

**DRAFT**

**CORPORATE CLIMATE CHANGE  
ACTION PLAN**



Submitted by:  
The Cool Vancouver Task Force  
and CITY OF VANCOUVER - Sustainability Support Group  
December 2003

# Corporate Climate Change Action Plan for the City of Vancouver

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## 1.0 Introduction and Background

The City of Vancouver is committed to becoming more sustainable and has been addressing the particular issues of climate change since the late 1980s. It demonstrated leadership many decades ago in reducing highway infrastructure planned for downtown, bringing housing back to the downtown, and increasing pedestrian amenity around the City. It took a strong position on not increasing road infrastructure and shifting transportation focus to transit and non-automobile modes.

Overall, Vancouver has taken a position of both responsibility and leadership in addressing climate change, however the 21<sup>st</sup> century has posed new challenges and renewed the call for determination and creativity in addressing these issues within the City's jurisdiction. In response, Council has approved a Corporate GHG reduction target of 20% below 1990 emission levels by 2010. While this Corporate Climate Change Action Plan focuses on describing how the City intends to meet this relatively short-term target, the City acknowledges that further reductions will likely be required in order to address the challenges of global climate change. The emission reduction measures described in this Plan have been formulated not only to meet the 2010 target but also to position the city well to continue with this process thereafter.

This Corporate Action Plan addresses only emissions resulting from City operations such as fire, police, parks, waste collection, community centers, City hall, etc. This Corporate Plan will be complimented by a Community Climate Change Action Plan to be completed in 2004.

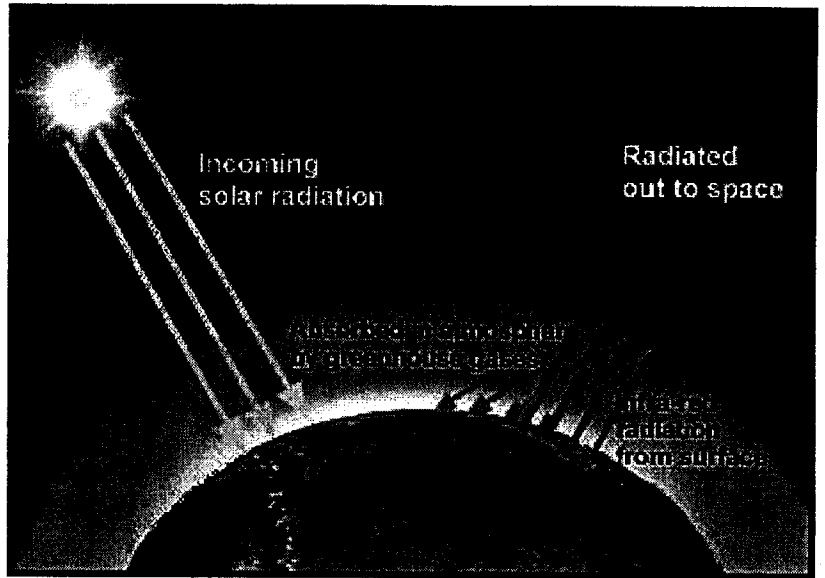
### 1.1 The Cool Vancouver Task Force

This Action Plan was developed in cooperation with the Cool Vancouver Task Force (CVTF). This collection of knowledgeable individuals from a wide range of stakeholder groups in the City of Vancouver and the Region was created through a March 25, 2003 Council motion and was co-chaired by City Councilor David Cadman and the City's General Manager of Engineering Services. The City wanted its plan to be informed by the interests and knowledge of a wide diversity of stakeholders including:

- The Environmental Youth Alliance
- City of Vancouver (Council and Staff)
- SPEC
- BC Ministry of Water, Land, & Air Protection
- Science World
- Vancouver Coastal Health Authority
- Terasen Gas
- BOMA
- Vancouver Board of Trade
- BC Hydro
- Vancouver Economic Development Commission
- SFU School of Resources & Environmental Management
- Environment Canada
- David Suzuki Foundation
- Vancouver Planning Commission
- Urban Development Institute
- GVRD
- Tides Canada Foundation
- Vancouver School Board
- Vancouver Park Board
- TransLink
- B.E.S.T
- UBC Sustainable Development Research Institute

## 1.2 Climate Change and Greenhouse Gases

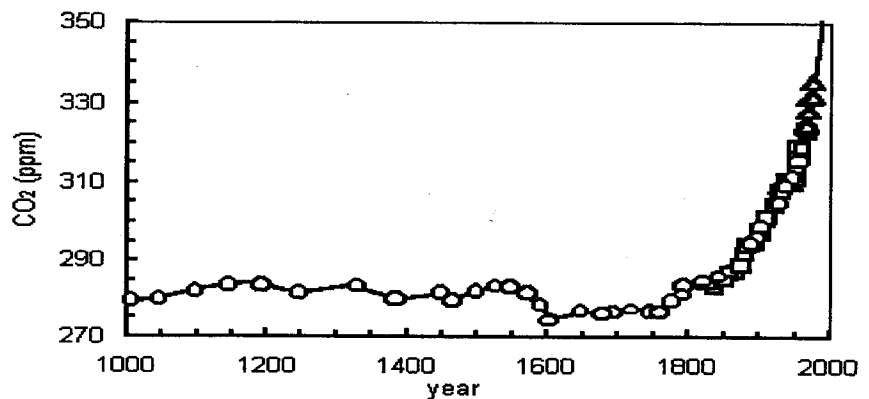
Climate Change is an expression used to generally describe observed and expected changes to the Earth's climate resulting from man's impact on a natural phenomenon called the greenhouse effect. The greenhouse effect occurs when gases in Earth's atmosphere, (primarily carbon dioxide but also including other gases such as methane, nitrous oxide, and hydroflouorocarbons) trap solar energy from the sun close to Earth.



While these greenhouse gases (GHG's) naturally cycle between the planet and its atmosphere, human activities that increase the emission of these gases into the atmosphere can change the natural balance and result in climate change<sup>1</sup>. The primary human activity that emits greenhouse gases is the burning of fossil fuels; in automobiles, to generate electricity, to heat our homes and business, to power industrial machines, etc. In addition, the garbage we produce also emits greenhouse gases as it breaks down in our landfills.

Globally, human activities add nearly 30 billion tonnes of carbon to the atmosphere each year. In 1997, Canada's greenhouse gas emissions were 682 million tonnes, a 13 per cent increase over 1990. If no serious action is taken, current forecasts are that Canada's GHG emissions could be 25 per cent above 1990 levels by 2010.

Ice core samples demonstrate the increase in CO<sub>2</sub> in the atmosphere over many hundreds of years.



Ice core data showing CO<sub>2</sub> levels this millenium<sup>2</sup>

Greenhouse gases vary in their impact in trapping solar radiation. For example, one tonne of methane has approximately 21 times the global warming potential of the same amount of carbon dioxide. For ease of comparison and to create a standard of measurement, GHG's are equated and expressed in tonnes of carbon dioxide equivalents (t eCO<sub>2</sub>).

<sup>1</sup> An example of this natural cycle is the absorption of carbon dioxide by plants. The plants incorporate the carbon from carbon dioxide into their structure and release the oxygen into the atmosphere. When a plant dies the carbon trapped in its body combines with gases in the atmosphere to release greenhouse gases.

<sup>2</sup> Taken from the CSIRO site (<http://www.ems.psu.edu/~radovic/COxTask3A.html#Carbon%20Dioxide%20Trends%20over>)

While there is some uncertainty around the science of climate change, the majority of world scientists agree that the climate is warming with potentially disastrous effects and that the primary cause of that warming is human activity.

### 1.3 The Impacts of Climate Change

A change in the world's climate of the magnitude predicted by scientists would have significant consequences for people, economies and the environment across the planet. It is impossible to predict exactly what the impacts of climate change will be to Vancouver, but scientists have identified some of the implications that Vancouver can probably expect to face including:

- Flooding from increased storm intensity, wetter winters, and rising sea levels;
- Disruptions to our water supply during longer drier summers;
- Increased number and intensity of extreme weather events such as rainstorms in the winter and summer droughts;
- New diseases resulting from increased average temperature (globally, tropical diseases have already begun moving northward);
- Increasing respiratory problems due to increased temperatures and smog effects;
- Indigenous plants and animals may be challenged for their ecological niches by foreign species from warmer climates;
- Environmental refugees from other nations that either will lack the resources to deal with climate changes or are expecting more drastic impacts

Globally, climate change impacts will likely include a rise in sea-level that would threaten millions of people, and the melting of up to half the ice in the world's mountain glaciers. In Canada, projected impacts include a large reduction in the areas covered by boreal forest and tundra, major changes to the levels and flow-rates of rivers and lakes, and the spread of semi-desert conditions over part of the southern Prairies.

The considerations for preparing for and responding to these challenges will begin to be addressed in the Community Climate Change Action Plan expected to be completed in 2004.

### 1.4 International and National Context

#### **Kyoto Protocol**

In 1992, a global approach to address the challenge of climate change was launched with more than 155 countries, including Canada, signing the United Nations Framework Convention on Climate Change (UNFCCC). Since 1992, a number of United Nations conferences have taken place. The goals of the agreements were to limit greenhouse gas emissions and protect carbon sinks and reservoirs.

In 1997, the Kyoto Protocol was established to create a future of lower GHG emissions, better energy efficiency, sustainable growth, and cleaner air, leading to an overall cleaner, healthier environment. The Protocol created various targets, for industrialized countries that ratify the agreement, to reduce overall GHG emissions by a global average of 5.2 percent below 1990 levels in the commitment period of 2008 to 2012.

The Protocol will come into effect 90 days after at least 55 Parties to the Convention, which account for at least 55% of the total carbon dioxide emissions for 1990 from industrialized nations, have ratified, accepted, approved or acceded to the Protocol. The 55% requirement will be satisfied for the Protocol's entry into force when Russia ratifies the Protocol. The United States has indicated that it will not ratify the Protocol.

### **The Partners for Climate Protection (PCP) Process**

The City joined the PCP program at its inception in late 1998. PCP is a national program coordinated by the Federation of Canadian Municipalities (FCM) that brings Canadian municipal governments together to reduce the local production of GHG emissions and improve the quality of life. The PCP works in conjunction with ICLEI to establish norms for measuring and reporting GHG emissions and reductions.

As a participating member of the PCP, the City has been implementing various measures to reduce GHG emissions and ultimately, to contribute to the Government of Canada's international commitment to reduce GHG emissions globally. The PCP process describes five key steps in addressing climate change:

- 1) Take emissions inventory and forecast future emissions
- 2) Set a reduction target
- 3) Develop a local action plan
- 4) Implement the plan
- 5) Measure progress: monitor, verify & report reductions

The process leading up to this Action Plan (and the pending Community Climate Change Action Plan) has taken the City through the first three of five steps in PCP process.

### **1.5 Role of the Corporate Climate Change Action Plan: A Sustainability Context**

This Corporate Climate Change Action Plan was developed with the awareness that it is part of a larger perspective and position on increasing the overall sustainability of the City. Fundamental to harmonizing this Action Plan, which is focused on reducing greenhouse gas emissions, with a broader sustainability context is recognizing two key roles of the City: the provision of services and leadership.

