How Ontario and Ontario Cities Are Coping with the Cost of Energy

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Introduction

This paper examines two questions; how Ontario and Ontario cities can reduce their energy consumption, and how renewable energy sources can be used to replace fossil fuels. The paper also looks at the policies of the Province of Ontario and the Government of Canada to encourage the use of renewable energy sources. Reducing energy reduces costs for the province and for Ontario cities. It also has another benefit - the reduction in the volume of greenhouse gases because energy production is overwhelmingly produced with coal, oil, natural gas and nuclear power. All of these fuels produce greenhouse gases, air pollution, or toxic waste. Policies that encourage the use of public transportation or the use of multi-person lanes on commuter roads also reduce greenhouse gases because they reduce the consumption of gasoline.

First, the paper discusses how electricity is produced in Ontario and the policies used to reduce greenhouse gases from electricity production. Second, it considers how the demand for energy can be reduced. Third, the programs that are used by the City of Toronto to reduce energy consumption are reviewed. There are also non-governmental programs to reduce energy consumption and to help preserve the environment. Then, the question of how renewable energy resources can be used to reduce energy consumption and the production of greenhouse gases is addressed. The final section provides a summary and offers some conclusions.

© Canadian Journal of Regional Science/Revue canadienne des sciences régionales, XXX: 2 (Summer/Été 2007), 359-372.
ISSN: 0705-4580 Printed in Canada/Imprimé au Canada

The Problems of Energy Supply and Cost

A Brief History of Electricity Production in Ontario

The Ontario legislature passed the Power Commission Act to create the Hydro Electric Power Commission in 1906. The principal function of the Commission was to build transmission lines to supply municipalities with power produced by the existing generating companies in Niagara Falls. The municipalities set up their own power distribution companies to distribute power to their residents. Toronto Hydro was set up in 1911.

The Ontario Government established the MacDonald Commission in 1995 as an advisory committee on electricity competition and to provide recommendations on the restructuring of Ontario's electricity industry. In 1996, the MacDonald Commission made a number of important recommendations. In 1997, the Ontario government issued a white paper called *Directions for Change, Charting a Course for Competitive Electricity in Ontario.*

The white paper was based on the recommendations of the MacDonald Commission (Province of Ontario 1996). In October, 1998, the Energy Competition Act was passed authorizing a restructuring of the industry in Ontario (Province of Ontario 1997: 3). The government wanted to sell Ontario Hydro and turn it into a private company. In April, 1998, Ontario Hydro was divided into five new companies. All of these companies are now owned by the provincial government. The reorganization was supposed to produce cost savings, but the opposite occurred. Before Ontario Hydro was reorganized in 1998, its costs were $1.3 billion. After 1998, its costs more than doubled. In 2005, its costs were $3.4 billion (Howlett 2006; Howlett and Curry 2006). Revenue increased by only 15 % over the same period. The problem of higher costs arose because there now are 5 companies instead of one. The Ontario Hydro Services Company became the industry leader in working with the independent operators and the Ontario Energy Board. The company's role was to help create a wholesale and retail electricity market for Ontario.

Table 1 shows how electricity is generated in Ontario and the fuels used to produce electricity. In 2005, 51 % came from nuclear plants. The two other major fuels were coal (19 %) and waterpower (22 %) (Ontario Power Generation 2005).

The Demand Response

The key efficiency element is the demand response. To reduce electricity consumption, the local utility pays its residential and commercial customers to reduce demand during the peak system period. This has produced a significant saving in electricity during the peak period. The local utilities are also introducing smart meters. Smart meters charge customers a higher price during the peak demand period and a lower price during the non-peak period. This encourages its customers to shift the time of day that they use significant energy-using appliances. OPG could achieve significant savings by paying its large industrial

TABLE 1 How Electricity is Generated in Ontario (per cent, 2005): All Ontario Sources

Fuel	All Ontario Sources	Ontario Power Generation
Oil and Gas	8	1
Coal	19	19
Nuclear	51	29
Hydroelectric	22	21
	100	70

Note: 1. OPG Generation Capacity is 70 % of the Total.
Source: Ontario Power Generation (OPG), 2006.

and commercial customers and the electric utilities the same price that it pays to the generating plants during the peak periods. This would lead to a significant reduction in the use of electricity. It would also change the existing system. Local electric authorities are now allowed to retain the cost savings.

