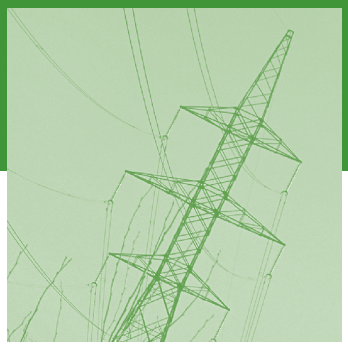
Sustainable Halton



Energy Demand and Supply

May 2007

Halton
a World Class Place To Be.

ICF INTERNATIONAL

Sustainable Halton

This is a draft final background report for the Sustainable Halton planning process. As the project continues and as we receive public feedback, there may be slight adjustments made to the content of this report.

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EXECUTIVE SUMMARY

1 CONTEXT

As Ontario's population continues to grow municipalities are considering how best to prepare for, and respond to, growth in their communities. As a result, planners and municipal leaders have begun a dialog and a process to design appropriate planning strategies and frameworks in order to accommodate potential growth.

Under the provincial *Places to Grow* framework, the Ministry of Public Infrastructure and Renewal suggests that Halton could be home to 780,000 Ontarians by 2031. In response to this, Halton has commissioned a series of studies to help identify the potential planning issues and impacts associated with population growth to 2031.

2 OBJECTIVE

ICF International was commissioned to develop a background paper analyzing the energy implications of population growth in Halton region between 2006 and 2031. As articulated in the Terms of Reference, the objective of ICF's study was "to provide an overview of demand, supply, and alternative technologies of energy for GGH area and their implications on land uses in Halton".

Based on an analysis of future energy demand in Halton region, the final report submitted by ICF focused on existing supply facilities and future supply requirements as well as energy demand reduction possibilities through land use planning and housing density policies.

3 ASSUMPTIONS

The following assumptions informed the Halton region energy analysis:

- The energy demand reduction possibilities associated with different housing densities in the Halton region where calculated based on housing mix data provided by Hemson Consulting Ltd..
- The scope of this analysis is limited to non-transportation energy use that is supplied through pipelines, power lines and other facilities that meet electricity and natural gas needs in Halton region and the Western GTA.

4 FINDINGS OF STUDY

The following summarizes some of the key points that should be considered in planning for future energy requirements as the Region contemplates projected growth over the next 25 years.

4.1 CURRENT ENERGY USE AND DEMAND:

- Halton represents about 3% of Ontario's population but 3.6% of provincial electricity use.
- The largest share of Halton's non-transportation energy use is for industry (32%) followed by the residential (21%) and commercial (16%) sectors.
- Residential and industrial energy intensities (energy use per household or per dollar of output), have been declining as efficiencies have improved.

- The Services sector has been and is expected to be the main driver of energy and electricity growth. Electricity intensity, measured as energy used per unit of floor area has actually increased since has 1990.

4.2 CURRENT SUPPLY:

- Electricity supply is now based around central generating facilities and transmission lines. The main supply into Halton Region is the Trafalgar Transformer Station in Milton which is approaching its capacity. It is supplied by 500kV lines connecting to Bruce nuclear station and Nanticoke coal station. The planned removal of the Nanticoke generating station from service will require both additional generation and transmission changes.
- The addition of a new gas-fired generating station in Halton Hills, the landfill gas generator in Oakville, upgrades to transmission facilities, and local Conservation and Demand Management efforts will help alleviate loading problems.
- The main gas pipeline serving the GTA and the northeastern U.S. bisects Halton Region. This line has recently been expanded. As a result, access to sufficient supplies of natural gas is not anticipated to be an issue.

4.3 FUTURE DEMAND:

- Through its land use planning and other processes, the Region can significantly influence future energy use.
- Higher densities, with more attached housing and apartments, result in significantly lower energy use. Apartments, for example, typically use about half as much energy as single detached homes.
- Moving to a higher density housing mix, where more than half of housing units are attached or apartments would lower heating energy use in the community by about 20% relative to current densities.
- The OPA has set an objective to achieve 6,300MW of demand reduction from CDM by 2025. This implies an aggressive program to eliminate 230 MW of demand reductions in Halton; an amount roughly double the load for Milton Hydro today.

4.4 FUTURE SUPPLY:

- The OPA is currently reviewing a proposed Integrated Power System Plan (IPSP) to address long term supply and demand issues; including changes to transmission facilities. The Region will want to monitor the development of this plan as the Ontario system is expected to become much more reliant on more distributed sources of power. Some of this supply will be located in Halton Region.
- To accommodate growth, existing transmission links may need to be upgraded and new transformer stations constructed.
- Co-generation is likely to play a much greater role both for industrial self-generation and in conjunction with large residential and commercial development. District heating and cooling will become an option as densities increase.
- Concern around the health and environment impacts of energy use are expected to grow as the population expands. Much of this will centre around transportation issues, however, all use of fossil fuels will come under increasing scrutiny.

- Improving energy efficiency and spending on CDM efforts will yield local economic benefits in terms of job creation and improved competitiveness.
- Each supply option brings a different set of issues to be managed. Regardless of the supply options chosen, intensification will bring challenges in terms of extending and expanding supply infrastructure into existing serviced areas. Advance discussions with supplier will help alleviate these challenges.

5 RECOMMENDATIONS

- The overall energy demand of a community can be reduced through planning strategies aimed at changing the population density and housing mix of target areas.
- In looking at supply options, the first and generally least expensive option is to reduce energy demands through more efficient design and operation. The second step is to then look at available supply resources within the region or acquiring electricity from outside the region.

Given the increased challenge of building, distributing and acquiring supply to meet growing demand across southwestern Ontario, and especially in the GTA and Greater Golden Horseshoe, reducing the overall demand first will remove some of this pressure. Strategies to reduce the region's end use include: increasing housing densities in targeted areas; improving building codes, standards and siting requirements; as well as removing barriers and encouraging conservation and demand management as well as the use of renewable energy.

