	Reduce energy consumption in 12% of buildings by an average of 17%	2010
Existing multi-unit residential buildings	Reduce energy consumption in 16 % of buildings by an average of 9 %	2010
Existing industrial, commercial, and institutional buildings	Reduce energy consumption in 20 % of buildings by an average of 14 %	2010

Notes: 1) MNECB = Model National Energy Code for Building
 2) EnerGuide is a Federal rating system for evaluating annual energy consumption. With the recently announced ecoEnergy Efficiency Initiative, this system or a new system may be developed.

Sector specific reductions used to establish the target are:

- Existing residential buildings: Buildings plan target of 17% average reduction in 12% of buildings = 2% total reduction in residential energy consumption and emissions.
- New residential buildings: Assumed to meet the EnerGuide 80 rating = 30% reduction from standard construction.
- Existing commercial buildings: Buildings plan target of 20% average reduction in 14% of buildings = 3% total reduction in residential energy consumption and emissions. Additional 15% reduction proposed for internal activity improvements.
- New commercial buildings: Buildings plan target of 25% better performance than the NMECB (National Model Energy Code for Buildings)

Note that the inventory was not able to differentiate between SF residential and MF residential consumption - assumed that MF reductions match the SF reductions.

Industrial GHG emissions were considered to decline by 10%. Note that the baseline year is 2002. The new biomass turbine at PG Pulp and paper was not in place then and so future inventories should show a reduction from this action (i.e. those reductions would be included within the 10% target.).

Section 6.2: Reduce Transportation Consumption

Simplified estimate. Assume that the community is able to target a 10% reduction in GHG emissions. This could be accomplished by reducing the distances traveled, increasing the fuel efficiency of vehicles, or incorporating biofuels.

Section 6.3: Encourage Energy Efficient Land Use Planning

No reductions estimated from this area. Assumed that land use planning activities are more foundational to result in reduced energy consumption in buildings and transportation.

Section 6.4: Energy Supply

Community Energy system (Phase 2) will offset an additional 26,800 MWh (96,500 GJ) of heating load than Phase 1. This results on a net reduction of 5,050 t of CO₂e.

Section 6.5: Outreach and Engagement of Residents and Businesses

No reductions estimated from this area. Assumed that outreach activities are more foundational to result in reduced energy consumption in buildings and transportation.

Program Resource Requirements

This section describes the resources required to implement the plan. These are estimated from 2007 to the 2012 milestone year. The resources required are only those borne by the city. It is expected that for the plan to be successful a range of partnerships will be developed for implementation, incentives, and public outreach. Partner funding could be accessed for both the corporate and community plan components.

As an example, the new ecoENERGY initiative from the Federal Government is expected to introduce a grant incentive program similar to the former EnerGuide for Houses program. This is also used in the current pilot project Energy Savings Plan incentive program of the BC government. To encourage the uptake of these programs in the Prince George area, the municipality could provide information to residents about accessing these programs, they could offer a discounted building permit fee (action A-23) to residents who perform an “A” (before) audit. These partnerships are intended to leverage the efforts of the municipality through the other available programs.

Corporate Plan Resources

The corporate program resource estimates are based on:

- Environment (or utilities) staff are the program manager and perform the implementation and progress reporting under existing staff time. This may require effort to meet periodically (quarterly or semi-annually) with the corporate energy management team, compile information on actions taken and implemented, compile energy use data as required (with the assistance of the facilities and fleet management departments), and prepare reports to council as required.
- Facilities management, fleet management and utilities services will provide their assistance from existing time allocations to implement the corporate activities. This includes meeting as a team periodically to review and evaluate energy activities and progress, preparing budget estimates for plan activities, ensuring that purchasing decisions are consistent with the plan goals, assisting the program manager to find and compile information as required, etc.
- Information and promotional requirements may include educational materials (posters, signs, etc.) and outreach activities for staff - car pooling information, clean-air day activities etc. These are budgeted at \$10,000 per year
- The Community Energy System is a multi-million dollar investment in sustainable energy for the municipality and potentially others in the downtown core. This activity is an element of the plan, however, for this work it is assumed to be funded separately.
- Many facility energy saving actions have been implemented - often in partnership with BC Hydro as part of their PowerSmart programs. Other opportunities may also exist and these can be identified through building energy reviews and audits. Energy audits can range from high level walk-through evaluations which may be provided free by utility companies, to detailed

engineering evaluations costing thousands of dollars. A rough estimate of \$ 20,000 per year is assumed.

- Implementation of the actions identified through building audits and evaluations cannot be determined. However, many experiences indicate that building energy efficiency is economic with pay back periods in the range of 5-8 years. If partner funding is available, or if energy prices increase, then these payback periods would become shorter.
- A fleet energy management program is recommended and would be implemented by staff. Some budget is required for supporting activities such as membership in a fleet management program (if desired), training services, tracking software upgrades, educational materials such as posters, windshield stickers, signage, etc.) A budget of \$20,000 per year is assumed for the first three years with lesser requirements in the latter three years.

Community Plan Resources

The community plan resource estimates are based on:

- Environment (or utilities) staff are the program manager and perform the implementation and progress reporting under existing staff time.
- Transportation, transit, planning and development, and long range planning staff will be required to provide support to the plan activities through their existing time allocations. This may include meeting periodically to review and evaluate energy activities and progress, preparing budget estimates for plan activities, reviewing planning proposals, etc.
- Building and energy audit incentives cited are based on a simple incentive in the range of a \$50 discount to renovation building permit applicants who conduct an energy audit and conservation evaluation prior to receiving a permit. An analogous incentive could be offered to commercial applicants. Note that this incentive is not sufficient to generate action, but rather is intended to highlight energy opportunities to residents prior to construction and to steer them to the relevant Federal and Provincial programs. If the City chose to be more aggressive in its incentive programs, then these costs would increase.
- Transportation and planning actions may require expenditures on consultant studies, stakeholder workshops, planning etc. These would be defined annually as the as the plan is implemented but are estimated here at \$20,000 per year.
- Implementation of transportation recommendations cannot be determined at this stage. However, these types of actions typically have a multitude of benefits and could be funded through a range of transportation, infrastructure, and utility budgets, as well as the energy plan program.

- Land use and planning activities are primarily developed in-house through updates and revisions to planning documents. There may be a need for some specialized research, legal interpretations, or specific stakeholder consultation on an issue. A budget of \$25,000 annually is assumed.
- Implementing Phase 2 of the Community Energy system is a long-term objective of this plan. However, that is a major capital initiative, and the implementation schedule cannot be predicted. It is expected to be funded as a stand-alone funding request and not as part of the energy plan.
- Outreach and communication expenses are variable and depend on the intensity that the City wishes to promote the program. This budget assumes that there is a 0.5 FTE of contract (e.g. summer student, new grad) staffing to implement outreach and education activities such as promoting the plan, encouraging conservation, writing website content, attending public events to promote incentive programs etc. (assumed a 0.5 FTE, with benefits & overhead = \$35,000).
- The outreach activities will require promotional items - brochures, school resource kits, posters, prizes, etc. A budget of \$15,000 in the first year for a launch activity, and \$20,000 is included.