In 2005, a new pricing system was introduced called the Market Power Mitigation Agreement (Ontario Power Generation 2005: 4) OPG has had a moderating effect on the wholesale price of electricity. In 2005, OPG received 4.7 cents per kwh. This is less than the weighted average wholesale price of 7.2 cents per kwh received by all Ontario generating producers. OPG also provides rebates to independent producers under a provincial pricing scheme. In 2005, it paid $740 million to Ontario Independent System Operators for the output of their plants.

OPG will continue to provide rebates to Ontario electricity users and private producers under the province's new electricity pricing program. The rebates are paid to the unregulated producers on all revenue that exceeds the limit of 4.7 cents per kwh established by the Ontario government. Revenues above these rebates are returned to the consumers (Ontario Power Generation 2006).

The subsidies in the price of electricity have to be removed. It is the full cost of electricity to businesses and households that provides the signal to encourage them to economize on their use of electricity. It also would be useful to adjust the prices of electricity from the different generating facilities to reflect the true cost of electricity. Prices are signals to all purchasers that allow them to find ways to reallocate their purchases to obtain electricity at the lowest cost.

The provincial government has signed agreements for 10 new green-power projects. The projects will be paid 8 cents per kwh. This is competitive with the subsidies paid to nuclear power. Another source of cheap power is to encourage new hydroelectric power projects in Manitoba and Labrador. In March of 2005, OPG, Hydro Quebec and SNC-Lavelin presented a proposal to the Government of Newfoundland to generate power on the Churchill River in Labrador. At this stage the parties are still negotiating and nothing has happened.

Most of Ontario's buildings and factories use natural gas for heating. However, it is more efficient to produce both heat and electricity from the natural gas. This approach is called "combined heat and power" and it is often 80-90 % efficient compared with the 34 % efficiency of the province's coal fired plant at Nanticoke. Combined heat and power generation is only feasible in large scale

projects.

The clean solution provides many advantages. It produces low-cost electricity and significantly lower emissions of both smog and greenhouses gases. It puts power where it is needed. It also avoids the need to build expensive new transmission lines and to increase the overall reliability of the electricity system by diversifying its power sources. Diversification means that the system is less vulnerable to system breakdown. Most power failures now occur because of grid failure (Ontario Clean Air Alliance 2006a).

Ontario's total combined heat and power is equal to about 100 % of its existing coal and nuclear capacity (Ontario Clean Air Alliance 2006c). Nanticoke is the number one greenhouse gas emitter in Canada. The Government of Ontario had planned to phase out Nanticoke by 2009 but this has been delayed. The Ontario Clean Air Alliance suggests that the Nanticoke coal plant be converted to a natural gas fired producer. The conversion cost of $1.25 billion is less than half the cost of what OPG spent to restart the Pickering Nuclear Power's unit 4. Converting Nanticoke will provide almost 8 times more power than bringing nuclear power unit 4 on stream (Ontario Clean Air Alliance 2006a).

OPG should set a standard price for electricity. The province should also move to a 100 % renewable electricity system because of the negative externalities produced from non-renewable energy sources. Many environmental research groups have suggested an alternative approach to the generation and distribution of electricity. The Ontario Clean Air Alliance argues that Ontario is too reliant on a limited source of generating units with an inflexible power distribution system that is vulnerable to system breakdowns (Ontario Clean Air Alliance 2006d). The Clean Air Alliance suggests the use of new technology that is becoming available, such as gas-turbine generation, photovoltaires, micro-hydro plants and wind power. These power generation systems can be use to replace the current large-scale electrical generation systems.

The current system creates many negative externalities such as air and water pollution and the problem of disposing of nuclear waste. Once the true system costs are taken into account, the costs associated with the current system are less attractive than the new low impact and more reliable power generating systems. An example is the use of small high-efficient natural gas co-generation plants combined with a new grid that emphasizes locating power supplies near high demand centers.

