Chapter 6: ENERGY

INTRODUCTION

Canadians are among the highest per capita energy users in the world. We use energy to keep our homes and offices at a "comfort level" of 20 degrees Celsius despite wide ranging outside temperatures. We use energy to transport people and cargos across our large country. We use energy to power the various businesses that manufacture the products we export.

A great deal of this energy is produced by the burning of fossil fuels such as oil, coal and natural gas. There are two main concerns associated with the large scale burning of fossil fuels:

- The process produces large quantities of carbon dioxide gas, a greenhouse gas that is a main contributor to climate change. The 2005 Partners for Climate Protection report to Council indicated that between 1994 and 2000, overall greenhouse gas emissions *per capita* in Burlington increased some 18% from 11 to 13 tonnes.

- Fossil fuels are non-renewable resources. Current data indicates that in the case of oil, our most versatile fossil fuel, we may soon reach a point where we are using more oil than we are discovering. From this point (often referred to as peak oil) our supply of oil will decline with resulting shortages and large-scale price increases.

A major type of energy used in residences, businesses and industries is electrical energy. Electrical energy is produced from a variety of sources both renewable and non-renewable. At the present time, the cost of this type of energy to consumers is below market pricing, with the balance made up by government subsidies.

Increasing interest is being shown in other energies, which may be used directly or converted to electrical energy. These will be discussed in this chapter, as well as government initiatives designed to reduce energy consumption by all segments of our community.

ISSUE: ELECTRICAL ENERGY

WHY WAS IT MEASURED

The consumption of electrical energy by a community may be considered as a measure of its size, economic activity and lifestyle. A continuing growth of electrical energy demand, on both an overall and per capita basis, requires the construction of additional generation facilities and/or the purchase of energy from other jurisdictions. Either of these outcomes will result in greater per unit electrical costs for consumers.

The mix of sources of electrical energy has environmental consequences. The concerns regarding burning fossil fuels have been outlined previously, nuclear energy plants have high

capital and operating costs and carry the environmental challenge of the safe storage of radioactive spent fuel cells, while water power installations often alter the landscape through the establishment of storage reservoirs.

WHAT WAS MEASURED

Electrical consumption in the City of Burlington was measured in the residential and commercial areas. The standard energy unit of "gigajoules" (GJ) was used (1 GJ = 278 kWh). Data was obtained from the *Energy Efficiency Opportunities in the City of Burlington's Corporate Building Stock* report prepared by International Council for Local Environmental Initiatives Energy Services (ICLEI) in 2000.

Table 6.2 shows Ontario's electrical supply mix, taken from the 2005 Ontario Power Generation Performance Report, published April 2006.

WHAT WAS FOUND

As shown in Table 6.1, the majority of Burlington's electricity is consumed by the commercial and industrial sectors. Over the study period, consumption rose steadily in the commercial/industrial sector, while fluctuating in the residential sector.

Table 6.1 - Annual Electrical Consumption City of Burlington (GJ)

Year	Residential	Commercial/Industrial	Residential per Capita
1991	1,650,153	2,850,887	12.7
1997	1,572,621	3,311,125	11.4
2000	1,729,486	3,708,550	11.5
2005	2,094,503	4,420,821	12.7

Source: Burlington Hydro Inc.

Table 6.2 - Ontario Electrical Supply Mix (%)

Electrical Sources	1999	2005
Nuclear Energy	39	50
Water Power	27	22
Coal	26	19
Natural Gas/Oil	6	8
Alternative Power Sources	2	1

Source: 2005 Ontario Power Performance Report

Table 6.2 shows that while nuclear energy supply increased greatly, most other sources such as Water Power and Coal decreased. It should be noted that the above data is for all Ontario electrical energy sources. About 70% of this energy is from Ontario Power Generation (OPG) facilities. One reason for the increase in the nuclear energy share was the restarting of a 515 MW power reactor.