6 INTRODUCTION TO ENERGY PLANNING AND POPULATION GROWTH

As Ontario's population continues to grow municipalities are considering how best to prepare for, and respond to, growth in their communities. As a result, planners and municipal leaders have begun a dialog and a process to design appropriate planning strategies and frameworks in order to accommodate potential growth. Halton region, given its many favourable characteristics such as its proximity to GTA and greenbelt is preparing for a significant portion of Ontario's population growth.

Under the provincial *Places to Grow* framework, Halton could be home to 780,000 Ontarians by 2031. This means that between 2021 and 2031 the Region has to plan for 151,000 more people than anticipated in its 2006 Best Planning Estimates. As a result, the Ministry of Public Infrastructure and Renewal has instructed the Region of Halton to consider the potential planning issues and impacts associated with population growth to 2031. This task will require planners to reflect on a comprehensive set of local issues including energy, health, services, land use, and infrastructure for example.

This paper is one in a series of background papers intended to inform this emerging dialog and help planners anticipate issues when designing planning processes to accommodate growth of this scale. In particular, this paper has been commissioned by the Region of Halton to provide a discussion of energy use in Halton as it relates to population growth between 2006 and 2031.

It should also be noted that while population growth will affect energy use and supply across all sectors, the scope of this paper is limited to non-transportation energy use that is supplied through pipelines, power lines and other facilities that meet electricity and natural gas needs in Halton Region and the Western GTA. While transportation energy use and it's associated environmental and health effects are not discussed in this paper, they will be strongly influenced by decisions on development intensities and urban design.

The Region of Halton has incorporated its commitment to encouraging effective management of energy in its existing Official Plan. Relevant excerpts from the Official Plan are included in Appendix 1.

7 CURRENT REGIONAL ENERGY SNAPSHOT

Halton at a Glance:

- *Halton Region is comprised of the City of Burlington and the Towns of Halton Hills, Milton and Oakville, bordered by the Golden Horseshoe Area and the Greater Toronto Area*
- *The region spans over 232,000 acres of land. This includes 25 km of shoreline on Lake Ontario.*
- *2001 Census identified Halton's total population as 375,229*
- *2006 population reached 439,256 making Halton on of Canada's fastest growing regions*
- *Total businesses located in Halton reached over 14,000 and continue to grow more than 5% per year.*
- *The predominant land use outside of urban areas is agricultural.*

(http://www.halton.ca/About/)

7.1 HOW IS ENERGY USED IN HALTON REGION?

Energy use pervades our lives every day. We use energy to heat and cool our homes, move our kids to soccer practice and to enable us to provide services or manufacture goods in our places of employment. About 21% of all the energy used in Ontario is used in our homes; another 16% is used in offices and services in the commercial and institutional sectors while 29% is used for transporting people and materials around. About one-third of all the energy used in Ontario is consumed by industrial operations that manufacture our goods (see Figure 1).

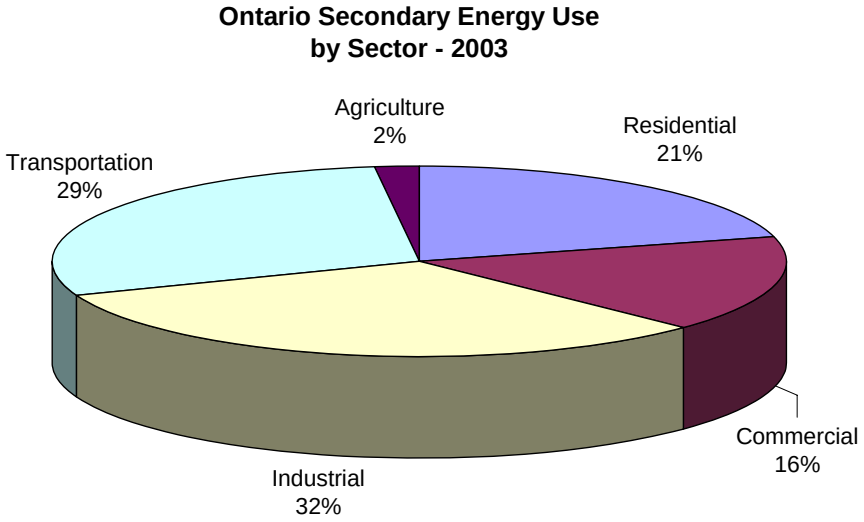

Figure 1

Halton represents approximately 3% of Ontario's total population[1] but accounts about 3.6% of the province's electricity use[2]. In 2003, Halton business and residents spent about $400 million on electricity. If Halton accounts for the same share of Ontario's natural gas consumption, then expenditures on electricity and natural gas would be approximately $650 million per year[3].

While detailed information on energy end use is limited at the regional level, it can be assumed that Halton's energy use is quite similar to the provincial breakdown illustrated above. Areas where Halton's energy use differs from these provincial averages will be presented in each sector discussed below.

7.1.1 Electricity and Natural Gas in the Home

Not surprisingly roughly 80% of the energy we use in our homes is for space and water heating[4]. Ontario homes use a number of different energy sources; electricity, natural gas, fuel oil and propane to meet their energy requirements. Each energy source has different characteristics which are reflected in the way they are produced and consumed. The characteristics of electricity, for example, make it uniquely suitable for some applications – such as appliances, electronics or driving motors. On the other hand, to the extent that electricity is "manufactured" from burning coal or natural gas, only about one-quarter of the original energy burned at the generator is delivered to the point where the electricity is used. Using this very high quality energy to supply low temperature space and water heating is quite wasteful compared to burning fuel oil or natural gas at the point of use; where new furnaces can convert over 90% of the fuel to delivered heat.

Most homes built in Halton today use natural gas for heating. In addition, many homes that were originally built with, or had converted to, electric heating have converted to natural gas over the years. This fuel switching trend has significantly decreased the electricity needs of the residential sector. Across Ontario, about 33% of households used electric water heating and about 15% of homes relied on electric space heating. In Halton, where natural gas is available in most areas, less than 10% of homes still require electricity for space and water heating. Therefore, a greater proportion of electricity consumption in Halton is used for appliances and other plug loads such as consumer electronics. Figure 2 illustrates how electricity is used in homes across the province.