This Plan articulates a number of measures to reduce the GHG emissions resulting from City operations while recognizing the City's role as a service provider. The emission reduction measures described in this plan recognize that providing these services requires energy and financial resources. As such, the measures described are limited to those that do not prevent the City from providing essential services and are financially viable without compromising other programs or requiring increased taxation.

Equally important in the development of this Plan was the understanding that the City's responsibility goes beyond just providing services; the City and our elected officials must also demonstrate leadership. While Corporate GHG emissions account for only about 1% of the emissions within Vancouver, this plan will play a key role in the formulation of a broader Community Climate Change Action Plan (expected in 2004). Not only does it clearly signal that the City is committed to addressing climate change issues but it also provides a number of very realistic and repeatable examples of how individuals and organizations can act independently to reduce greenhouse gas emissions. It is expected that a fundamental component of the Community Plan will see the City actively share/promote what it learns in implementing its Corporate Plan with the broader community.

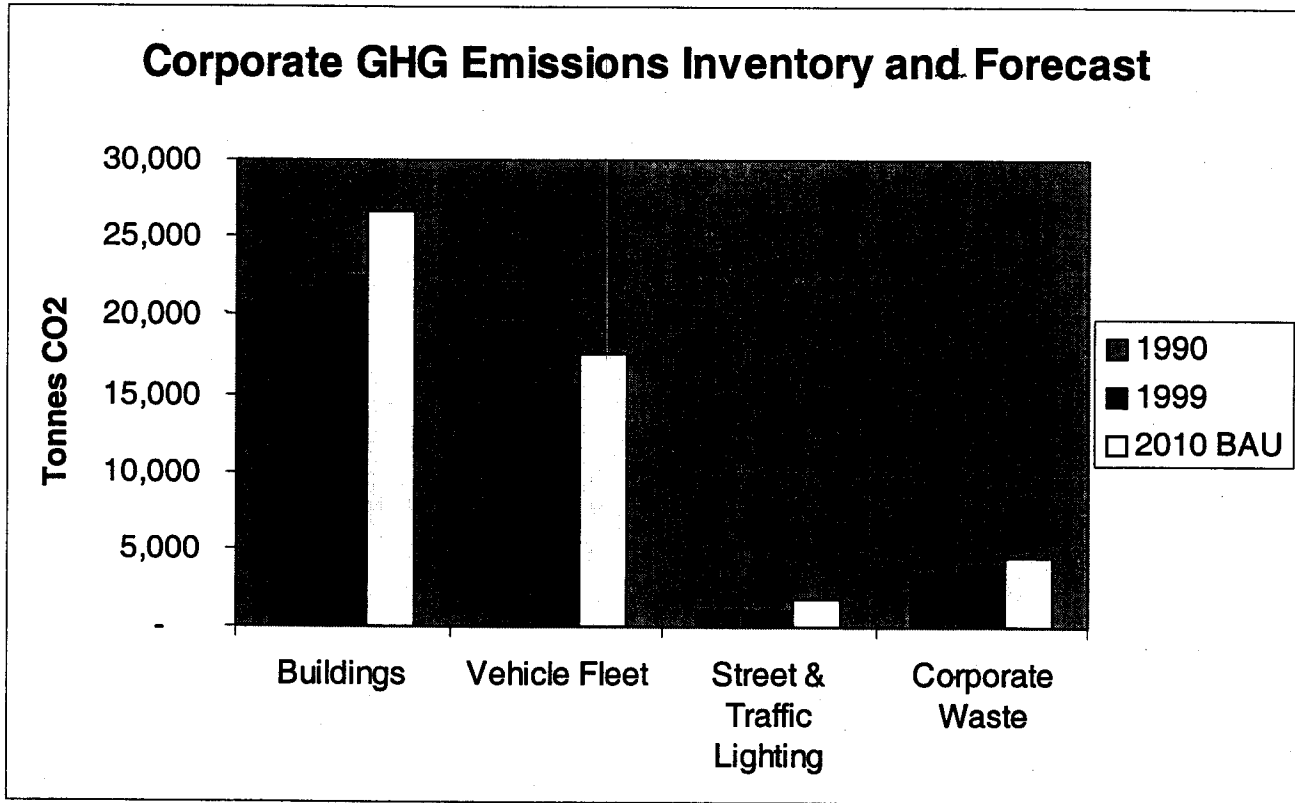
## **2.0 Corporate Emissions Inventory**

In 1999, just over 50% of Vancouver's Corporate GHG emissions were from energy use in civic facilities, just over 35% were from fleet operations, and almost 10% were landfill emissions associated with the waste generated by City operations.

In BC, the GHG implications of electricity vary with annual rainfall and the total amount of demand. When we have a wet year with low demand, more of our power comes from hydro and less from burning natural

gas. For the three years shown, the carbon intensity varied from 19 t/GWh in 1990 (a very wet year) to 39t/GWh for 2010 (according to BC Hydro forecasts).

Total Corporate GHG emissions actually decreased 6% from 1990 to 1999. This demonstrates that despite a rapidly growing population and the increasing GHG emissions associated with the production of electricity, it is possible to reduce total GHG emissions.



**Notes:**

- The 1999 emission numbers are based on fuel sales and utility data. The 1990 number is based on 1990 fuel sales and a back cast from 1993 facilities energy consumption data.
- The Business as Usual (BAU) 2010 forecast is a simplistic increase in GHG emissions from 1999 based on population projections and accounting for the anticipated increases in the carbon intensity of electricity. It is presented here to illustrate that this plan has been developed taking a growth into account; for the purposes of this Plan this growth estimate is believed to be conservative and that actual growth in GHG emissions from the expansion of corporate facilities would be less than projected here.

*The total corporate emissions in 1990 were 46,000 tonnes. A 20% decrease from 1990 would require a net GHG emission reduction of 9,200 tonnes; this Plan describes the emission reduction measures and their anticipated contribution to realizing this emission reduction.*

### 3.0 Greenhouse Gas Emission Reduction Measures

The City of Vancouver and the Cool Vancouver Task Force have identified a number of emission reduction measures (ERM) that appear to be cost effective approaches to addressing climate change. While most of these initiatives offer real opportunities to reduce emissions, some of them are dependant on further research and development. Others do not significantly reduce corporate emissions but are included so as to

demonstrate leadership to other organizations and the public of Vancouver. The recommendations have been tailored to adapt to these varying circumstances.

It is also necessary to acknowledge that while this plan does address emission reduction, a complete climate change plan must also address the development of adaptation strategies and the potential offered by emissions trading. These issues will be addressed for both the Corporation and the Community in the Community Climate Change Action Plan expected to be completed in 2004.

The thirteen emission reduction measures described in this Plan fall into five main categories:

#### **Civic Facilities ERM's**

- Energy Performance Contract
- Energy Efficient Purchasing Policy
- Supporting Alternative Energy
- Green Design for New and Replacement Civic Facilities

#### **Corporate Fleet ERM's**

- Vehicle Right-Sizing
- Shift to Diesel Vehicles
- Shift to Biodiesel Fuel
- Driver Training Program
- Fleet Demand Management
- Other Technologies and Fuels for Consideration

#### **Street/Park Lighting and Traffic Control Signals**

- Track and implement technological improvements

#### **Corporate Waste Reduction and Landfill Gas Recovery**

- Expand waste reduction and landfill gas recovery programs

#### **Corporate Demand-Side Management (DSM)**

- Develop DSM programs for staff energy use and commuting

### **3.1 Civic Facilities**

The City of Vancouver (including Parks) owns and/or occupies a diversity of facilities ranging from City Hall and other offices, Police and Fire Stations, Community and Recreation Centres, to land holdings for investment and planning purposes. Roughly 50% of the City of Vancouver's corporate greenhouse gas emissions are due to energy use in its facilities. Those facilities that the City both owns and occupies offer great opportunities to invest in energy efficiency capital improvements that will pay for themselves within a short period of the operational lifecycle while significantly reducing our greenhouse gas emissions.

For the purposes of GHG planning, there are two categories of civic facilities included in our emissions profile:

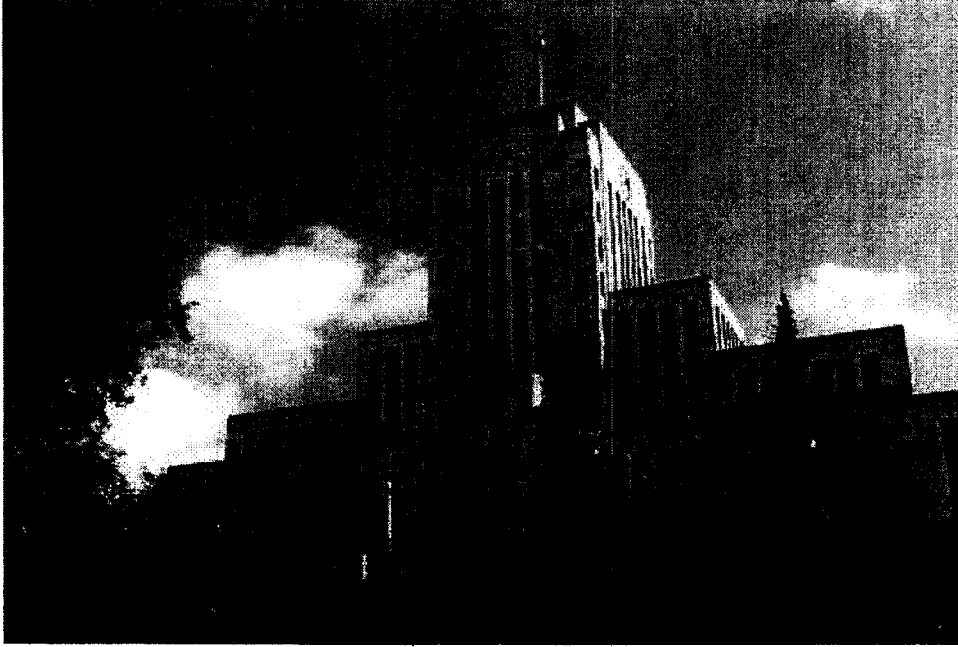
- City of Vancouver owned and occupied;
- City of Vancouver occupied but not owned.

Buildings that the City owns but does not occupy are not included in the corporate emission profile (contrary to accepted PCP protocols) because these make a small percentage of the energy consumed by the corporate stock and because the City does not have access to the utility information of its tenants.



### 3.1.1 Energy Performance Contract (Targeted emission reduction from 1990 baseline = 4,400 tonnes)

One of the most obvious and assured ways to reduce the greenhouse gas emissions from existing civic facilities is to improve the energy efficiency of the facilities themselves through measures such as improved controls, more efficient lighting and heating/cooling equipment, and improvements to the building envelope such as its insulation and windows.