Other renewable power sources such as wind power, and solar power are also desirable. This power can be generated by local cooperatives and sold to the grid. The long-term goal is to move to 100 % renewable energy supplies. The short-term goal is to achieve 60 % renewable by 2020. To achieve these goals the provincial government has to provide the right monetary incentives.

Municipal Programs to Reduce Energy Consumption and Conserve Energy

In February 2000, the City of Toronto published a comprehensive plan to provide a clean, green and healthy environment (City of Toronto 2000). The plan provided a number of recommendations. One recommendation was that the city adopt the principle of pollution preventive planning. It also recommended that the city pass a community 'right to know' by-law so that the residents are aware of what the city is doing and of the locations, the sources and the health effects of toxics in their community. There were 31 recommendations to reduce, air, land and water pollution.

There were 9 recommendations to improve the quality of the land. These included increasing city parks and natural areas and cleaning up the waterfront. There were also 8 recommendations regarding water. These included programs to restore the health of rivers, streams and the waterfront. Other recommendations included the prevention of the discharge of pollutants in the sewer system and the reduction of the consumption of water.

The plan offered 6 recommendations on air quality. These included a comprehensive air quality strategy to monitor ambient air quality and reduce greenhouse emissions. The plan offered 2 recommendations on a sustainable public transportation system. These included the recognition of the importance of a sustainable public transportation system and the need for a plan to implement a sustainable public transportation system.

The final 5 recommendations dealt with sustainable energy use, including the adoption of a goal on sustainable energy use and the reduction of energy consumption by the city. After the plan was published nothing much was done to implement the recommendations.

The changes that did occur came from Toronto Hydro, the provincial and federal governments and private foundations. Toronto Hydro introduced a demand management program to conserve electricity and to reduce the peak load. One of the key tools is the Peaksaver Program. Customers are given $25 to sign up for this program. About 20,000 customers of Toronto Hydro have already signed up (Toronto Hydro 2006).

The program allows Toronto Hydro to control their thermostats. During a recent heat wave, Toronto Hydro raised the settings by one or two degrees. The result was barely noticeable to their customers except on their bills. The reduction in the demand for energy made a substantial difference by educating customers to reduce the demand on the grid. Toronto Hydro uses about 20 % of the electricity produced in Ontario but it is responsible for 40 % of the savings generated since 2004.

The source of Toronto Hydro's success is the provincial government funding that was allocated for conservation. Toronto Hydro received $40,000.

Toronto Hydro's president, David O'Brien, believes that thermostat control will become mandatory in Ontario in the future, but nothing has happened yet (Barber 2006). The powerwise energy conservation program for households and businesses now includes three local electric utilities; Toronto, Mississauga, and Ottawa. All

three are involved in conservation programs. There is also an umbrella organization called Powerwise.

The provincial government joined the program in December, 2005. The province invited local electricity distribution companies to join the program to create a conservation society for Ontario. The powerwise program has been a success. In 2005, it saved 110.6 kwh of electricity. Other programs include free florescent light bulbs, collecting old air conditioners and providing a rebate to encourage their customers to purchase new ones. Toronto Hydro also subsidizes the use of energy efficient light bulbs for the holiday season. These programs saved 90 million kwhs of electricity last year (Toronto Hydro 2006).

Non-governmental Programs to Help Reduce Energy Consumption

The Clean Air Foundation brings together leaders in government, industry and public interest groups to implement programs to reduce energy consumption, to reduce emissions, to improve air quality and to protect the environment while following a solid business model.

The Foundation operates a number of programs such as Car Heaven. This program is intended to get older high-pollution cars of the road. The incentives include free tows, charitable receipts, and incentives such as bicycles, transit passes and $1,000 off the price of a new GM vehicle.

Chill is a program designed to retire old appliances by offering free pickups, a $25 energy saving kit, and a $75 rebate on the purchase of a new energy saving appliance. Cool Shops is another program that operates in 5 cities to help small business owners reduce energy consumption. Keep Cool provides incentives for people to get rid of their old inefficient air conditioners and replace them with new energy efficient air conditioner (Clean Air Foundation).