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[1] Calculated from 2001 Census data.
[2] Information from rates filings from LDC's serving Halton to the Ontario Energy Board.
[3] This estimate is based on 2003 electricity sales from local LDC's assuming an average price per delivered kWh of 8.5¢/kWh. Since natural gas sales are not available specifically for the Region, it was assumed that Halton's share of provincial natural gas use was approximately equal to its share of electricity use, priced at an average delivered cost of 35¢/cu.m..
[4] OEE Database for Residential sector for Ontario:
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_2_e_1.cfm?attr=0

Residential Electricity Use by End Use - 2003

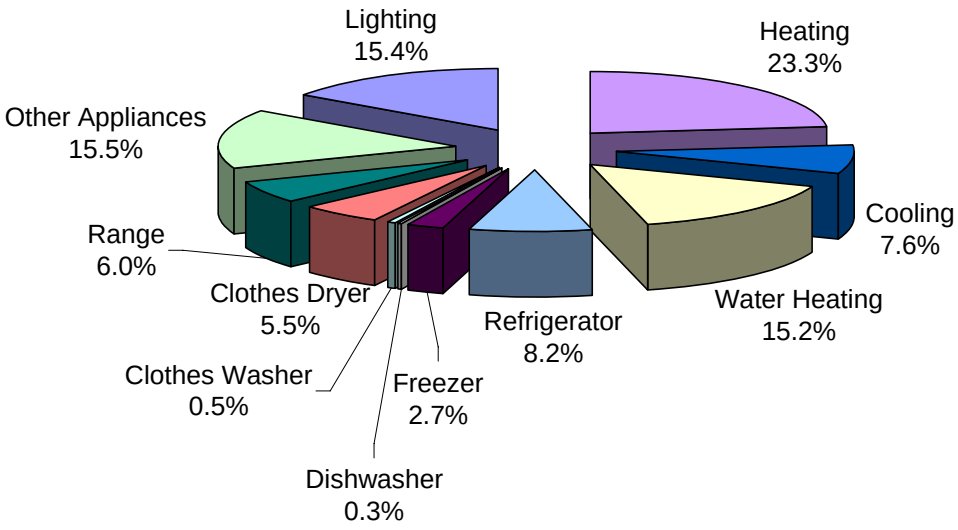

Figure 2

Since 1990, overall energy use in Ontario has increased as a result of population and economic growth, however, during this period Ontarian's became more efficient in their energy use. For example, the amount of energy used by the residential sector as a whole increased by 16% between 1990 and 2003, but the amount of energy used per household *decreased* by 8%.[5] Energy use per square meter of floor area decreased even faster than energy use per household. Between 1990 and 2003 our homes used 11% less energy per m2 of floor space.

Broken out by energy source, this change in residential energy use between 1990 and 2003 is as follows:

a) Provincial electricity use decreased by 2% while electricity use per household decreased 22%[6].

b) Provincial natural gas use grew by 38%, and natural gas use per household[7] decreased by 5%[8].

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[5] OEE Database for Residential sector for Ontario:
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_2_e_1.cfm?attr=0
[6] OEE Database for Residential sector for Ontario:
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_2_e_1.cfm?attr=0
[7] This calculation of average use is based only on households that are using natural gas
[8] OEE Database for Residential sector for Ontario:

c) Provincial heating oil use decreased by 38%, and heating oil use per household[9] decreased 17%[10].

Market Share of Space Heating by Energy Source					
	Energy Source (percent share)				
	Natural Gas	Fuel Oil	Electricity	Wood	Other
Ontario	**75%**	8%	11%	5%	1%

The overall increase in natural gas use is due in part to the continuing substitution of natural gas for other forms of space and water heating; as well as the majority of new construction installing natural gas heating. Natural gas supplies the majority of space heating across Ontario; and certainly within Halton Region and the GTA.

The way that we use electricity at home changed between 1990 and 2003, as illustrated in Figure 3. Across Ontario electricity use for major appliances declined as they became substantially more efficient and electric water heating declined as more homes converted to natural gas. Over the same period, however, the rapid increase of consumer electronics in homes and increasing use of air-conditioning offset these reductions, with the result that average use per home declined only slightly during the period. It remains to be seen how this trend will develop in the future. Air conditioning is approaching the saturation point (particularly in southern Ontario). Some of the categories included in "other" appliances, such as home computers, may also be approaching saturation levels and new equipment in this category has become significantly more efficient. If these applications begin to level out, overall electricity use may begin to decline as older stocks of appliances are replaced.

Between 1990 and 2003:

- *Energy use by central air systems increased by 121 percent while use by room air conditioners increased by under 20 percent.*
- *Other appliances, such as home electronics, increased by 57 percent*
- *Lighting use increased by almost 20 percent.*

(OPA, 2005)

http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_2_e_1.cfm?attr=0

[9] This calculation of average use is based only on households that are using heating oils

[10] OEE Database for Residential sector for Ontario:
http://oee.nrcan.gc.ca/corporate/statistics/neud/dpa/tablestrends2/res_on_2_e_1.cfm?attr=0