WHAT IS HAPPENING

Ontario, through Ontario Power Generation (a commercial company wholly owned by the province) undertook several initiatives to increase the amount of hydroelectricity available from the Beck Hydroelectric stations in Niagara Falls and from a new hydroelectric generating station at Lac Seul in North-western Ontario to be completed in late 2007. In addition OPG returned the Pickering A Unit 1 nuclear power reactor to service and completed preparations with TransCanada Energy to establish the Portlands Energy Centre a 500 MW combined cycle gas and cogeneration-capable facility in downtown Toronto.

Smart Meters

Burlington Hydro is participating in an implementation plan mandated by the Government of Ontario to introduce smart meters for electricity. Smart meters provide customers with consumption information that will allow them to manage their demand for electricity. This is expected to result in more efficient use of electricity supply because customers will be charged variable rates depending on time of day.

Alternative Sources of Electrical Energy

The two types of energy receiving the most interest at present are wind (converted to electricity through wind generators) and solar (used directly for heating and converted to electricity in solar cells). These sources may be tapped on both a large scale and small-scale basis, even by individual homeowners. The provincial government recently passed legislation that enables individuals and groups to generate electrical energy and to sell amounts generated in excess of their own needs to the provincial energy grid.

ISSUE: ENERGY USE AND GREENHOUSE GAS EMISSIONS

WHY WAS IT MEASURED

The majority of the energy we use for heating and transportation is obtained from the burning of fossil fuels, primarily oil and gas. As stated in the introduction, the burning process produces carbon dioxide gas, a ‘greenhouse gas’ which is a major contributor to climate change. The amount of carbon dioxide produced by a city corporation or by the entire city is therefore an indicator of our consumption of fossil fuels for energy production and our contribution to climate change.

WHAT WAS MEASURED

In 2002, the City of Burlington joined the Partners for Climate Protection program and committed to reducing greenhouse gas emissions. This program is a partnership between the Federation of Canadian Municipalities (FCM) and the International Council for Local

Environmental Initiatives (ICLEI) to provide guidance to municipal governments in taking stock of its greenhouse gas emissions and developing a plan to reduce these emissions.

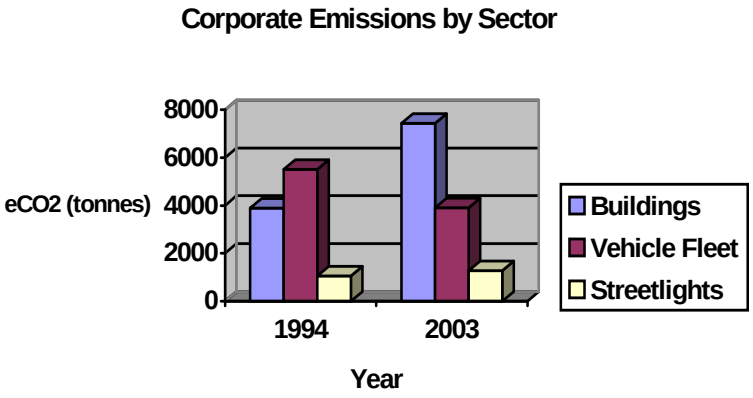
In 2004 the City completed a corporate and community-wide inventory of greenhouse gas emissions using the Partners for Climate Protection recommended base year of 1994. The inventory report outlines several challenges in collecting the data for this initiative, particularly due to the age of the data. Assumptions were often made, particularly for community-wide data. The inventory results should be used as a tool to provide guidance but not be used in absolute terms.

WHAT WAS FOUND

Figure 6.1 provides a summary of the emissions inventory for the city corporation itself, comparing the baseline data (1994) with 2003 data.

The corporation's greenhouse gas emissions were estimated to be 10,500 tonnes of equivalent carbon dioxide (CO_2) in 1994. By 2003, emissions had increased by 21% to approximately 12,500 tonnes. There was a significant increase in the buildings sector from 1994 to 2003, which can partially be explained by an increase in City facilities (e.g. Appleby Ice Arena, Tansley Woods Recreation Centre, and two additional fire stations).