Renewable Energy Resources that Can be Used to Reduce Energy Consumption Electricity

Using electricity efficiently, especially at peak periods, can save a significant amount of natural gas. The saved natural gas can be used to produce hydrogen. The extra hydrogen can be used to displace most or all of the remaining uses of oil (Loven's 2004).

Biogas

Many European cities use biogas, made from waste products, as a fuel to power automobiles, buses and other forms of public transit. The Swedish and other European governments are trying to encourage the use of biogas (Hume 2006).

In Ontario, the Ministry of Natural Resources has decided to turn the slush (e.g. unwanted branches, stumps and leaves) that is currently burned into a feed

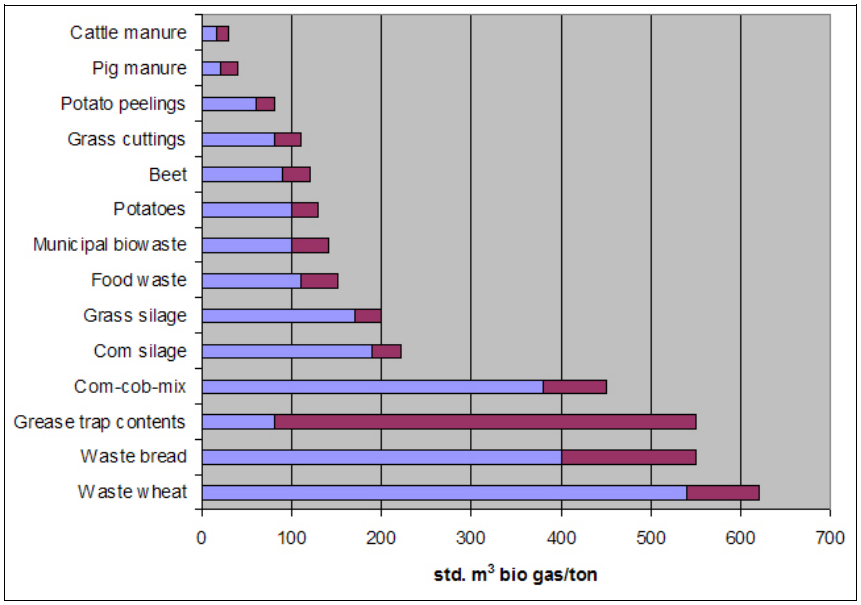

FIGURE 1 Biogas Yields of Different Feed Stocks
Note: The dark bar represents the amount of feed stock. The light represents the amount of biogas that is obtained from the feed stock.
Source: Buijk (2006)

stock for a biogas refinery. The Ministry has ordered a moveable biogas refinery from Advanced Biorefinery Inc. The transport costs of moving the slush to a central refinery is high. To reduce the cost, the Ministry proposes to move the refinery to the slush. It is hoped that the new refinery will be economically viable once it is put into operation (Hamilton 2006a).

A lecture given by Jan Buijk provided a diagram (Figure 1) that shows the biogas yields of different feed stocks. The diagram shows that there are many different types of feed stocks that can produce biogas. Some, such as waste wheat yield a much greater amount of biogas than others, such as cattle manure (Buijk 2006). General Electric Energy has a plant in Jenback, Austria that produces high efficiency gas engines that can use biogas made from biomass. There are over 2,500 plants in Germany producing biogas. Germany also uses biogas to produce electricity. In 2005, there were over 500 plants producing electricity with a combined output of over 500 mwh (Buijk 2006).

The plant's engines are sold all over the world. Given the advances in technology and the ease of producing biogas from biomass, biogas will very likely become an important source of fuel for motor vehicles and the generation of electricity. Most Canadian cities are not making use of this fuel to reduce their energy consumption.