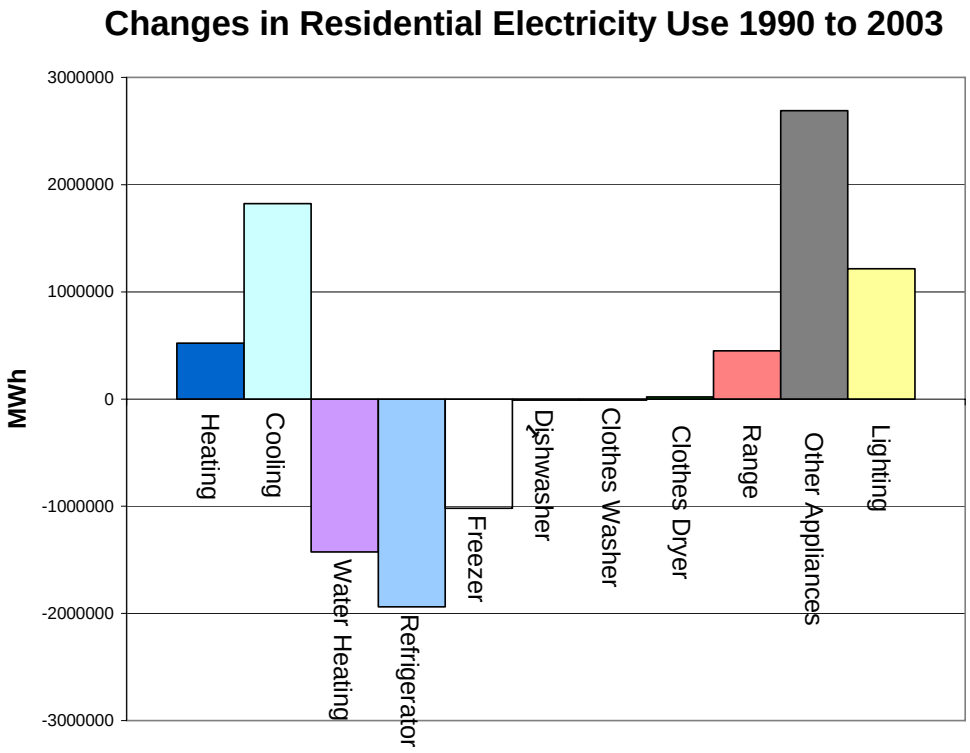

Figure 3

The importance of this change for energy planning is that the areas of residential energy use which are growing most rapidly, in particular air conditioning are driving the growth in the summer peak for the Ontario electrical system.

The types of homes we live in have different energy requirements (Figure 4); particularly for space heating. Space heating requirements for apartments and row housing are significantly lower than for detached homes, not only due to their generally smaller size, but also because heat loss is reduced through shared walls. Space heating energy intensity for apartments is less than one-third that of a single detached home. Water heating and other energy use also tends to be lower in 'attached" forms of housing, although the reduction is not as marked. The type of housing built in a community therefore plays a significant role in determining that

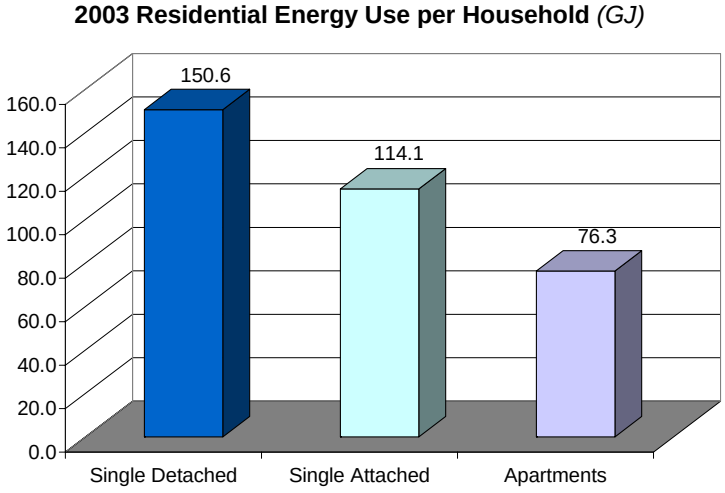

Figure 4

region's overall residential energy demand.

In Halton, the housing mix resembles many typical southwestern Ontario communities with over 60% of the residential buildings being single detached (Table 1). Only 13% are row housing and a further 4% are classed as semi-detached.[12] Provincial trends between 1990 and 2003 indicate that the most rapid growth in residential housing types occurred in Single Attached homes (47%), followed by Single Detached (28%) and Apartments (13%)[13]. The faster growth in single family housing versus apartments helps account for the 32% increase in average floor space per home. However, while the increase in floor space outpaced the increase in population energy intensity per household declined; implying an overall gain in efficiency. If the trend towards bigger single detached homes continues to dominate in Ontario it will have significant impacts on the provinces energy requirements. This housing growth and the mix of building types will be discuss in more detail in Part 2 of this paper.

Provincial versus Halton Housing Mix (by %)[11]

	Ontario (2003)	Halton (2001)
Single Detached	**57%**	**63%**
Single Attached	**14%**	**17%**
Apartment	**18%**	**20%**

Table 1

7.1.2 Electricity and Natural Gas at Work

As mentioned above, access to energy enables us to provide services and manufacture goods in our workplaces. However, your type of employment will dramatically change the picture of energy use at your workplace. For our discussion here, we will divide workplaces into 2 categories: the service sector and the industrial sector.

Service Sector:

The ways we use energy in commercial/institutional, or service sector, is in many ways similar to how we use energy at home – for space heating and cooling, water heating, lighting and equipment. In Ontario, a large percentage of activity in the service sector is undertaken in

Service Sector Energy Use by End Use - 2003

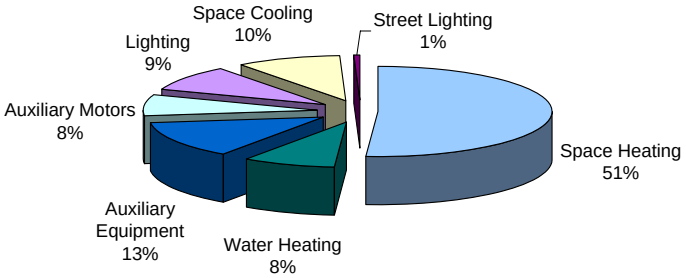

Figure 5

[11] OPA, Factor Analysis of Ontario Electricity Use - 1990 to 2003, Prepared for the Chief Conservation Officer, Ontario Power Authority, November 2005, prepared by ICF International. & Hemson Consulting, The Growth Outlook for the Greater Golden Horseshoe, January 2005.

[12] Regional Municipality of Halton Planning and Transportation Division, Quick Tabs – 2001 Census Population Summary, May 2004.

[13] OPA, Factor Analysis of Ontario Electricity Use - 1990 to 2003, Prepared for the Chief Conservation Officer, Ontario Power Authority, November 2005, prepared by ICF International.

offices. With respect to energy use, offices account for the largest share of service sector energy end use, at 36%, followed by educational services at 15%, health care/social assistance and retail trade both at 12%, and accommodation/food services at 7%. As in many jurisdictions, Ontario continues to develop as a knowledge based economy. As such, offices were the fastest growing segment of the market between 1990 and 2003.