Because every facility is unique in its construction and operation, each requires a tailored approach to energy conservation. Energy audits of each facility would provide the information required to prioritize the most effective and economic measures to reduce the energy consumption of the facility. In the experience of other large organizations an average 20% reduction in energy consumption from retrofitted buildings is economically viable.<sup>3</sup>

The City has to date not initiated a comprehensive facility audit and retrofit program, largely because of constraints to staff and resources. The Cool Vancouver

Task Force process has been a stimulus to establish staff, resources and the mandate to pursue audits and retrofits more purposely. The first step in realizing such a program would be to hire an Energy Projects Coordinator to assist in initiating a process towards conducting a comprehensive facility audit and retrofit program.<sup>4</sup>

There are financial advantages towards moving forward with this quickly as BC Hydro has only committed to funding energy efficiency initiatives through their Power Smart Program until the end of March 2005<sup>5</sup>. The bulk of this funding, which would likely exceed one million dollars, would only be accessible if the City had a contract(s) in place by that time to conduct energy retrofits. Based on the experience of similar organizations, the City would need to initiate its process early in 2004 in order to be able to achieve a March 2005 deadline.

While there are two approaches available to the City to perform comprehensive facility energy audits and retrofits, the Cool Vancouver Task Force recommends the City pursue an Energy Performance Contract (EPC) as opposed to a self-managed approach for the reasons described below.

#### *The Energy Performance Contract (EPC)*

<sup>3</sup> A small percentage (5%) of the building area making up the Corporate stock would not be immediately considered for retrofits as they are owned but not occupied by the City and therefore the City would not be able to recoup the retrofit costs through the utilities savings. As a result, building retrofits would result in an approximate 19% reduction in emissions from the corporate building stock. This would be equivalent to a 4,400 tonne reduction relative to 1990 by 2010 once corporate growth is factored in.

<sup>4</sup> Power Smart funding is available for approximately half of the cost of retaining an Energy Coordinator. This funding would come with some conditions and therefore would need to be explored in greater detail.

<sup>5</sup> Funding programs through Power Smart might be renewed after March 2005 but we have a firm commitment until then.

The Energy Performance Contract (EPC) approach is one where an Energy Service Company (ESCO) undertakes a turnkey (design/build) retrofit project and in turn receives compensation from the energy savings. This form of implementation eliminates the need for the City to provide upfront capital funding<sup>6</sup>. This approach minimizes City staffing requirements to manage the project, facilitates cost control, creates a single source of project accountability, and transfers most of the risk of project performance to the ESCO while maintaining City control of the project objectives. It is also likely to result in the retrofits being completed more quickly than using a self-managed approach.

EPC projects are bundled and comprehensive by nature. They address all energy related components such as lighting, heating, ventilation, air-conditioning, and control systems as well as water efficiency measures. At the same time, they offer the opportunity to incorporate and finance a wider range of facility infrastructure renewal and "green" building measures (such as green roofs etc) that the City may wish to incorporate<sup>7</sup>. They also bundle the auditing and retrofitting of multiple facilities into a single contract; this makes it possible for the costs and savings from retrofits of many smaller facilities to be bundled and thereby meet the minimum energy savings requirements of Power Smart funding.

EPC's are a proven way to finance and implement building energy retrofits. In addition to the numerous Central and Western Canadian municipalities that have entered into EPC's (such as Toronto, Hamilton, Windsor, Prince Albert, Regina, and City of Calgary) a number of major organizations in BC have also begun a comprehensive EPC process (including UBC and the City of Burnaby). The City of Vancouver is currently considering an EPC to retrofit City Hall and Library Square, not only to improve energy efficiency but also to meet the broader sustainability objectives required to obtain a LEED Silver rating.

It is projected that it will take at least 18 months to select and initiate the procurement process for an Energy Service Company (ESCO), select the successful ESCO, establish timelines and project scope/ payback periods, conduct energy audits, and negotiate an EPC (in consultation with the Department of Legal Services) and report to Council for authority to enter into the EPC. The City would not commit to energy retrofits under an Energy Performance Contract until all audit and contract negotiations are complete. This is to ensure that the planned course of action is financially viable and would not compromise effective operations and service delivery. Once a contract is signed, the retrofits could likely be completed in one year.

#### ***Inter-Departmental Energy Committee***

EPC's include not only capital retrofits of facilities but also include modified operational approaches to increase facility energy efficiency. In order to ensure that departmental and employee needs are satisfied in the retrofit process and under a modified operational approach, it is important to form a multi-stakeholder committee early in the process to understand these needs and to incorporate them into the terms of the EPC. Identifying and addressing potential conflicts between energy efficiency measures and the smooth functioning of a given facility (and its staff/patrons) would not only require the feedback of staff but a deliberate exploration of the experience of other organizations with similar facilities and their experience with energy retrofits.

A committee of this nature can also provide a valuable communication tool to the individual departments and facilities. Not only does this assist in keeping employees informed of the changes in their working environment, it also supports the dissemination of information on how individual behaviors can positively impact the environment through energy savings.

#### ***Savings Sharing Fund***

<sup>6</sup> The energy audit component of the EPC would likely qualify for Federation of Canadian Municipalities' Green Municipalities Enabling Funding and the retrofits would likely qualify for Green Municipal Infrastructure Funding.

<sup>7</sup> Establishing higher targets for energy performance or the inclusion of non-savings generating measures increases the payback period of the contract. Conversely, external funding, better than expected energy performance, and the potential for reduced borrowing costs by having the City borrow funds can "buy" down the payback period.

As a tool to help increase staff awareness and support of energy efficiency, some organizations have created an internal accounting process to track capital expenditures for energy related projects, account for the savings from the retrofits, and allocate a portion of the savings beyond those estimated in the EPC (attributable to behavior changes) to a savings sharing fund. Facilities involved in the retrofit program can apply to the fund to finance discretionary projects or to allocate to further sustainability initiatives.

Often in a large organization, managers at the facility level are not aware of costs associated with utility use as the bills are paid through a central accounting or facility management department. By setting up a revolving fund, individual managers are more likely to become involved in the management of the project and can encourage building occupants/staff/users to manage resources more effectively. The City of Surrey has developed such a fund with the encouragement of Power Smart.

The remainder of the savings in excess of the hard retrofits could be used to either buy-down the EPC payback period and/or be allocated to support further sustainability initiatives within the City (such as the Corporate Sustainability Coordinator recommended in Section 3.5 of this Plan).

#### ***The City as a Responsible Landlord and Tenant***

An EPC is only recommended for city owned and occupied facilities where the City is responsible for capital upgrades to facilities and also receive the benefits of reduced operating costs. This does not mean that the City should ignore its role as a landlord and as a tenant.

For buildings that the City owns but does not occupy or pay for the utilities, revised or renewed lease arrangements could be explored that would enable the City to recover the costs of energy efficient improvements. Obviously this is only applicable to those buildings that the City expects to own for a period long enough for energy savings to repay the capital improvements.

For buildings or space that City leases from other owners, the City should explore lease revisions that would enable the owners to recover their investment in energy efficiency upgrades. The City should also review the energy efficiency of its leased spaces and consider finding new leased space or buying additional space if the owners of the space cannot be encouraged to conduct energy efficiency upgrades.

#### ***Recommendations***

- i. That Council approves the creation of a Energy Projects Coordinator position, subject to classification by the General Manager of Human Resources, at estimated annual cost of \$71,500. Funding for this amount should be added to the Facility Design and Management annual operating budget without offset beginning in 2004;
- ii. The Energy Projects Coordinator's initial mandate should be to help explore the issues and opportunities around an Energy Performance Contract for the City so as to best inform the process of moving forward with this initiative;
- iii. The Energy Projects Coordinator should be directed to assist in the formation of an Interdepartmental Energy Committee to ensure the EPC incorporates departmental and facility specific needs;
- iv. That the Energy Projects Coordinator, in consultation with Finance and Accounting, should help to determine the opportunities and feasibility of establishing an Savings Sharing Fund (or similar communication/incentive tool) to support the EPC;
- v. That Real Estate and Park Board are directed to review existing lease agreements and where appropriate explore, in consultation with Legal Services, revised lease structures to enable it to retrofit its own leased buildings and to encourage energy retrofits in those buildings that it leases space.

### **3.1.2 Energy Efficient Purchasing Policy (Targeted emission reduction from 1990 baseline = 250 tonnes)**

One of the fastest growing sources of increased electricity consumption in office buildings is from "Plug Loads". Plug Loads refer to the energy consumed by equipment and appliances that are plugged into electrical outlets such as computers, copiers, printers, fridges, etc. BC Hydro recently completed a detailed analysis of electricity use in its service region and published the findings in their Conservation Potential Review.

Within this Review, they determined that energy efficient office equipment offers the most cost effective opportunity to reduce electrical consumption in commercial/office settings. According to their review, they believe that most energy efficient office equipment has no incremental capital costs and could save an average of 25% on operating costs. The net impacts of using energy efficient equipment in office buildings was estimated at a 3% overall reduction in electricity consumption.

For the City this would translate to approximately a 1% reduction in total energy consumption from corporate facilities translating to roughly \$50,000 saved annually. This would be equivalent to a 250 tonne reduction relative to 1990 by 2010 once corporate growth is factored in. Eventually an energy efficient purchasing policy could become a component of an integrated Sustainable Purchasing Policy that could address, among others, sourcing, recycled/renewable content, off gassing, and the disposal options for used products.

#### ***Recommendation***

- i. Purchasing, in consultation with the Sustainability Support Group and with Legal Services, should report back on the opportunities and implications of establishing an Energy Efficient Purchasing Policy by September 2004. In the interim, Energy Star rated equipment should be purchased where applicable.

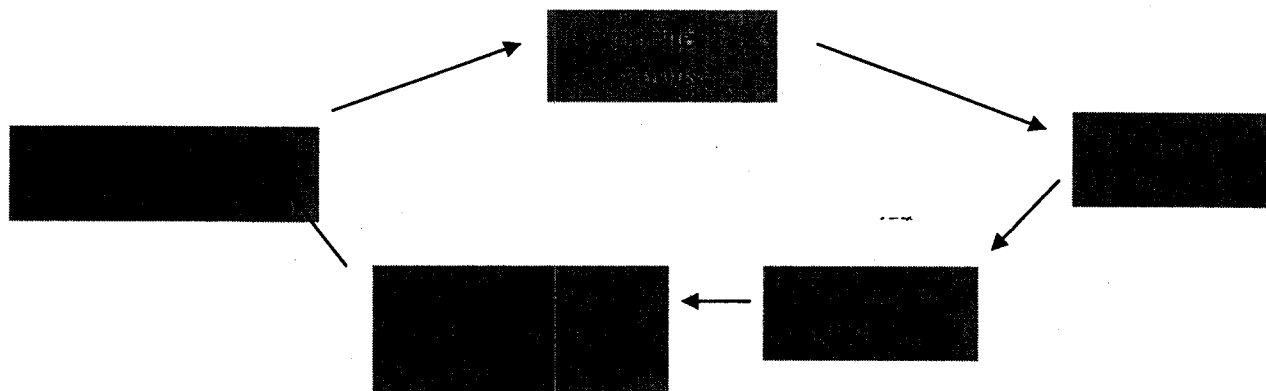
### **3.1.3 Supporting Alternative Energy (A leadership opportunity)**

While many of the best opportunities for reducing the greenhouse gas emissions from civic facilities rests in reducing the energy used in or by those facilities, the City can demonstrate a more holistic approach by actively pursuing and supporting the development of alternative sources of energy for use in its facilities. The landfill gas recovery and cogeneration initiative (described in Section 3.4) is an excellent example of the development of alternative energy sources but additional opportunities that other organizations might emulate may exist.