In the United States, the Bush Administration is pushing ethanol as an alternative fuel for gasoline. The automobile companies are given tax credits as an incentive to build motor vehicles that are able to use both ethanol and gasoline. The credits were part of the Alternative Motor Fuel Act of 1998 (United States 2005). The credits count

towards an automobile manufacture's average fuel economy standard. The Act regulates the miles per gallon produced by the manufacture's vehicles. By mid 2005, the FFV credits saved automobile manufacturers $1.6 billion. The desired mixture is 85 % ethanol and 15 % gasoline (E85). Most of the ethanol produced in the U.S. today is from corn. A recent article in Consumer Reports (CU 2006) put a new 2007 Chevrolet Tahoe FFV through a number of tests. The vehicle was tested for fuel economy, acceleration and emissions. They also interviewed a number of industry and government experts on the consequences of the use of ethanol as a replacement for gasoline.

The fuel economy test showed that E85 caused fuel economy to drop by 27% compared to the use of gasoline. Therefore, the cost of operating the vehicle went up with the use of E85. The emission test showed a significant decrease of smog for E85. But E85 emits acetaldehyde, a possible cancer producing emission. Most gas stations that sell ethanol are located in the corn-belt. A station that wants to add ethanol faces a cost of over $200,000 to install the pumps and the storage tanks. This is a significant deterrent and ethanol is only slowly becoming available in other parts of the U.S.

The United States government provides gasoline refiners and marketers that blend gasoline with ethanol, a 51-cent tax credit per gallon. The 2005 Energy Policy Act mandates that 7.5 billion gallons of ethanol be blended with gasoline by 2012 (Consumer Reports 2006). A test by Michael Wong at the Argonne National Laboratories estimated that ethanol produced 35 % more energy than the energy used to produce it (Consumer Reports 2006). Other tests show that ethanol does not add to the world's balance of greenhouse gases but it does put back more carbon dioxide than the plants used to produce it. Ted Patzek, of the University of California at Berkeley, says that the carbon dioxide emissions from corn ethanol are 50 % higher than from regular gasoline (Consumer Report 2006).

There is another issue that argues against the use of corn to make ethanol. Many observers argue that it is not a good long-term source because it diverts corn from the food supply and raises the price of corn to farmers that raise animals. More promising sources of cellulose ethanol are made from corn leaves and stalks, straw, wood pulp and switch grass. Brazil uses sugar cane to make ethanol. In Brazil, all vehicles run on 100 % ethanol (Consumer Report 2006).

The U.S. National Renewable Energy Lab expects the price of ethanol to drop by 50 % over the next few years (United States, Energy Information Agency 2005). The Department of Energy and the Oak Ridge National Lab estimates that by 2030, ethanol could replace 30 % of U.S. oil consumption. Ethanol is only one of a number of alternative choices to replace gasoline. Other sources are biogas, hydrogen, natural gas, and electricity produced from fuel cells. Also, more fuel-efficient vehicles are now being produced by a number of manufacturers.

Wind Power

Wind power uses the power of the wind to generate electricity with wind turbines. Wind power is one of the cleanest sources of energy available. It produces no emissions that contribute to air pollution or greenhouse gases or nuclear waste. Wind power is one of the cleanest sources of energy available. In June 2006, there were

1,050 MWH of installed capacity. Another 3,006 mwh of wind power is under construction (Canadian Wind Energy Institute of Canada 2006). The potential for additional wind power is estimated at another 406 mwh. By 2010, wind power is expected to grow to 4 gwh (Canadian Wind Energy Institute 2006).

One major problem with the use of wind power is that the wind does not blow all the time! This problem may reduce a supplier's desires to build more wind power sites (Canadian Wind Energy Institute of Canada 2006). Alberta and Ontario both face the problem that there are limits on the how much wind power they can produce before their electricity systems become unstable. Alberta has put a cap on the amount of wind power electricity generation at 900 MW. This level should be reached next year. An Ontario government report suggests that 5,000 MW is the maximum amount of wind power that can be produced before the grid system becomes unstable.

Solar Power

Many people are concerned about the cost and the availability of electricity. They are searching for alternatives that will reduce their electricity cost and that are environmentally friendly. Solar power is one possible alternative to the use of conventional generated electricity.