Given the nature of the businesses in this sector[14] and the services they provide it is easy to see why space and water heating occupy the largest percentage of energy end use, 59% of the total in 2003 (Figure 5).

As in the residential sector, natural gas and electricity meet the bulk of our energy needs at work, at 50 percent and 42 percent respectively. Natural gas is primarily used to meet space heating/cooling and water heating needs. Approximately 40% of electricity use is used for lighting, with about 35% is used to power motors and auxiliary equipment such as electronics; with only 5% is used for heating applications (see Figure 6) Changes in lighting technology, motor and equipment efficiency will play a significant role in determining the future electricity demand of our workplaces.

Service Sector Electricity Use by End Use - 2003

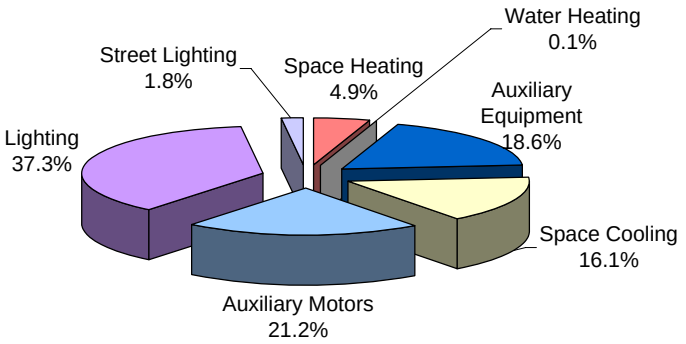

Figure 6

Between 1990 and 2003, overall energy use in our commercial/institutional workplaces grew 44%, making it the fastest growing sector in Ontario. All of the energy sources (including electricity, natural gas, and fuel oils) in this sector experienced growth; with electricity growing by 31% and natural gas by 52%. As in the Residential sector, space cooling grew rapidly; increasing its electricity use by 52 percent.[15]

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[14] Also includes Wholesale Trade, Warehousing, Arts/Entertainment/Recreational services and Information/Cultural services.

[15] OPA, Factor Analysis of Ontario Electricity Use - 1990 to 2003, Prepared for the Chief Conservation Officer, Ontario Power Authority, November 2005, prepared by ICF International.

Not only did this sector grow in sheer size and output, with the offices category increasing a remarkable 40%, overall energy intensity at our workplaces increased approximately 17% and electricity intensity increased 4%. This means that the sector not only grew as a share of the total economy, but that the amount of energy per square meter of floor space also increased; making this the only sector to show an increase in energy intensity.

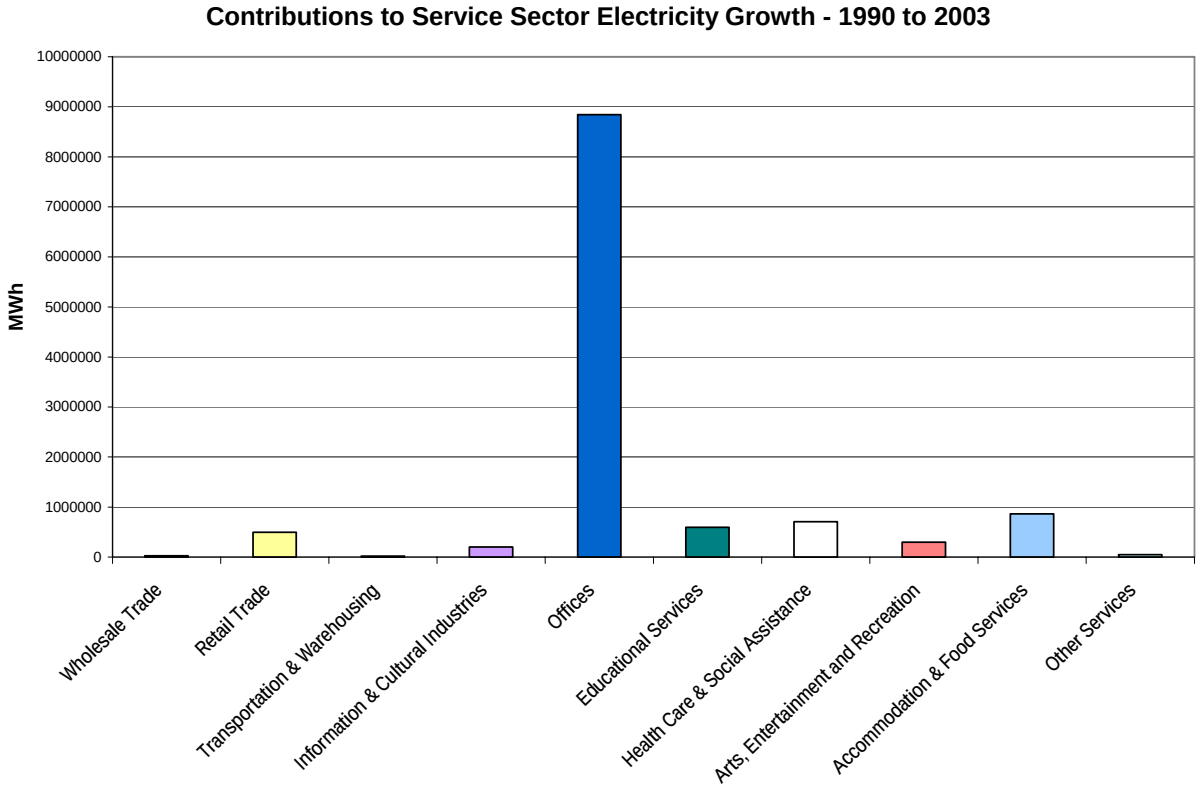


Figure 7

Industrial

Industrial energy use differs significantly from residential and commercial energy use; both in terms of the way in which energy is used and the types of energy used (see chart below). There is also much greater variability in the way in which energy is used in different industries within the sector; energy use in an auto assembly plant is quite different from energy use a steel mill or a facility making glass products. Across the sector, electricity supplies 17% of industrial needs, natural gas 36%, and fuel oils 7% (Figure 8).