Figure 6.1 – Corporate Emissions



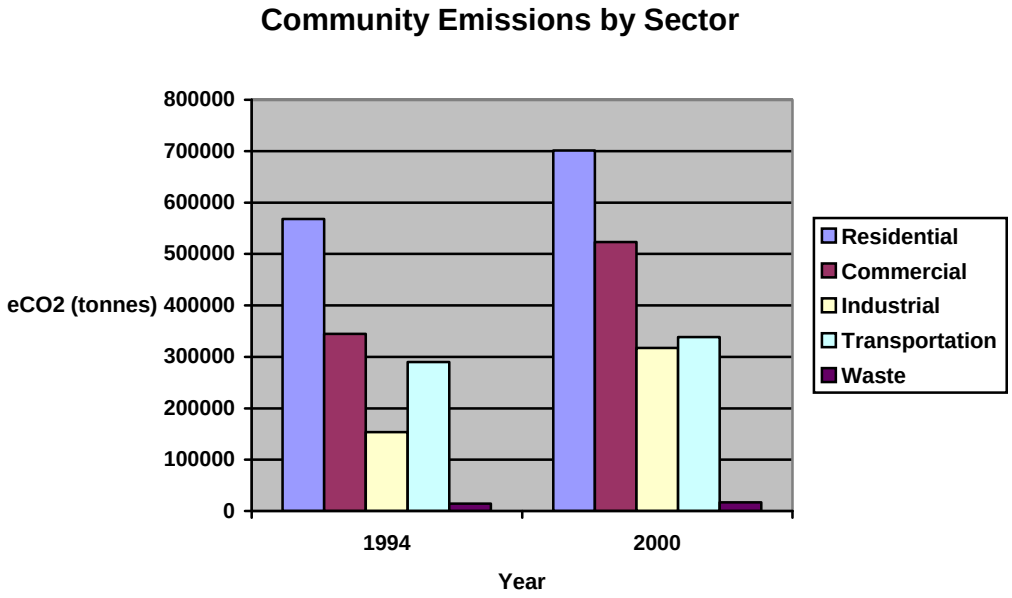
There was also a shift in energy generation from a greater reliance on nuclear power in 1994 to coal fired generation in 2003. If the same ratio of nuclear/coal-fired power was applied to the 2003 data for corporate electricity usage, it is estimated that the City's GHG emissions would have increased by approximately 13% instead of 21%.

The emission totals from vehicles showed a decline, which may be explained by the use of alternative fuels as well as an increase in contracting out some services (e.g. snow removal and turf management practices).

It should be noted that during the period 1994 through 2003, the city corporation's emissions increased by 21% while the city population increased by 16%. The emissions per capita, perhaps a better indicator of the effective use of energy, rose by less than 4% from 81 to 84 tonnes eCO2 per 1000 population. As mentioned above, if the same energy source mix had been in place both years, the emissions per capita would have been somewhat decreased.

Figure 6.2 provides similar data for various segments of the community as a whole, so the numbers are much larger. It should be noted that the most recent data needed for the preparation of this figure was from 2000 as opposed to 2003 for the previous figure.

Figure 6.2 – Community Emissions



While the residential sector was the largest contributor to greenhouse gas emissions, the greatest increases in emissions took place in the industrial and commercial sectors. In part this reflects the change in the nature of Burlington from a largely residential to more balanced community.

The data also indicates that the total emissions for the community as a whole increased by 38% and that there was a noticeable increase on a per capita basis from 11 to 13 tonnes eCO_2.

WHAT IS HAPPENING

As the next step in the Partners for Climate Protection plan for reducing energy use and greenhouse gas emissions, a document entitled "Agenda for Action – A Plan to Conserve Energy and Reduce Greenhouse Gas Emissions**"** was presented to City Council early in 2007. The plan proposed a variety of actions for the City to undertake in the areas of energy management and conservation, green purchasing, street lights and traffic signals, and fleet management. Targets for emission reductions were recommended for both the city corporation and the community as a whole. The Agenda for Action report was referred by Council to the City's strategic planning process.

LEED Buildings

Buildings are responsible for a significant amount of energy use, and are estimated to account for 38% of all secondary energy use in Canada, contributing 30% of all greenhouse gas emissions in the country (Canada Green Building Council). In order to effectively manage this, serious consideration should be given to the way buildings are constructed.