There is a growing interest in solar power in Canada. The Ottawa Solar Power website states that interest in renewable energy in Canada has also increased significantly over the last few years. This is because of the rising cost of conventionally generated electricity. It is also because consumers are concerned with the reliability of the supply of electricity.

Solar power provides a technology that does not pollute the environment and is not dependent on the electrical grid. It is also not affected by ice and wind storms. The only person that controls it is the system buyer. At the present time, solar power cannot provide all of the electricity used in a home. Solar power can be used to generate electricity and heat water and air. If the sun does not shine, the system will not work. Solar power is limited as to what it can do. Therefore, a household has to be connected to the grid or have its own generators to produce electricity and heat.

There are two types of solar systems - solar thermal that uses the power of the sun to heat water and air and photovoltaic that uses the power of the sun to charge batteries that provide electricity. The cost to build a good system for a home is about $35,000 (Ottawa Solar Power 2006).

The potential for solar power has been recognized by electrical generating companies. SunEdison LLC of Baltimore and SkyPower Corp. of Toronto have created a joint venture to build, own and operate 50 MW Solar photovoltaic farms in Ontario.

Ontario introduced a new standard offer program that will pay 42 cents for every kilowatt-hour produced by small solar projects under 10 mwh. This is a significant incentive to encourage the development of more solar power plants.

TABLE 2 Cost Index of Various Types of Energy Commodities, 1997=100

	Canada					Ontario				
	Electric	Natural gas	Fuel oil & other fuel	Gas	Energy	Electric	Natural gas	Fuel oil & other fuel	Gas	Energy
1995	104.4	105.6	99	101.9	103	105.7	102.4	104	101.5	102.8
1996	105.6	104.4	105.8	106.4	106	104.9	101.2	111	107.6	105.6
1997	106.8	112.2	112.3	108.4	109	104.4	106.9	118	108.8	107.2
1998	107.8	119.1	100.8	99.1	104	104.4	114	107	99.5	103.0
1999	108.5	130.7	101.3	108.0	110	104.7	122.3	105	108.9	108.9
2000	109.2	158.9	143.2	131.7	128	105.0	144.8	145	133.6	126.9
2001	111.1	206.0	143.5	128.3	132	111.6	206.0	150	128.6	136.1
2002	119.6	168.7	131.8	127.2	130	125.3	162.2	134	127.6	131.8
2003	117.2	219.5	151.5	135.4	140	119.8	206.3	154	134.6	142.8
2004	122	214.9	166.7	149.6	149	129.1	196.5	170	147.3	152.0
2005	125.4	229.9	209.2	168.7	164	136.9	204.9	209	167.1	167.6

Source: Statistics Canada, Canada = V737433, V737434, V737436, V77437; Ontario = V738354, V738355, V738356, V78357 and V738358, Cansim 326-0002.

New Coal Power Technology

The Centre for Energy Information has estimated Canada's reserves of coal at 6,578 million tones. In 2004, production of coal was 66 million tones. Exports were 27.1 million tones of mostly coking coal for the steel industries in other countries. Consump-tion of coal in 2004 was 55 million tones. Most of the coal was used to produce electricity (Coal Association of Canada 2006). Coal to generate electricity is viewed as the least attractive fuel by people concerned with the environment. Coal-fired plants using new clean-coal technology may come back. Clean-coal technologies (CCT) allow the use of Canada's most abundant non-renewable resource to be used more cleanly than in existing coal-fired plants. The Clean Power Coalition (CCPC) believes the best way to show how cleanly coal can be used is to build a demonstration plant.

The Saskatchewan utility, Saskpower, plans to construct a plant to show how coal can be used with near zero emissions, including carbon-dioxide sequestration.

The proposed co-generation plant will produce and sell electricity and CO_2, a byproduct of the plant. Nearby oil producers will provide a ready market for the carbon dioxide. CO_2 is used by oil producing companies to push more oil to the surface while trapping the CO_2 below the surface. Saskpower decided not to proceed with the $1.5 billon plant in 2007 due to cost. The plan calls for the plant to be in operation in 2011.