Industrial Sector Energy Use by Energy Source - 2003

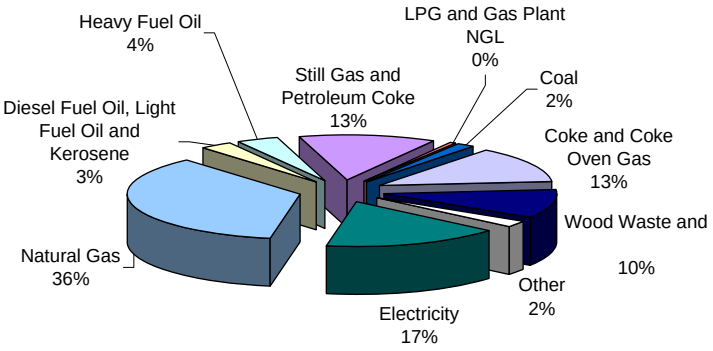
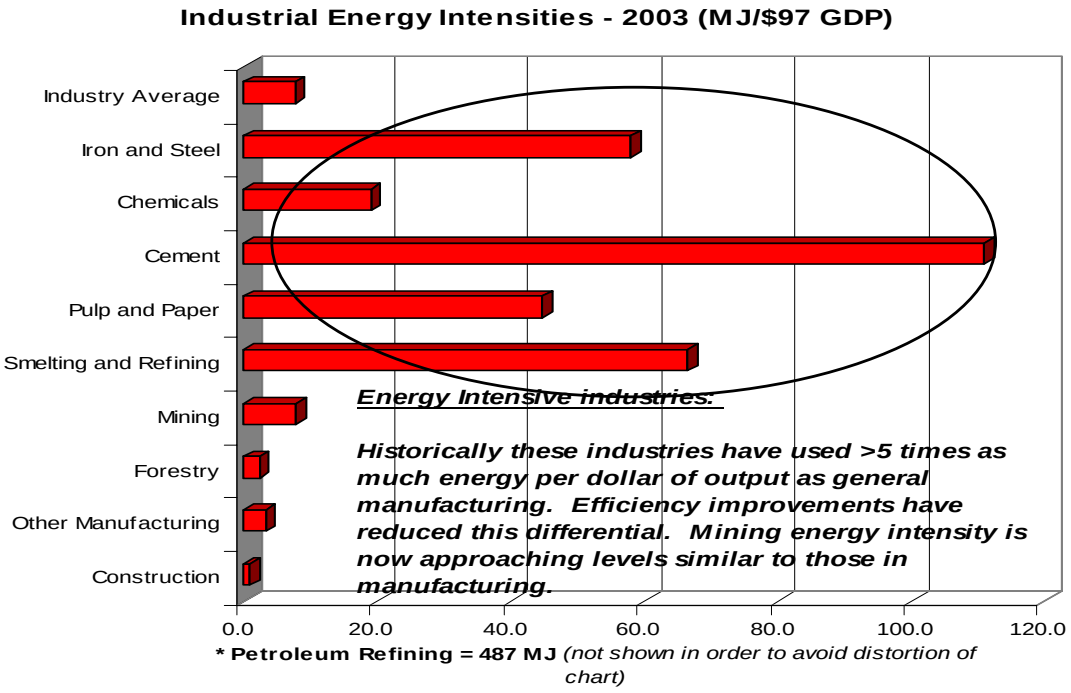


Figure 8

Between 1990 and 2003 the energy intensity of some industries, such as petroleum refining, smelting and cement increased. Overall, however, industrial energy intensity decreased by almost 30%. In fact, industrial electricity use as a whole decreased over the period. In part this was due to a structural shift to less electricity intensive industries and in part due to increases in efficiency.



While the way in which energy is used varies significantly between industries, the overall level of energy intensity (the amount of energy used to produce a dollar of output) tends to fall in a common range for all but a handful of "energy intensive" industries. For planning purposes, this means that apart from these identified industries (pulp and paper, mining, smelting and refining, steel, cement, refining and chemical operations), industrial energy consumption can be expected to fall within a common range per dollar of output. In a recent assessment of industrial energy use prepared for the OPA, the only energy-intensive industries identified within Halton were several aggregate mines[16]. The balance of large industries identified in the area, in the vehicle assembly, automotive parts, food and beverage industries, etc., all fell within the category of less energy intensive industries.

Large "energy intensive" industries tend to operate independently of other local energy decisions. Large plants – such as the Ford Assembly plant –while they are not energy intensive are so large that they effectively become stand alone energy consuming centers. The Ford plant, to offer one example, is served by its own transformer station independent from the supply for Oakville Hydro. Given the scale of these operations' energy use, any introduction or removal of such facilities from an area (i.e. the PetroCanada refinery in Oakville) can and will make notable changes in a region's energy use. These business decisions are difficult to predict or model in local energy plans or future needs assessments.

7.2 WHERE DOES HALTON'S ELECTRICITY AND NATURAL GAS COME FROM?

Provincial Energy Supply

- *Ontario has 30,000MW of electricity generating capacity.*
- *It is estimated that 80% of Ontario's electricity generating capacity will need to be refurbished or replaced over the next 20 years.*

(http://www.energy.gov.on.ca/index.cfm?fuseaction=english.news&back=yes&news_id=134&backgrounder_id=105)

7.2.1 Electricity Supply and Transmission

Halton Region and the Greater Toronto Area rely on electricity imported from the province's fleet of generating stations supplemented by a few small generators located within the Region. Prior to its closure, the Lakeview Generating Station in Mississauga provided 1,200 MW of power within the region as well as providing voltage support. There are also "several smaller private generators in the area including TransAlta McDonnell Douglas GS (110 MW) and Peel Waste Recovery GS (10 MW)" [17] which contribute to local supply.

[16] OPA, Market Profile and Conservation Opportunity Assessment for Large Industrial Operations in Ontario, June, 2006.