A better understanding of the potential to generate or capture alternative sources of energy at civic facilities is required to determine the feasibility of City becoming more involved in the development of alternative energy sources to decrease our reliance on fossil fuels. Some promising examples of potential alternatives at City facilities include the installation of grid connected electrical generators powered by the water system pressure reducing valves, solar heated water systems at our community swimming pools, or even ground source heat pump piping installations beneath City parks with large open spaces or playfields.

While the City works to develop their understanding of opportunities to generate alternative energy at its own facilities, it can demonstrate immediate action in this area by purchasing a portion of the energy it does use from certified "green" power producers. BC Hydro has created a mechanism for organizations to support the development of the emerging alternative energy economy through their Green Power Purchase program. A Green Power Certificate represents the environmental and social attributes of 1 MWh of electricity generated by independent power producers in BC at qualified green generation facilities. Most of the green electricity generated in 2003 is coming from small hydro projects that meet specific criteria to ensure they have minimal impact on existing aquatic and terrestrial ecosystems.

In a way, purchasing Green Power Certificates is an opportunity to “close the loop” on the electricity generated through the City’s Landfill Gas Recovery and co-generation initiative.



Some of the revenue generated through this operation could be used to cover the cost of the Green Power Purchase certificates.

In the longer term, the City believes that it is BC Hydro’s responsibility to aggressively develop and support “green” power production. The City should engage Hydro in discussions as to why green power purchase is not more widely available and why additional costs cannot be blended into the typical rate base. The Task Force recognizes that purchasing Green Power Certificates at a 33% cost premium is only a temporary measure for the City to demonstrate its commitment to immediate action<sup>8</sup>. The City can demonstrate its leadership by developing its own potential for alternative energy generation and by working with Hydro to pursue this direction at a wider and universally accessible scale.

In addition to pursuing these initiatives at civic facilities, the Community Climate Change Plan to be released shortly will address how the City can encourage and support the development of alternative community energy systems.

#### **Recommendations**

- i. That the proposed Energy Projects Coordinator’s mandate includes the requirement to assist in reporting back on the feasibility of generating additional “green” energy at civic facilities;
- ii. That the City should advocate for the more aggressive implementation and broader accessibility of alternative energy with the GVRD, BC Hydro, and the Provincial Government;
- iii. That, as an immediate but interim measure, the City of Vancouver annually purchases Green Power Certificates equivalent to a percentage of the annual electricity used at City Hall. Certificates representing 10% of the electricity used in City Hall would cost an estimated additional \$10,000 and could be funded from the City’s share of the Landfill gas revenues.

#### **3.1.4 Green Design for New and Replacement Civic Buildings (Targeted 20% reduction in emissions from new or replacement facilities)**

While reducing energy consumption in existing facilities is the key to meeting the 20% reduction target by 2010, the City can act now to minimize the impacts of future growth on its greenhouse gas emissions. One key opportunity to do so is requiring that all new and replacement civic buildings greater than 500 square meters be designed to meet the equivalent of a *minimum* LEED Silver standard<sup>9</sup>.

<sup>8</sup> Green Power Purchase Certificates have a cost premium of \$20 each (this equates to \$0.02/kWh).

<sup>9</sup> It is anticipated that such LEED standards will not be available for residential buildings until 2008. City constructed and operated residential buildings built before 2008 should be designed to be at least 20% more energy efficient than standard practice.

LEED (Leadership in Energy and Environmental Design) is a widely recognized "green" building rating system that allocates points for a diversity of environmental design features. By requiring that new or replacement civic facilities are designed to meet the equivalent of a minimum LEED standard ensures that they incorporate a broad spectrum of sustainable building considerations. Because there are a number of ways to achieve a LEED rating, it may be necessary to specify a requirement to score a minimum number of LEED points for energy efficiency or the use of alternative energy to ensure a reduction in corporate greenhouse gas emissions.

In this report, it has been simplistically but conservatively assumed that the civic facility stock will increase by 12.6% between 1999 and 2010 to keep pace with projected increases in population. Building new and replacement facilities at least 20% more efficiently than in 1999 reduces the energy impacts of this growth to a 10% increase. Realistically, this is a high growth estimate because many of the new facilities that are planned are actually replacing older, inefficient ones.

### **Recommendations**

- i. That Council approve the recommendation to adopt green design standards equivalent to that of a minimum LEED Silver rating for all non-residential new and replacement civic buildings over 500 square meters. This recommendation will be presented in the "Applying the LEED Rating System" Policy Report that is expected before Council in the fall of 2003;
- ii. That facility design teams should be encouraged and supported in pursuing a higher LEED score when good opportunities are available to do so;
- iii. That Planning should report back on the energy implications of LEED and how to modify this requirement to ensure that buildings are at least 20% more efficient than is currently standard;
- iv. That the LEED rating system for residential buildings be evaluated when it becomes available.

## **3.2 Corporate Fleet**

The City of Vancouver fleet (including Police, Fire, Parks, and City operations) consists of approximately 2000 cars, trucks, and heavy equipment units<sup>10</sup>. Greenhouse gas emissions from the fleet have decreased 11% since 1990 as a result of technological innovation and vehicle downsizing. These approaches, in conjunction with the development of viable new fuel compositions are expected to provide significant opportunities to further reduce both greenhouse gas and common air contaminant (CAC) emissions from the City's fleet.

### **3.2.1 Right-Sizing**

**(Targeted emission reduction from 1990 baseline = 600 tonnes)**

One of the easiest and most economical ways of reducing GHG emissions is to size vehicles so that they are appropriate to their task. "Right"-sizing vehicles to smaller, more efficient units or even bicycles not only reduces emissions, it will generally reduce the overall cost of ownership due to lower capital and operating costs. In the last two equipment replacement programs, Equipment Services has worked with the various City operations to identify opportunities to replace units with smaller, more efficient vehicles where task requirements permit.

Equipment Services has reviewed the current City fleet, and estimates that there are approximately 209 units that could potentially be replaced with smaller units, in particular mid-size cars and light trucks. Their analysis of the fleet indicates that continued right-sizing has the potential to reduce GHG emissions a further 2%. This would be equivalent to a 600 tonne reduction relative to 1990 by 2010 once corporate growth is factored in.

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<sup>10</sup> The "fleet" also includes approximately 2,000 units of numbered small equipment.

Equipment Services will continue to work with City operations to evaluate the downsizing potential for units in future replacement programs. In order to assist this process, it is recommended that the City develop standard equipment specifications for common vehicle uses throughout the City as they have observed an inconsistency in how different operational units specify vehicles (size) for similar operations.

**Recommendations**

- i. That the Corporate Management Team (CMT) review and develop policies to identify vehicles that can be downsized on replacement, and direct all departments to evaluate vehicle usage and operational requirements for vehicles in their fleet in light of these policies. These policies should expressly encourage the use of bicycles where appropriate to task.
- ii. That the CMT develop common standards for vehicle specifications for similar applications throughout the City to assist in the development of right-sizing policy.

**3.2.2 Shift to Diesel Vehicles**

(Targeted emission reduction from 1990 baseline = 700 tonnes)

During the 1990's, the City replaced many of the light duty diesels in the fleet with gasoline engines due to concerns regarding diesel common air contaminant (CAC) emissions and noise complaints. This resulted in increased GHG emissions, as gasoline engines are inherently less efficient than diesels. In 2007, new U.S. Environmental Protection Agency requirements will significantly reduce CAC emissions from diesel engines in the North American market offering the City a promising opportunity to also reduce its GHG emissions.

Through the use of ultra low sulphur fuels and advanced combustion and after-treatment technologies, diesel CAC emissions in 2007 will be approximately 87% lower than today's limits, comparable or lower than today's "clean" technologies. Because of their inherent efficiency advantages, the use of diesel engines can reduce the GHG emissions from those vehicles by approximately 20%. This efficiency combined with the decreased cost of diesel fuel can result in operational cost savings (not including decreased maintenance requirements) of approximately 30%.

Equipment Services has identified approximately 300 gasoline vehicles that could likely be replaced with diesel-powered vehicles at the end of their service life resulting in a 2%+ reduction in fleet GHG emissions. This would be equivalent to a 700 tonne reduction relative to 1990 by 2010 once corporate growth is factored in. Although there is a higher purchase cost for diesel vehicles, the reduced fuel costs and consumption would limit the total estimated net annual cost increase to about \$50,000.

**Recommendations**

- i. That Equipment Services evaluate purchasing "clean diesel" units upon the replacement of light duty gasoline vehicles once the diesels conforming to the new 2007 standards are available;
- ii. That Equipment Services evaluate the possibility of postponing scheduled replacement of applicable fleet vehicles for two years prior to the new cleaner standards taking effect to increase the number of vehicles replaced with clean diesels.

**3.2.3 Shift to Biodiesel Fuel**

(Targeted emission reduction from 1990 baseline = 2,700 tonnes)

While switching some of the fleet to "clean" diesels after 2007 offers the opportunity to reduce GHG emissions, more immediately and significantly are the opportunities for GHG reductions by switching to biodiesel fuel for the diesel fleet. This has the potential to not only reduce Corporate Fleet emissions but to transform the entire diesel market in the lower mainland and reduce all diesel related emissions.



Biodiesel is a renewable fuel made from animal or plant based fats and oils. Biodiesel has similar properties to petroleum diesel and generally can be used in most diesel engines without any modifications. In order to keep the fuel economical, biodiesels are generally blended with petroleum diesels to produce biodiesel blends. A 20% biodiesel (B20) blend is the most common.

Biodiesel has undergone comprehensive testing, including EPA Tier 1 and Tier 2 emission testing. Biodiesel and biodiesel blends have been shown to significantly reduce common air contaminant (CAC) emissions of particulate matter, carbon monoxide, sulphates, and hydrocarbons. They have also been shown to have lower ozone forming potential and lower cancer causing potential than regular petroleum diesel<sup>11</sup>. In addition, since biodiesel is produced from renewable sources, a B20 blend can reduce net GHG emissions by between 10% and 17% over the entire fuel cycle. Also, biodiesel can be produced from recycled cooking oils (e.g. recovered yellow grease from restaurants), thereby reducing the impact of waste cooking oils on the environment.

Currently, there are no local producers of biodiesel and it is imported from the Prairies or Washington State. Imported B20 biodiesel blend is estimated to cost up to \$0.06 per litre more than conventional diesel. Local producers have suggested that with sufficient volume commitments or demand, local production would likely become feasible with a good potential to lower the cost of a B20 blend. The drop in price resulting from local production, if coupled with tax exemptions such as those announced by the Provincial Government in Ontario for biodiesel could make a B20 diesel blend cost neutral within a few years. If biodiesel were cost neutral, there would be a real opportunity to impact emission not only from the Corporate Fleet but also from all diesel engines in the region.