The Prices of Energy Commodities in Canada

Table 2 shows how the costs of various types of energy commodities have changed from 1995 to 2005. The data are for Canada and Ontario. The largest changes are for fuel oil, natural gas and gasoline. Table 3 shows how the prices of thermal coal, crude

TABLE 3 The Prices of Coal, Crude Oil and Natural Gas in Canada, 1995 to 2006, By Selected Months (1997 = 100)

	Coal (thermal)	Crude Mineral Oil	Natural Gas
January, 1995	101.4	85.8	112.0
June, 1995	101.5	89.1	90.2
December, 2005	86.4	87.5	98.3
January , 2006	98.4	87.8	97.4
June, 1996	101.6	99.9	90.4
December, 1996	95.2	119.1	101.3
January, 1997	98.6	116.4	107.9
June, 1997	105.8	93.1	94.4
December, 1997	92.4	91.1	110.5
January, 1998	96.8	83.8	107.5
June, 1998	102.1	67.4	109.9
December, 1998	89.9	57.3	122.7
January, 1999	102.8	63.2	123.7
June, 1999	103.1	89.6	121.6
December, 1999	93.9	139.2	136.8
January , 2000	94.5	141.0	140.0
June, 2000	98	166.5	153.1
December, 2000	93.4	155.4	233.1
January, 2001	98.5	158.6	262.8
June, 2001	95.6	153.7	261.9
December, 2001	96.1	106.3	233.9
January, 2002	96.3	226.5	226.5
June, 2002	98.3	114.7	208.2
December, 2002	97.1	163.0	218.5
January, 2003	96.7	181.5	230.1
June, 2003	95.2	153.1	227.2
December, 2003	95.3	149.1	218.5
January, 2004	95.1	156.7	233.8
June, 2004	95.9	183.9	237.1
December, 2004	94.9	185.9	225.6
January, 2005	95.3	206.1	224.8
June, 2005	99.8	253.9	225.7
December, 2005	94.9	185.9	225.6
January, 2006	97.2	262.7	300.5
June, 2006	105.5	290.6	243.1
December, 2006	94.2	248.1	238.6

Source: Statistics Canada, V1576529, V1576530, and V1576531 Cansim 3300006

oil and natural gas have changed from January 1995 to May 2006. The data are in index numbers with 1997 equal to 100.

Table 3 shows that the prices for thermal coal changed from one month to another but there is no clear pattern in the data. Crude oil shows a significant pattern over the period. The price of crude oil began to rise in July 1999 (103.1) and continued to rise reaching a peak of 294.4 in May 2006. Between 1997 and 2006, crude oil prices tripled. Natural gas prices showed a similar pattern. Prices went up by 235.9 % compared to 1997.

Provincial Programs to Reduce Energy Consumption

In 2006, the Ontario started a province wide education program to conserve electricity, oil and natural gas. The province introduced the 20/20 program to reduce pollution, by helping households and businesses adopt conservation programs. If the electricity system is likely to exceed the peakload, businesses are encouraged to start using their own energy generators.

Summary and Conclusions

The paper outlines some of the problems associated with energy supply and demand facing Ontario cities. It also identifies many types of renewable energy that can be used to replace the major sources of nonrenewable energy: oil, natural gas, coal and nuclear power. These include biomass, solar energy, and wind and water power. There are also public and private sector programs designed to encourage households and businesses to reduce their consumption of fossil fuels and electricity.

Since the quality of life in Ontario's cities is affected by the pollution from the use of fossil fuels and from the production of electricity from fossil fuels and nuclear power, the cities also have an incentive to promote conservation and to encourage people to switch to renewable sources of energy that are non-polluting. The cities also have an incentive to conserve energy to reduce their operating budgets. A new set of monetary incentives is required from the two senior levels of government that would help individuals and cities move away from non-renewable energy sources. The long-term benefits are lower costs for households and cities and significantly reduced levels of harmful pollutants.

Bibliography

Bamber, L. 2006. "Coalbed Methane - The New Alternative Fuel". *The Globe and Mail*, A3, September 15, 2006.