[17] Hydro One Networks, Transmission Solutions: A 10 Year Transmission Plan for the Province of Ontario 2005 – 2014,

Today, power is distributed across Ontario from large, central generating stations to where it is needed through a network of high voltage transmission lines. Large generating stations, such as the Bruce Nuclear station or the Nanticoke coal-fired generating station, and loads such as the Trafalgar Transformer Station (TS) in Milton are linked by 500,000 volt (500kV) lines. These lines in turn feed 230,000 volt (230kV) and 115,000 volt (115kV) circuits as the power is distributed to load centers across the province. Local Distribution Companies (LDC's) such as Oakville Hydro, Halton Hills Hydro, Milton Hydro and Burlington Hydro are served from these high voltage lines by transformer stations which deliver power at 27,600 volts (27.6 kV) for distribution through their service territories. Finally, local transformers convert the electricity to utilization voltages for local homes and industries. Figure 9 shows the configuration of the transmission system that now serves Halton Region and the Greater Toronto Area (GTA) West.

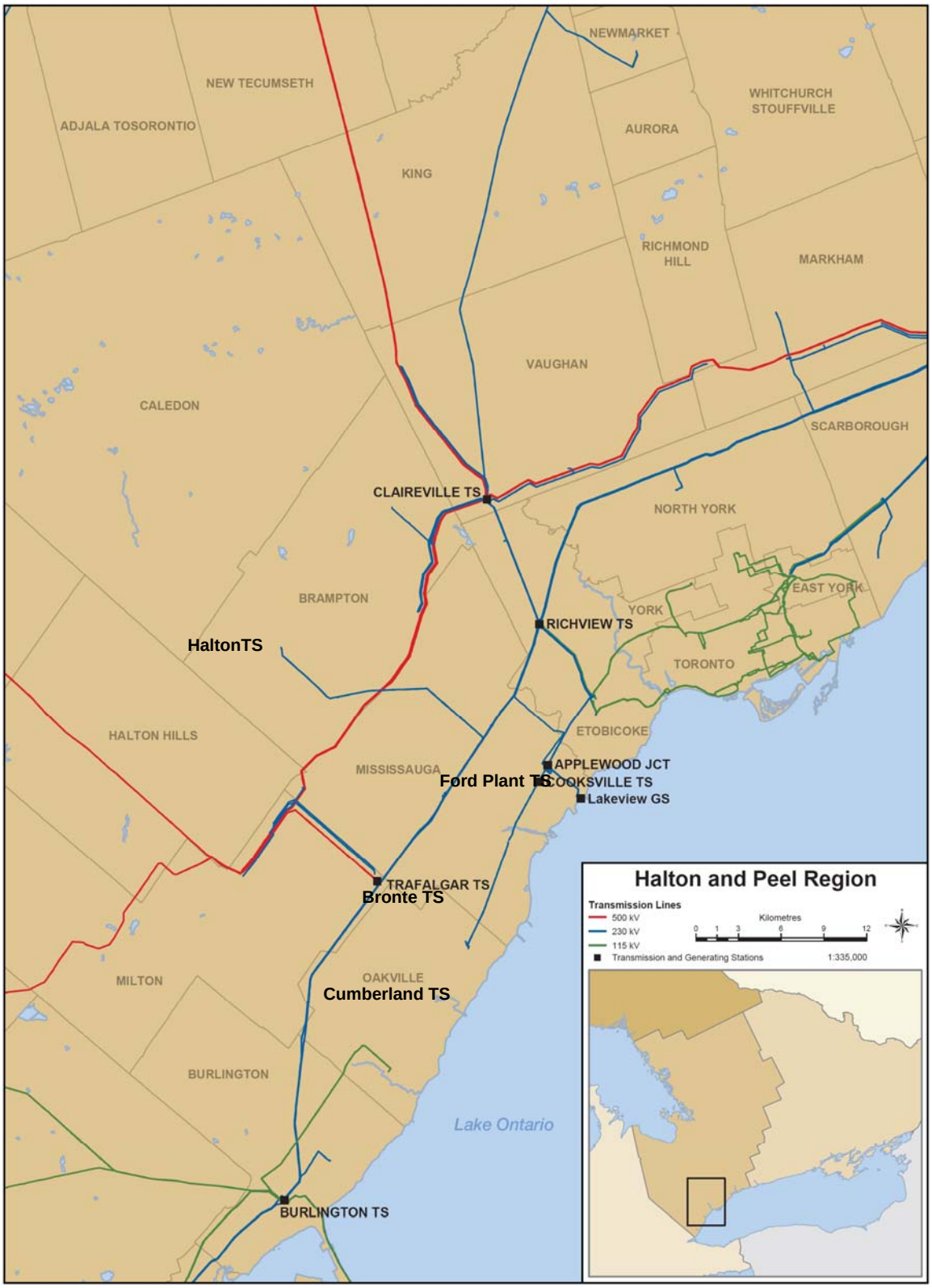

NEWMARKET
NEW TECUMSETH
ADJALA TOSORONTIO
KING
AURORA
WHITCHURCH STOUFFVILLE
RICHMOND HILL
MARKHAM
VAUGHAN
CALEDON
SCARBOROUGH
CLAIREVILLE TS
NORTH YORK
BRAMPTON
EAST YORK
YORK
RICHVIEW TS
HaltonTS
TORONTO
HALTON HILLS
ETOBICOKE
MISSISSAUGA
APPLEWOOD JCT
Ford Plant TS
COOKSVILLE TS
Lakeview GS
TRAFALGAR TS
Bronte TS
MILTON
OAKVILLE
Cumberland TS
BURLINGTON
Lake Ontario
BURLINGTON TS
Halton and Peel Region
Transmission Lines
500 kV
230 kV
115 kV
Transmission and Generating Stations
Kilometres
0 1 3 6 9 12
1:335,000

Figure 9

7.2.2 Natural Gas Supply:

Natural gas is supplied throughout Halton Region by Union Gas Inc., which is responsible for building and maintaining gas distribution throughout the region. Halton Region sits astride the main pipeline route that delivers natural gas from Union's main Dawn storage facility near Chatham. This transmission line which bi-sects the region from west to east, supplies not only Halton Region but also the rest of the GTA and the northeastern U.S.