The City has the opportunity to play a lead role in transforming the diesel fuel market in the Lower Mainland by creating the initial local demand for biodiesel. The City, along with 6 other local governments, is currently working towards running a biodiesel demonstration in early 2004. If the demonstration is successful, the City (along with other members of the BC Petroleum Products Buying Group - the BCPPBG) will look at expanding the use of biodiesel throughout the rest of the fleet as supplies permit. Suppliers have indicated that the volumes commanded by this group may be sufficient to make local production viable. By pursuing biodiesel for use in their own fleets, the Buying Group has the real potential to affect the emissions from all private or commercial diesel engines in the region.

The City's flagship involvement in this demonstration would cost approximately \$90,000. This total includes:

- \$20,000 fuel cost premium
- \$30,000 for fueling infrastructure (returning old fuel tanks and pumps to service for biodiesel)
- \$40,000 for engine oil analysis to ensure no adverse operational effects on the fleet

As this is a multi-municipality initiative there is a reasonable potential that 25% (\$22,000) of these costs could be offset by funding from the GVRD SEF fund. In addition, the Federation of Canadian Municipalities might fund 50% (\$45,000) of these costs through their Green Municipalities funds. Biodiesel plays a key role in the federal governments Climate Change Plan and they are calling for 500 million litres of biodiesel production annually.

If the entire City diesel fleet were converted to B20, the annual additional cost would range from \$0 to \$250,000 per year (less than a 1% increase in the fuel budget) but the estimated reduction in annual fleet related GHG emissions would be between 7% and 11%. Using a midrange decrease of 9%, this would be equivalent to a 2,700 tonne reduction relative to 1990 by 2010 once corporate growth is factored in.

## **Recommendations**

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<sup>11</sup> These studies showed small increases of NOx, but these increases can be offset by changes to the diesel fuel specification.



- i. That \$90,000 be allocated to Equipment Services to take part in a biodiesel demonstration project to confirm the suitability of this fuel for use in the City's fleet and to make recommendations regarding the ongoing use of biodiesel blends for use in the entire diesel fleet;
- ii. If biodiesel is found to be suitable for fleet use, Equipment Services should work with the other members of the Fuel Purchasing Cooperative to include biodiesel in future fuel contracts to ensure the required volumes and to reduce the cost of biodiesel blends;
- iii. The City should request that the provincial and federal governments reduce taxes on biodiesel and biodiesel blends of fuel in order to promote the use of these fuels;
- iv. The City should request that the GVRD study the environmental and economical impacts of biodiesel use in the region;
- v. The City should work with petroleum industry, the Vancouver Economic Development Commission and the GVRD to encourage the development of biodiesel manufacturing facilities within the GVRD.

### 3.2.4 Driver Training Programs

(Targeted GHG emission reduction from 1990 baseline = 1,500 tonnes)

The way a vehicle is operated has a significant impact on fuel utilization. Implementing a driver-training course in fuel efficient driving techniques can result in a significant reduction in fuel consumption. Recently, the City of Edmonton revised their driver training program to include a revised fuel efficient driving course targeted at the operators of high fuel consumption units (medium and heavy duty vehicles, and high mileage automobiles). As part of the training course, vehicle operators drove a typical city route "normally", and then re-drove the route using the fuel efficient practices taught in the course. On average, drivers reduced their fuel consumption by 11% between the two test drives. When tested several months later, drivers were on average able to further reduce their fuel consumption a further 5%. The City of Edmonton estimates that this new program has saved the City \$600,000 annually, and has reduced their annual fuel consumption by 1.2 million litres.

Currently, the City's driver training programs include instruction on fuel-efficient driving techniques for employees who are upgrading their license with the City. However, most drivers are not routinely exposed to these concepts. It is recommended that the City develop a pilot program with the Engineering Department's Sewers Operations branch medium and heavy duty drivers to teach fuel efficient driving techniques, and to evaluate the impact this training has on fuel consumption. If successful, it is recommended that it be studied to expand the program to all medium and heavy duty vehicle drivers, and to high mileage automobile drivers, and that a feasibility study be undertaken to expand the program to all City Employees.

It is proposed that a consultant be brought in to develop and implement the trial program with the City's driver trainer and Equipment Services. If the program is expanded, it is anticipated that additional staff and specially modified vehicles will be required for the on-going operation of the program. The cost of implementing this program requires further study, but it is anticipated that these costs would be offset by reduced fuel consumption. It is recommended that staff investigate implementing this program immediately.

If similar results to Edmonton were obtained, it would be expected that the City could reduce fuel consumption by at least 5% over current levels. Once corporate growth is factored in, this would be equivalent to a 1,500 tonne reduction relative to 1990 by 2010.

#### **Recommendations**

- i. The Engineering Department, with consulting assistance not exceeding \$30,000 should develop and conduct a fuel-efficient driver training program trial and report back on the feasibility of expanding the program to all departments.

### 3.2.5 Fleet Demand Management (Not possible to establish quantifiable target emission reduction)

While reducing the size of a vehicle, changing its fuel type, and improving its efficiency are all important approaches in reducing fleet greenhouse gas emissions, additional opportunities must be explored to coordinate and possibly reduce the amount of corporate vehicle use.

By having individual departments focus on their vehicle usage, it may be possible to identify opportunities to reduce overall vehicle usage. Is it possible to combine trips? Is there any viable technology currently available to facilitate trip coordination? Is it possible to locate staff and/or vehicles closer to their most common destinations? Are some facilities or staff destinations easily accessed by transit?

Integral to this form of assessment is a consideration of pooled vehicle use. In looking at vehicle usage, it may become evident that some trips could be effectively served using a pooled bicycle. In addition, large city facilities such as City Hall have a number of pool vehicles for staff use while on City business. Coordination of these pooled vehicles is currently decentralized. By centralizing the vehicle pool, there may be an opportunity to reduce the total number of vehicles or for trip efficiencies to be realized. Reducing total vehicles could increase the annual mileage of individual vehicles making higher priced but more efficient alternatives more viable.

#### **Recommendation**

- i. That Equipment Services work with individual departments and examine centralized locations to identify opportunities to reduce corporate motor vehicle use and report back with recommendations.

### 3.2.6 Other Technologies and Fuels for Consideration (Not possible to establish quantifiable target emission reduction)

#### **Hybrid Technologies**

Hybrid vehicles combine a gasoline engine with an electric motor and regenerative braking in one vehicle to complement one another in providing power and charging the battery. Commercially available hybrid passenger vehicles reduce fuel consumption by 20% - 40%.

The City is has been operating two hybrid Toyota Prius sedans in its fleet since the spring of 2003. While initial analysis indicates that while these vehicles are very fuel efficient, the total cost of ownership is estimated to be significantly higher than the City's compact sedans because the purchase price is approximately \$15,000 higher. In order to be economical and reliable<sup>12</sup>, these cars are generally best suited to high mileage applications (over 30,000 km per year). Unfortunately, most City cars are normally used in low mileage applications (less than 15,000 km per year). At this time, the cost of replacing vehicles with hybrids versus the relative environmental impact is quite high.

As a potential future opportunity, there are several companies working on hybrid systems for medium and heavy-duty applications. Most of these systems are still in development and are not commercially available. It is anticipated that there will likely be suitable applications for this technology in the City's fleet. Since most medium and heavy-duty vehicles have significantly higher fuel consumption than cars, there would be greater fuel reductions and emission reductions in using a medium or heavy-duty hybrid versus using a hybrid car.

#### **Recommendations**

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<sup>12</sup> It has been reported that there can be significant battery and electrical maintenance issues when these vehicles are used in low mileage applications.

- i. That Equipment Services continue to evaluate the operation of the two existing hybrids in the fleet and investigate other hybrid technologies so as to identify potential future opportunities for their use.

### **Ethanol Blended Fuels**

Blended fuels that combine ethanol (typically made from distilled grains) with gasoline offer a promising opportunity to reduce greenhouse gas emissions by making a portion of the fuel renewable. The federal government's Climate Change plan calls for a significant increase in the use of ethanol-blended fuels.

### **Recommendations**

- i. That Equipment Services report back on the opportunities and feasibility of using ethanol blends fuels in the City's fleet.

### **Natural Gas and Propane**

Since the 1980's, the City has had a significant amount of experience with natural gas and propane vehicles. In theory, propane and natural gas (methane) are cleaner burning fuels compared to more complex hydrocarbons (e.g. gasoline, diesel). However, using these fuels in engines that were designed for other fuels has proved to be troublesome.

In the 1980's and early 1990's, the City converted many vehicles to propane, and, in later years, to natural gas. However, performance of these units (both mechanically and environmentally) was typically unsatisfactory. Regionally, the AirCare failure rate for vehicles converted to propane or natural gas has been almost double the failure rate of gasoline vehicles. Recent tests done by AirCare and the City have shown that even with new conversion technologies, emissions generally are worse after a gasoline engine is converted. However, the factory built units have had a much better success rate than the aftermarket conversions. Therefore, Equipment Services will not recommend converting existing gasoline engines to propane or natural gas, and will only recommend factory built units if natural gas or propane is considered for use in the City.

Generally, factory built natural gas and propane vehicles are available in many full size passenger cars and trucks, and in both dedicated and bi-fuel (dual fuel) configurations. However, there are usually more fuel-efficient gasoline engines available for the same model. Therefore, in most cases, there is no GHG benefit to purchasing a natural gas or propane unit since a smaller gasoline engine will generally produce less GHG's than the larger alternate fuel engine. The City is currently working on setting up a trial of two medium-duty natural gas (spark ignition) vehicles for the City's fleet. Although there is a potential for reduced vehicle emissions, there may be no net reduction in GHG emissions due to the lower fuel efficiency of the spark ignition engines versus the diesel cycle engines.

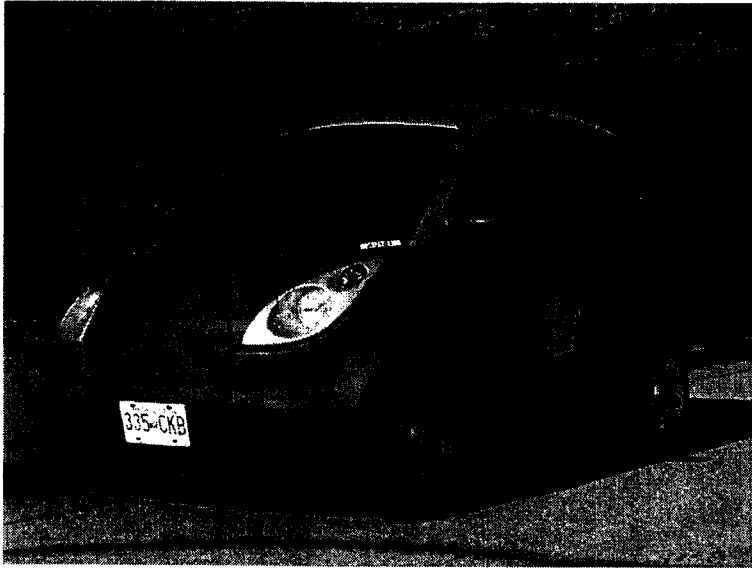
Currently, there is a potential for high-pressure direct injection natural gas engines (Westport HPDI system) to have lower GHG emissions since these engines maintain the higher efficiencies of the diesel cycle engine. However, these engines are still in the development stage. There has been some interest in getting a Westport engine into a City fleet unit for a trial, but there currently are logistical, maintenance and safety issues that would need to be addressed for the proposed applications and maintenance facilities.