Barber, J. 2006. "One Project that's Now Waste of Energy". *The Globe and Mail,* August 26: M2.

Bricklin, R. 2006. "In Ontario and Alberta how much windpower is too much", *The Globe and Mail*, November 20: A6.

Buijk, J. 2006. "Biogas, Fuel Source for Renewable Energy". Lecture. Coalition for a Green Economy, April 10.
Canadian Wind Energy Institute of Canada. 2006. www.awts.pe.ca., last accessed October, 2007.
Canadian Wind Energy Institute of Canada. 2005. Press Release. September 23, 2005.
City of Toronto. 2000. *A Plan for an Environmentally Sustainable Toronto.* Toronto: Toronto Environmental Task Force.
Clean Air Foundation. 2006. www.cleanairfoundation.org/, last accessed August 29, 2006.
Coal Association of Canada. www.coal.ca/content.
Consumer Report. 2006. *The Ethanol Myth.* Yonkers N.Y.: Consumer Report Inc., Consumers Union of U.S. Inc.
Electricity Choices Org. 2006. www.energy.ca/gov, last accessed May 1, 2006.
Gillespie, K. 2006. "A Burning Issue Heats Up". *The Toronto Star*, November 12: A6.
Hamilton, T. 2006a, "Turning Forest Slash into Cash". *The Toronto Star*, Ocotber 30: B1.
_____. 2006b. "Re-wiring Ontario". *The Toronto Star*, B1, November 6, 2006.
Howlett, K. and B. Curry. 2006. "McGuinity Blasts Emissions Plan". *The Globe and Mail*, October 4: A4.
Howlett, K. 2006. "Hydro Costs Soar 50% since Shakeup". *The Globe and Mail*, A5, December 15, 2006.
Hume, C.A. 2006. "Swedes Moving Fast on Biogas". *The Toronto Star*, September 18: A8.
Hydro One. 2006. "About Hydro". *www.hydrone.com*.
Loven's, Amory. 2004. "How America Can Free Itself of Oil—Profitably". *Fortune*, October 4: 29-31.
Mang, A.R. 2006. "Coal Power". *The Globe and Mail*, September 15: A3.
Renewable Energy Access. 2006. www.renewableenergy.org/.
Ontario Clean Air Alliance. 2006a. "Nanticoke". *www.cleanair.web.net/*.
_____. 2006b. "A Low Cost, Low Risk Strategy for Ontario". www.cleanair.web.net/.
_____. 2006c. "New Energy Directions". www.cleanair. web.net/, last accessed September 5, 2006.
_____. 2006d. "A New Electricity Strategy for Ontario", www.cleanair.web.net/. Last accessed October, 2006.
Ontario Power Generation. 2005. *The Market Mitigation Agreement.* Toronto: Ontario Power Generation.
_____. 2006. *It's All about Performance*. Toronto: OPG, April, 2006.
Ottawa Solar Power. 2006. www.ottawapower/.
Province of Ontario. 1996. *The Macdonald Commission*. Toronto: Province of Ontario.
_____. 1997. *Directions for Change, Charting a Course for Competitive Electricity in Ontario.* Toronto: Province of Ontario.
_____. 1998. *The Energy Competition Act.* Toronto: Province of Ontario.
Reguly, E. 2006. "Wind Talk Turns out to be Hot Air". *The Globe and Mail*, B2, November 30, 2006.

Solar Energy Industries Association. 2006. www.sela.org/. Last accessed October 26,

Statistic Canada, Cansim, 362-0002 and Cansim, 330-0006.

_____. Average Retail Prices for Regular Gasoline. Ottawa: Statistics Canada.

Tabuns, P. 2006. "Ontario Lags on Climate Change". *The Toronto Star*, September 5: A17.

Toronto Hydro. 2006. "PowerWise", www.torontohydro.com/, Last accessed spring, 2006.

Wind Energy Institute of Canada. 2005. "Press Release". September 23.

United States. 2005. *The Alternative Motor Fuel Act.*

United States, Energy Information Agency. 2005. *Annual Energy Outlook 2006 with Projections to 2030.*