One approach to addressing the environmental impact and energy use of buildings is to consider the Leadership in Energy and Environmental Design (LEED) rating system for all new development. LEED is a voluntary certification program for developing high-performance, sustainable buildings and was created to transform the building market by facilitating the construction of facilities that are profitable, healthier for occupants and environmentally responsible. The system measures and ranks building environmental performance according to six main categories: sustainable sites, water efficiency, energy and atmosphere, materials and resources, and indoor air quality.

Momentum for the LEED rating system has increased significantly over the past five years. There are now over 170 registered buildings in Canada, compared to five years ago when LEED was virtually unheard of in the construction industry. The popularity of the program has increased so much so that several Canadian municipalities, such as Vancouver, Ottawa and Kingston, have adopted the LEED rating system as a minimum standard for all new public buildings.

Geothermal Heating and Cooling

Geothermal heating and cooling does not rely on the burning of fossil fuels, but utilises the fact that below the frost line, the earth is at a virtually constant temperature year round. It is therefore warmer than the air in winter and cooler than the air in summer. A series of horizontal or vertical pipes are laid some two or more metres below ground level and a liquid is pumped through them. In winter the liquid absorbs heat from the surrounding ground, and this is extracted from the liquid by a heat pump and used to warm the building. The reverse process takes place in the summer.

This approach to heating and cooling is a feature of a number of LEED buildings and is now being used by some homeowners who feel the cost of installing the system will be more than offset by future savings in energy costs.

CONCLUSIONS

It seems clear from the energy indicators that there is ample room for improvement in Burlington's use of energy. Despite the considerable increase in the cost of energy, and the potential for significant disruption from climate change, Burlington is still not making progress in curbing its demand for energy. This has serious implications for the future sustainability of Burlington's quality of life.

Electrical energy use in Burlington is rising as the city grows. While this is not desirable, it is not unexpected. What might be considered surprising is that residential per capita electricity use is not improving with time. Efforts to conserve electricity have apparently not been effective. Businesses, residents, and government in Burlington will need to make energy conservation a much bigger priority.

Burlington's production of greenhouse gas emissions is another area of concern. One consequence of not curbing the use of energy is an increase in greenhouse gas emissions that leads to climate change. Total and per capita greenhouse gas emissions in Burlington continue to rise despite Kyoto promises and warnings from climate scientists. Burlington is taking some steps to address the issue, such as its participation in Partners for Climate Protection. This should be considered as an opportunity for the City of Burlington to take a leadership role in helping cut local greenhouse gas emissions.

While renewable forms of energy exist, Ontario's energy supply is still dominated by fossil fuels and nuclear energy. Wind, solar, and geothermal energy should play a much bigger part of the energy picture. Since renewable sources of energy tend to be small scale and local, the City of Burlington could play a role in encouraging their use.

Green buildings is one initiative that has real potential for reducing greenhouse gas emissions, improving occupant satisfaction, and diminishing the environmental footprint of development. The LEED rating system can be used as a good independent measure of whether a development is consistent with these sustainability objectives.

We support the "Agenda for Action" document submitted to Council. The proposed reductions in energy use by the corporation will result in cost savings and reductions in greenhouse gas emissions. In order to properly document both these achievements the City will need to record on an ongoing basis the total consumption of electricity and fossil fuels, together with the current cost and source of the energy produced. It is also felt that the best approach would be to set ambitious targets and do our best to reach them as opposed to being content with smaller steps.

RECOMMENDATIONS

1. That the City take a local leadership role in encouraging the development of 'green buildings' by requiring LEED certification for all new municipal buildings.

1. That the City investigate a district energy application for the downtown core area for heating and cooling buildings to reduce greenhouse gas emissions. Energy sources should include geothermal and solar.

2. That the City encourage LEED certification for private sector developments, especially those for which zoning and/or official plan amendments are requested.

3. That the City develop a comprehensive energy management plan that incorporates the life cycle costs of capital projects.

4. That the City develop targets for energy consumption reductions, and fund energy saving initiatives by considering both upfront capital and operating costs.