### **Recommendations**

- i. That Equipment Services continue to evaluate natural gas and propane as alternative fuels for the fleet. In addition, they will continue to examine the possibility of using HPDI natural gas technology for future trials in the City fleet.

### **Electric Vehicles**

The City is currently operating and evaluating two electric vehicles in its fleet. Electric vehicles are often misleadingly referred to as "Zero Emission Vehicles" since they do not produce any tailpipe emissions, however the source of the electricity to charge these vehicles can have a range of emissions (from "clean" hydro or nuclear energy, through to coal burning power plants). Battery powered electric vehicles are very efficient, and are well suited to low mileage applications. However, they are usually significantly more expensive than conventional vehicles, and there are significant limitations to their use. Most major manufacturers are now canceling their electric vehicle programs due to the economics of the platform. Most electric vehicle development now is being undertaken by smaller companies.



One area that is being developed locally is low speed electric vehicles. These vehicles are licensed under federal low speed vehicle regulations and are currently restricted to speeds less than 40 km/h. Also, these vehicles do not have to meet vehicle collision standards applicable to regular vehicles. Therefore, these vehicles tend to be lighter, more efficient, and

more economical than previous electric vehicles.

#### **Recommendations**

- i. That Equipment Services continue to explore the use of low speed electric vehicles and determine if they are suitable for use in the fleet.

#### **Fuel Cells**

Fuel cells are another "zero emission" type of vehicle. Typically, fuel cell powered vehicles are operated on hydrogen that is typically produced from natural gas or through electrolysis. Like electric vehicles, the source of the hydrogen can result in a range of overall emissions. Typically, fuel cells can be more efficient than internal combustion engines, and therefore there is a potential for reductions in GHG emissions. Currently, fuel cells powered vehicles are not expected to be available for several years, plus a new fuelling infrastructure must be created to support a hydrogen-based fuel cell fleet.

The City is currently working with Fuel Cells Canada to be part of a three-year demonstration trial of a fleet of five fuel cell cars in the Vancouver region. It is anticipated that the City will typically be operating one or two of these units during the trial period. The City will continue to examine this technology and will determine the feasibility of using fuel cells in the City's fleet once they are commercially available.

#### **Micro Compact Cars**

Generally, North American cars are on average much bigger than cars elsewhere in the world. In Europe, in particular, where fuel costs are significantly higher than in North America, small cars are much more popular. Sub-compact and micro-compact cars are very common, and generally vehicles are powered by much smaller engines. For example, the British version of the Ford Focus is typically powered by engines as small as 1.4 litres, while the smallest North American Focus is powered by a 2.0 litre engine. As well, small diesel engines are available for this car in the European market.

Because the North American automobile market is dominated by the United States, smaller cars are usually not available here. However, there is some indication that some super fuel-efficient micro-compacts might be coming to Canada in the next few years. Daimler Chrysler is currently looking at importing their "Smart Car" to Canada - a 2 seater car developed by Swatch and Mercedes. The European Smart Cars are powered

by 0.6 litre gasoline or diesel engines, and they typically have fuel efficiencies that are similar or better than current hybrids. Also, due to their compact size (it is short enough that it can be parked perpendicular to the curb in a normal parallel parking spot) they are an ideal urban car, yet they can still travel at highway speeds.

#### **Recommendations**

- i. That Equipment Services, in cooperation with the Sustainability Support Group, work with the FCM to lobby for the importation or production of small fuel efficient urban micro-compact cars.

#### **Other Technologies**

A range of alternative forms of transportation have emerged in recent years and some are gaining popularity. Many of these technologies may hold promise for the Vancouver fleet to more closely match the "vehicle" with the task. It is expected that more of these will become available in coming years as energy prices rise. Currently, many alternative forms of transportation do not fit within the designation classes for vehicles, and as such, are not insurable and can be difficult to classify for appropriate roadway use. The City cannot promote or pursue technologies that do not fit into vehicle classifications; however there may be opportunities in the future for alternative modes.

#### **Recommendations**

- i. That Equipment Services is allocated an annual consulting budget of \$20,000 to assist them in effectively monitoring emerging transportation technologies and fuels for opportunities to reduce fleet GHG emissions.

### **3.3 Street/Park Lighting and Traffic Control Signals**

**(Targeted 55% energy reduction from 1990 by 2010 results in GHG emission increase of 100 tonnes because of increasing carbon intensity of electricity)**

Innovations in street lighting systems technology have historically resulted in decreasing energy consumption. The City of Vancouver will continue to keep abreast of these innovations and implement them as they are technically proven and financially viable.

The Engineering Services' Electrical Design Branch is currently researching the potential offered by using enhanced new achievements in technology of lighting sources, fixtures, ballasts, time and dimming controllers, and advanced remote control systems to continue to reduce the electrical demand of our street, lane, and park lighting systems. Design methods and criteria will be also researched in the domain of increased visibility that a system creates, and increase safety and security without higher levels of light or increased power consumption.

Street and lane lighting has been changed from incandescent and mercury lamps to high intensity discharge (high pressure sodium and metal halide lamps) and fluorescent lamps over the years, contributing to energy consumption reduction. Potential further reduction in energy consumption is currently researched through the use of:

- Induction lamps, pulse-start metal halide lamps, light emitting diodes (LED)
- Energy efficient luminaries
- Electronic ballasts for high intensity discharge lamps

The upgrade of traffic signals to take advantage of innovations in Light Emitting Diode (LED) technology is currently underway and will be completed in the near future. Currently LED's offer a very low energy source of visible light but have limitations in their ability to illuminate spaces; engineers are hopeful that within the next five years this technology will revolutionize many lighting applications.

The City is also responsible for significant lighting in our parks, plazas and other public open space. The same benefits derived in street noted above also apply to these areas.

Street lighting retrofits have historically been justified and implemented based on their economic payback. The financial implications of implementing any new technology will be specific to that initiative. BC Hydro currently offers significant financial support of electrical reduction initiatives. Additional financial support might be accessed through the Federation of Canadian Municipalities - Green Municipal Enabling and Infrastructure Funds.

### **Recommendations**

- i. That Engineering Services, Electrical Design Branch, continue to monitor and implement new street and park lighting systems technologies.

### **Targeted Greenhouse Gas Reductions**

	1990	1999	2010
Electricity Consumed (GWh)	51	39	28
Carbon Intensity (t/GWh)	19	25	39
eCO <sub>2</sub> (tonnes)	1000	1000	1100

The electricity used for street lighting decreased by 24% from 1990 to 1999 due to the evolution in lighting system technologies. Using this historical rate of improvement in efficiency, the City is forecasting a further 29% decrease between 1999 and 2010. Even if the carbon intensity of electricity more than doubles (as projected) between the 1990 base year and the 2010 target year, the GHG emissions from street lighting are expected to remain relatively stable.

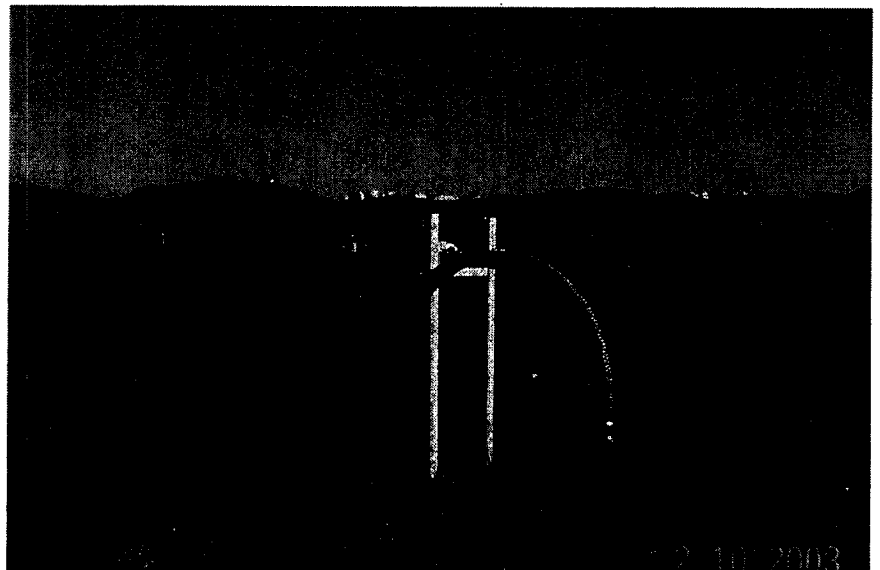
### **3.4 Corporate Waste Reduction and Landfill Operations (Targeted emission reduction from 1990 baseline = 2,000 tonnes)**

Corporate waste accounted for nearly 10% of the City of Vancouver's Corporate GHG emissions in 1999. The reported greenhouse gas emissions are the City's portion of the emissions from the Vancouver Landfill based on the estimated volume of waste generated at corporate facilities.

The City conducts waste reduction and recycling programs at its facilities. The main focus is on recycling of office paper. Some offices have operating worm bins for office food scraps. Individual departments, and the Corporate Services group, must continue to evaluate the extent and effectiveness of the corporate waste reduction and recycling initiatives with the goal of continuous reduction in waste disposed.

One of the most significant greenhouse gas reduction programs implemented by the City to date is the Vancouver Landfill Gas Recovery Program. The award winning Vancouver Landfill Gas Collection and Utilization Project is the winner of the Federation of Canadian Municipalities-CH2M Hill Sustainable Community Award for renewable energy in 2003. A landfill gas collection and flare system in place since 1991 was expanded in 2002 to increase gas recovery and use the gas to generate electricity and heat by the end of 2003.

At the end of 2003, landfill gas collected will be used to generate heat and electricity for sale. The landfill gas will be used by Maxim Power Corporation to generate electricity for sale to B.C. Hydro and the waste heat will be used to heat CanAgro Produce's greenhouse operations.



Initially, the project will generate about 40 GWh of electricity per year. With expansion of the facility expected in the near future, an additional 15 GWh per year of electricity will be sold to B.C. Hydro.

The Vancouver Landfill is taking a waste by-product and turning it into a creative, new energy option that provides revenue and numerous environmental benefits. Instead of simply flaring the gas, which has an inherent greenhouse gas reduction benefit, the gas is cooled, compressed, and then transported via pipeline to an adjacent generating facility where it is burned in reciprocating engines to generate electricity. As a further benefit, the heat released from the engines is used to provide hot water heating to the CanAgro tomato greenhouse next door. This means that CanAgro will rely less on fossil fuels to heat the greenhouse thereby further reducing GHG emissions. Initially, the project will provide about 20 percent of CanAgro's energy requirements.

**Recommendations**

- i. In addition to continuing with the planned landfill gas recovery system expansion, the Corporate Services Group, in cooperation with individual departments and facilities, will implement waste reduction and recycling programs at corporate facilities where these programs have not yet been implemented.

**Projected Greenhouse Gas Impacts**

	1990	1999	2010
Tonnes of eCO2	3,500	4,000	1,500

**3.5 Corporate Demand Side Management  
(Emission reduction from 1990 baseline = 700 tonnes)**

There are two approaches to reducing GHG emissions related to energy consumption: supply side management and demand side management. Most of the preceding emission reduction measures focus on supply side management - improving the efficiency of equipment or modifying energy source/fuel type to reduce the related emissions. Equally important but more difficult to quantify are programs to reduce the demand for energy while still maintaining a high level of service/functionality.

Efforts to educate people about the choices available to them and the energy impacts of those choices can not only reduce energy demand but are important in making the critical link for people between their behavior and its consequences. When people begin making this connection, it can begin to affect their long-term behavior not only at work but in their personal lives as well. Two specific areas for attention envisioned in this Plan are commuter choices and energy usage in civic facilities.

**Commuter Options**

In addition to energy awareness within facilities, staff and patron commuting behaviors also have significant GHG emission implications. While these emissions are not counted as part of the Corporate Emission Inventory, they do impact Community Emissions and need to be addressed to both demonstrate leadership and responsibility. The City has already made considerable effort toward supporting alternative commuter options but a coordinated and focused approach is required in order to be truly effective.

The City needs to explore the opportunities to reduce employee and even facility patron vehicle trips by looking at parking provision, bicycle facilities, increased attention on implementing and managing carpool programs, and perhaps most significantly, looking at the potential of negotiating a universal transit pass (U-pass) for City employees to encourage and facilitate their use of public transit.

**Energy Usage Behaviors**

The behavior of building occupants can have a small but significant impact on the energy consumption of their facility. Lights left on in unoccupied rooms (during and after hours) beyond what is required for safety reasons and office equipment that is active when not in use are often the most visible examples of needless

energy consumption. Not only can this waste be minimized by all staff and patrons, unique opportunities exist for "after-hours" staff such as security and janitorial to minimize energy waste.

Efforts to educate staff would be best conducted in conjunction with the energy retrofits of their facilities as these improvements are visible, frequently address energy related concerns that staff may have, and can create a system of incentives (such as described in section 3.1.1 Savings Sharing Fund).

The University of British Columbia has developed and runs an award-winning program to educate its faculty and staff around the environmental impacts of their behaviors at work. Their experience and the experience of other organizations with similar programs has shown that employee behavior awareness programs typically reduce the energy consumption in buildings by 2-3% and can reduce it by up to 5%. A 3% energy reduction would result in approximately \$150,000 reduction in annual operational costs. This would be equivalent to a 700 tonne GHG emission reduction relative to 1990 by 2010 once corporate growth is factored in.

Undertaking a successful Corporate Demand Side Management Program requires focused advocacy and resources to be truly effective. A dedicated staff person, or Corporate Sustainability Coordinator is required to investigate, organize, and manage/coordinate these initiatives. It is not envisioned that this Coordinator would "do it all" themselves but would access, coordinate, and leverage the resources available within the City as well as amongst other organizations that have conducted similar programs or share a similar mandate.

#### **Recommendation**

- i. That Council approves the creation of a Corporate Sustainability Coordinator position, subject to classification by the General Manager of Human Resources at estimated annual cost of \$68,000. Funding for this amount should be added to the Sustainability Support Group annual operating budget without offset starting in 2004.

## **4.0 Targeted Impacts of Emission Reductions Measures**

The total corporate emissions in 1990 were 46,000 tonnes. A 20% decrease from 1990 would require a *net* GHG emission reduction of 9,200 tonnes; this Plan describes emission reduction measures with impact targets to reduce net GHG emissions by 12,750 tonnes representing a 2010 net decrease from 1990 levels of more than 25%.

<b>Emission Reduction Measure</b>	<b>Targeted Emission Reduction from 1990 by 2010</b>
Energy Performance Contract	4,400 t
Energy Efficient Purchasing Policy	250 t
Vehicle Right-Sizing	600 t
Shift to Diesel Vehicles	700 t
Shift to Biodiesel Fuel	2,700 t
Driver Training Program	1,500 t
Street Lighting and Traffic Control Signals	-100t
Landfill Gas Recovery	2,000 t
Corporate Demand Side Management	700 t

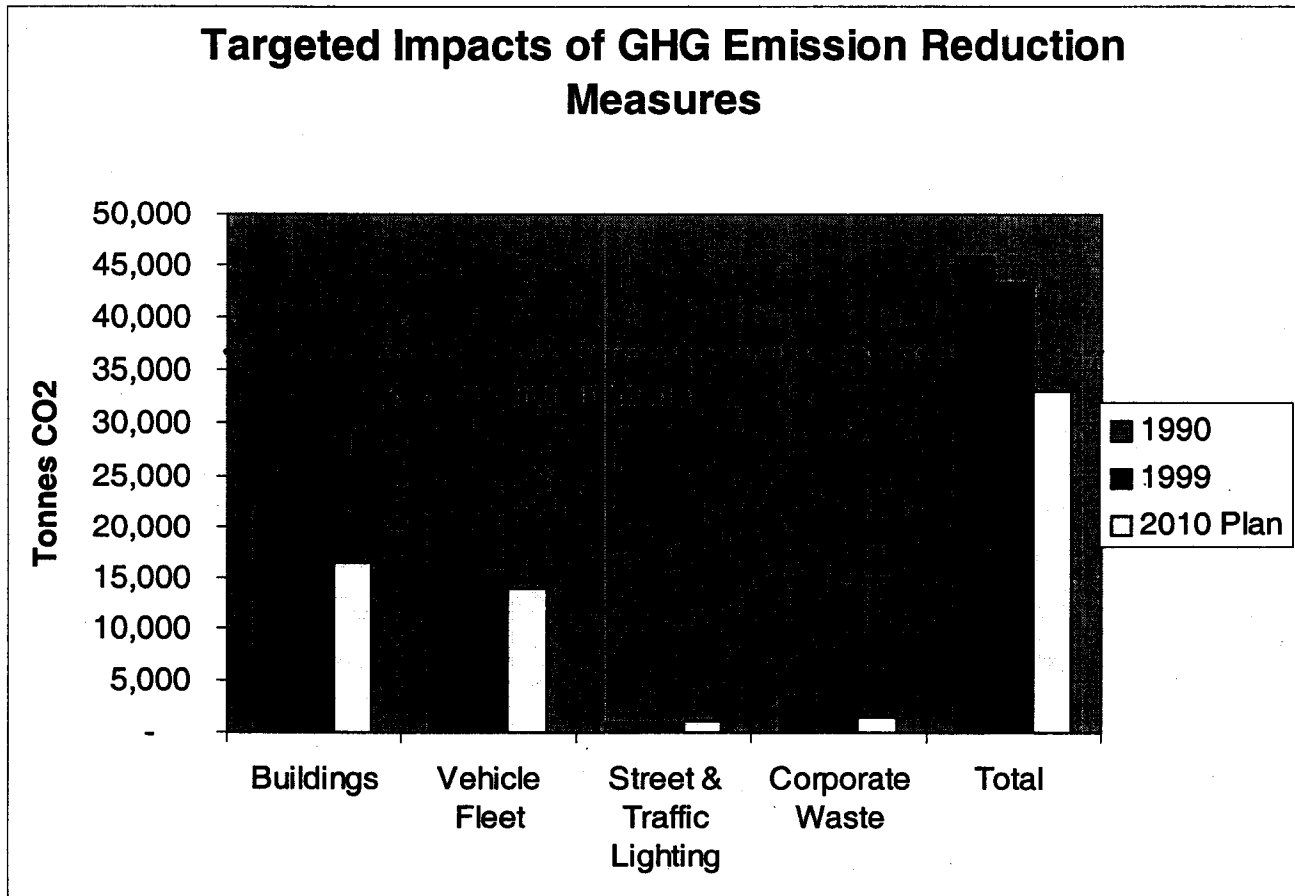
Total Targeted Net Emission Reduction = 12,750 t

This net targeted GHG reduction incorporates a number of projections including growth estimates for corporate operations and for the carbon intensity of electricity. It has been assumed that facility stock and



corporate fleet growth will mirror projected increases in population of 12.6% from 1999 (the latest complete emission inventory) to 2010. This is a simplistic assumption but one that serves the purposes of this Plan by acknowledging that growth will occur and by choosing a growth rate that is felt to overestimate the actual increases in corporate building stock and fleets in order to be conservative. It is important to stress that if initiatives to limit the impacts of future growth, such as building new and replacement civic facilities more energy efficiently, are not pursued than the effectiveness of other initiatives at reducing *net* emissions will be compromised; targeted decreases will be offset by higher than expected growth impacts.

A second growth projection affecting the impact targets of emission reduction measures is the estimated increases in the carbon intensity of electricity. Historically most of the electricity in BC has been produced by large hydro projects. As we move into this 21 century, our electricity is increasingly provided by natural gas fired generation plants and therefore has a much higher carbon intensity. The projected carbon intensity of electricity developed by BC Hydro for 2010 is based on the assumption that Power Smart programs will be widely successful, that alternate energy sources will play an increasing role in meeting our electricity demands, and that carbon offsets are available and economically viable to decrease the carbon intensity. The success of this plan is linked to the success that BC Hydro has in limiting the growth in the carbon intensity of electricity.<sup>13</sup>



In addition to the quantified target emission reductions, this plan includes a number of promising opportunities to further reduce GHG emissions. The impacts of these additional measures have not been quantified because many of them rely on yet to be proven technologies, behaviors, or infrastructure. While

<sup>13</sup> While for this Plan the reported annual carbon intensity of electricity has been used for emission inventory years (1990 and 1999), in the future the City may consider using a 3-5 year rolling average intensity. This would help to ensure that emission inventories are not overly skewed by variations in rainfall.

it is possible that not all of the targeted impacts of emission reduction measures will be achieved, it is expected that the promise of some of these additional measures will be realized.

## 5.0 General Recommendations and Conclusions

This Corporate Climate Change Action Plan developed by the City and the Cool Vancouver Task Force is a strong plan with a diversity of approaches to address GHG reductions throughout the City organization. By pursuing the actions proposed in this plan, the City of Vancouver will not only meet Council's GHG reduction target in a cost-effective manner, but also establish itself in a position of leadership in the Region and across Canada. This plan also positions the City as a potential "model" for other corporations and institutions within the City of Vancouver, in anticipation of the Community Climate Change Action Plan that will be circulated in a consultation process in early 2004.

This plan and the anticipated Community Plan are only the first steps in addressing climate change. They lay the groundwork by confirming the viability of the 2010 reduction targets and by establishing a responsible and credible plan of action to meet those targets. The 2010 targets are acknowledged as short term and insufficient to meet the challenge of climate change but they enable the City to begin taking immediate and effective action and position the City well to continue their efforts beyond 2010.

### **General Recommendations**

- i. That City Council accept the 20% reduction target as viable to achieve;
- ii. That the City begin to incorporate GHG implications into all applicable Corporate operations decisions;
- iii. That Engineering, in cooperation with Facility Design and Management, develop a systematic and repeatable approach to updating the Corporate GHG inventory;
- iv. That the Sustainability Support Group provides an interim report on the implementation and impacts of this Corporate Climate Change Action Plan in 2007 and reports back on proactively establishing a new GHG reduction target if the existing target has been met.
- v. That City Council request that the Park Board, Police Board, and Library Board endorse this plan;
- vi. That this plan is forwarded to the School Board to assist them in responding to the issues of Climate Change

## Glossary of Terms

- CAC - Common air contaminants include such things as particulate matter, carbon monoxide, sulphates, NO<sub>x</sub>, and hydrocarbons. References to automobile emissions frequently refer to CACs and not explicitly to greenhouse gas emissions; vehicle CAC emissions have been dropping rapidly for years but the same improvements have not been made in GHG emissions.
- CO<sub>2</sub> - Carbon Dioxide is the most common greenhouse gas.
- eCO<sub>2</sub> - The various greenhouse gases each has a different impact upon greenhouse effect and for simplicity and comparison, they are frequently converted to their Carbon Dioxide Equivalence.
- EPC - An Energy Performance Contract is a contract where a private company undertakes energy efficiency capital and operational improvements for an organization in exchange for the utility savings for a specified period of time.
- ERM - Emission reduction measure
- ESCO - An Energy Service Company is a private company that undertakes energy performance contracts.
- GHG - A Greenhouse Gas is one of a number of gases that work to trap the heat from the sun within the Earth's atmosphere resulting in climate change, the most common of which is carbon dioxide.
- ICLEI - International Council of Local Environmental Initiatives
- LEED - Leadership in Energy and Environmental Design is widely recognized "green" building rating system that allocates points for a diversity of environmental design features including, but not limited to, energy efficiency.

## APPENDIX B: SUMMARY OF INITIATIVES - CITY OF VANCOUVER CORPORATE CLIMATE CHANGE ACTION PLAN

INITIATIVE (Section references from Corporate Climate Change Action Plan Report)	IMPLEMENTATION MILESTONES	TARGET GHG REDUCTION (net from 1990)	ESTIMATED COST IMPLICATIONS	POTENTIAL OFFSETS
<b>I. CIVIC FACILITIES</b>				
<b>3.1.1 - ENERGY PERFORMANCE CONTRACT (EPC)</b> - A contract to plan, fund, and implement energy efficiency capital improvements to all City owned and occupied facilities, paid back using energy savings.	<b>IMMEDIATE ACTION:</b> Hire a full-time Corporate Energy Manager to initiate/manage the EPC process.		\$71,500 annual salary plus one-time computer and set-up costs of \$5,000	BC Hydro Powersmart Funding potentially = \$36,000
	<b>LATER ACTION:</b> Undertake energy audits of all City-owned facilities that are occupied by the City.		Audit costs absorbed by Energy Service Company if EPC is completed	BC Hydro Powersmart and FCM funding could potentially cover entire audit cost and "buy down" payback term of EPC
	<b>LATER ACTION:</b> Undertake retrofitting of all City-owned facilities that are occupied by the City.	4,400 tonnes	Retrofit costs absorbed by Energy Service Company if EPC is completed	BC Hydro Powersmart funding in the order of a million dollars could potentially help to "buy down" the payback term of the EPC. Once EPC is settled (10 - 12 years estimated), this initiative will result in significant energy cost savings for the City.
<b>3.1.2 - ENERGY-EFFICIENT PURCHASING POLICY</b> - Establish an energy efficient office equipment purchase policy.	<b>IMMEDIATE ACTION:</b> Develop and implement corporate policy for ensuring purchase of energy-efficient equipment by September 2004.	250 tonnes		Estimated energy cost savings of 1%.
<b>3.1.3 - SUPPORTING ALTERNATIVE ENERGY</b> - Explore and pursue opportunities to support the development of alternative energy sources, such as BC Hydro's Green Power Certificates.	<b>IMMEDIATE ACTION:</b> Purchase BC Hydro Green Power Certificates for 10% of electricity consumed at City Hall.	demonstrates leadership	\$10,000 annually	
	<b>IMMEDIATE ACTION:</b> Explore and report back on additional opportunities to generate alternative energy at Corporate Facilities			
<b>3.1.4 - GREEN DESIGN FOR NEW BUILDINGS</b> - Require all new and replacement City buildings to be constructed to a minimum of LEED Silver standard "green building" rating.	Council to address when the application of the LEED rating system is reported back on.	20% reduction in emissions from new & replacement City facilities		Detailed in a separate, pending Council Report on the application of the LEED rating system

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INITIATIVE (Section references from Corporate Climate Change Action Plan Report)	IMPLEMENTATION MILESTONES	TARGET GHG REDUCTION (net from 1990)	ESTIMATED COST IMPLICATIONS	POTENTIAL OFFSETS
<b>II. CORPORATE FLEET</b>				
3.2.1 - <b>VEHICLE RIGHT-SIZING</b> - Develop policy and standard practices to downsize vehicles (appropriate to task) upon scheduled replacement.	<b>IMMEDIATE ACTION:</b> Develop and implement policy.	600 tonnes	-	Application appropriate smaller vehicles could result in reduced capital and operational costs
3.2.2 - <b>SHIFT TOWARD DIESEL ENGINES</b> - Purchase diesel vehicles (upon replacement) where appropriate after new EPA emission standards come into effect in 2007, as these engines are more fuel efficient.	<b>LATER ACTION:</b> After 2007 emissions standards take effect, evaluate impact and purchase diesels upon vehicle replacement where possible.	700 tonnes	Minor net annual cost expected once increased capital costs are offset by reduced operational costs	
3.2.3 - <b>SHIFT TO BIODIESEL FUEL</b> - Use biodiesel blended fuel in City's diesel fleet.	<b>IMMEDIATE ACTION:</b> City to undertake a biodiesel demonstration project.		One-time cost of \$90,000 for facility upgrades, extra fuel costs, and vehicle testing	Up to 75% of demonstration costs might be covered by funding from GVRD and FCM
	<b>LATER ACTION:</b> Implement ongoing use of biodiesel for City's entire diesel fleet.	2,700 tonnes	Cost implications will be better understood once demonstration and fuel contract negotiations complete ... potential that biodiesel could be cost neutral	Will seek tax exemption for biodiesel from Provincial and Federal governments
3.2.4 - <b>EFFICIENT-DRIVER TRAINING PROGRAM</b> - A program to train staff how to increase fuel efficiency of their vehicles through modified driving habits	<b>IMMEDIATE ACTION:</b> develop and implement a driver training pilot project.	-	\$30,000 one-time consulting budget	-
	<b>LATER ACTION:</b> Expand training program to all City staff drivers.	1,500 tonnes	Cost implications will be better understood once pilot project is complete but program costs anticipated to be covered by fuel savings	
3.2.5 - <b>FLEET DEMAND MANAGEMENT</b> - Explore opportunities to reduce the use of fleet vehicles	<b>IMMEDIATE ACTION:</b> Explore opportunities to coordinate and reduce staff trips and to centralize coordination of pooled vehicles	-	-	-

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INITIATIVE (Section references from Corporate Climate Change Action Plan Report)	IMPLEMENTATION MILESTONES	TARGET GHG REDUCTION (net from 1990)	ESTIMATED COST IMPLICATIONS	POTENTIAL OFFSETS
<p><b>3.2.6 - OTHER TECHNOLOGIES AND FUELS</b> - Continue to monitor developments in emerging vehicle and fuel technology for potential fleet implementations, such as:</p> <ul style="list-style-type: none"> <li>i. Hybrid Vehicles</li> <li>ii. Ethanol Blended Fuels</li> <li>iii. Natural Gas and Propane</li> <li>iv. Fuel Cells</li> <li>v. Micro-Compact Cars</li> <li>vi. Other Technologies</li> </ul>	<p><b>IMMEDIATE ACTION:</b> monitor and demo emergent technologies</p>		<p>\$20,000 annual consulting budget</p>	<p>Explore opportunities to share consultant with other fleet operators in region</p>
<b>III. LIGHTING &amp; TRAFFIC SIGNALS</b>				
<p><b>3.3 NEW TECHNOLOGIES</b></p>	<p>Continue to evaluate, implement and monitor new street &amp; park lighting technologies</p>	<p>-100 tonnes</p>	<p>Detailed and evaluated on a project by project basis</p>	
<b>IV. CORPORATE WASTE &amp; LANDFILL</b>				
<p><b>3.4 CORPORATE WASTE &amp; LANDFILL</b></p>	<p>Continue to expand Corporate Waste Reduction And Landfill Gas Recovery Programs</p>	<p>2,000 tonnes</p>	<p>Ongoing initiative</p>	
<b>V. CORP. DEMAND-SIDE MANAGEMENT</b>				
<p><b>3.5 CORPORATE DEMAND-SIDE MANAGEMENT (DSM)</b> - Design and initiate education &amp; awareness programs to reduce the demand for energy, automobile usage, etc.</p>	<p><b>IMMEDIATE ACTION:</b> Hire a full-time Corporate Sustainability Coordinator to initiate energy awareness programs for staff</p>	<p>700 tonnes</p>	<p>\$68,000 annual salary plus one-time computer and set-up costs of \$5,000</p>	<p>Estimated energy cost savings of up to 3%</p>

**APPENDIX C  
CORPORATE and COMMUNITY CLIMATE CHANGE ACTION PLANS: SUMMARY OF POTENTIAL FINANCIAL IMPACT TO CITY OF VANCOUVER  
IMMEDIATE ACTION RECOMMENDATIONS ONLY / DOES NOT INCLUDE RECOMMENDED INITIATIVES THAT REQUIRE REPORTING BACK TO COUNCIL**

	INCREASE TO OPERATING BUDGET	ONE-TIME COST	POTENTIAL OFFSET: ONGOING	POTENTIAL OFFSET: TIME OR LIMITED TERM	ANTICIPATED START OF OFFSET	TERM OF OFFSET	OFFSET SOURCE	INTERNAL FUNDING SOURCE / RECEIPT OF SAVINGS
1. New Staff: Corporate Energy Coordinator	\$71,500	\$5,000	\$0	-\$35,750	When position is hired	Minimum of 1.5 years, potentially longer	BC Hydro PowerSmart	Operating Budget
2. Purchase BC Hydro Green Power Certificates	\$10,000	\$0	\$0	\$0	n/a	n/a	n/a	Operating Budget
3. Green Design for New and Replacement Facilities	<							>
refer to separate Council report								
4. Biodiesel Fuel Demo Project	\$0	\$90,000	\$0	-\$67,000	Concurrent with project implementation	One-time grant	GVRD and/or FCM	Operating Budget
5. Efficient-Driver Training Program Development	\$0	\$30,000	\$0	\$0	n/a	n/a	n/a	Operating Budget
6. Consultant Budget for the Study of Future Vehicle Technologies	\$20,000	\$0	-	-	n/a	n/a	Will explore sharing consultant costs with other regional fleet managers	Operating Budget
7. New Staff: Corporate Sustainability Coordinator	\$68,000	\$5,000	-\$150,000	-	Anticipated to begin building in 2005	Ongoing	Energy savings	Operating Budget
8. Communications Strategy Costs	\$0	\$10,000	\$0	\$0	n/a	n/a	n/a	Operating Budget
9. Community Climate Change Consultation		\$50,000						Operating Budget
10. Community Climate Change Technical Consulting		\$25,000						Operating Budget
<b>TOTALS</b>	<b>\$169,500</b>	<b>\$215,000</b>	<b>-\$150,000</b>	<b>-\$102,750</b>				