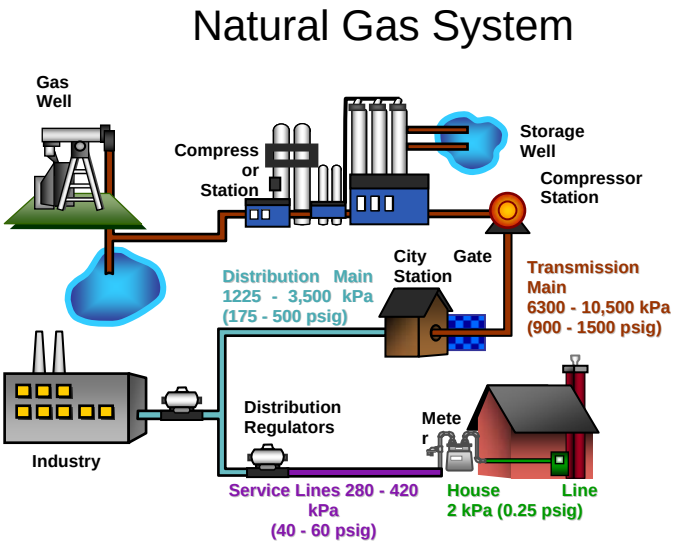


Figure 10

The delivery of natural gas is, in some ways, comparable to the distribution systems described above for electricity. Where electricity is transformed from higher voltages at the generator to lower voltages as it is distributed to its point of use, natural gas is transported at lower pressures as it moves from high pressure inter-provincial pipelines to local distribution lines and into homes and businesses.

The main "transmission" pipeline corridor which crosses Halton actually contains several large pipelines of differing sizes. Union Gas recently expanded the capacity of this line by installing an additional 48 inch pipe. As a result, Union has indicated that it is well positioned to accommodate future growth within the region.

Union Gas has also analyzed the

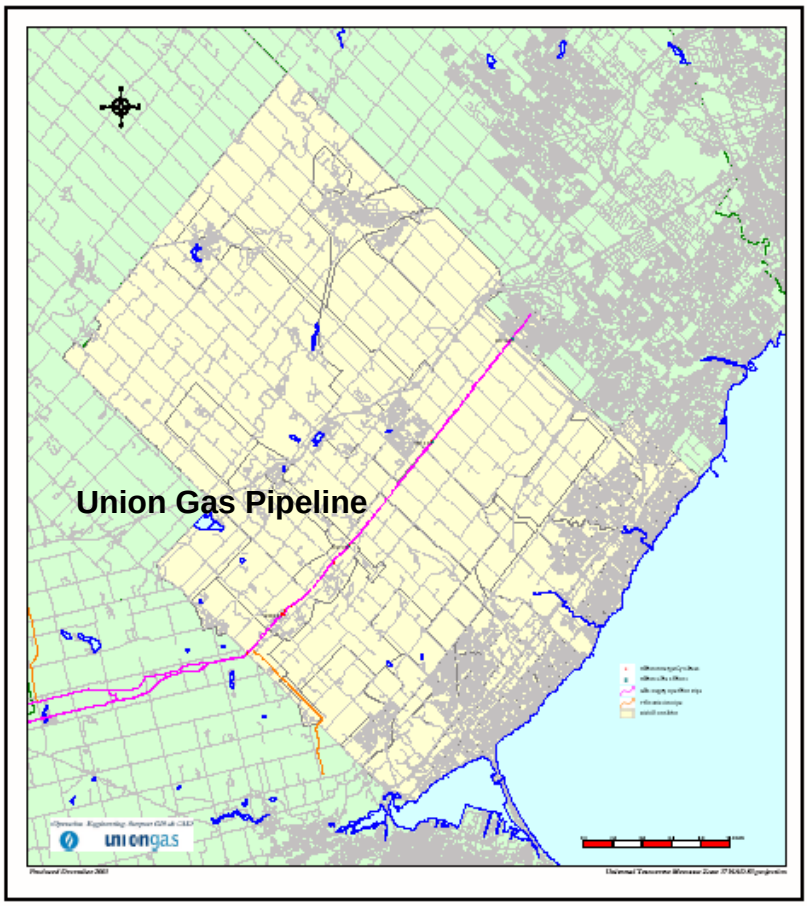


Figure 11

implications of increased use of natural gas for generating electricity in Ontario. Based on their analysis "A complete coal phase-out using only natural gas as a fuel would represent approximately 1% of North American demand". This increase could be accommodated with existing pipeline capacity.

7.3 HOW WILL PROVINCIAL AND FEDERAL INITIATIVES AFFECT SUPPLY AND DEMAND?

The way in which energy is used and supplied in Halton is obviously influenced by changes at federal and provincial level and in turn by global developments. World oil prices influence domestic oil and gas prices, which in turn affect the electricity commodity price. Federal policies relating to air pollution and greenhouse gases can impact power costs and the choice of new generation, while support of energy efficiency through appliance and vehicle standards can decrease the amount of energy that will be required. Similarly, the Ontario government can influence levels of energy use through its regulatory power (i.e. the Building Code) or direct the type of generation that is pursued through direct involvement in the market (i.e. RFP's for new supply and demand management).

The current federal government has announced that it intends to reduce climate changing greenhouse gas (GHG) emissions by 45-60% from 2003 levels by 2050[18]. Pursuit of this objective implies a substantial and sustained emphasis on improving efficiency across the economy as well as a marked expansion of our reliance on renewable energy and co-generation[19].

A number of Provincial initiatives in will impact future energy needs. Recent changes to the Ontario Building Code will increase energy efficiency of new housing by 21.5% in 2007 rising to 35% in 2012, relative to the existing code. New non-residential buildings will become 16-18% more efficient in 2007 and 25% more efficient by 2012. Other changes, including tightening regulations for energy using equipment, the installation of "Smart Meters" for electricity use, and increased expenditures on conservation and demand management programs by both electric and gas utilities as well as directly by the OPA will also act to reduce energy intensity. The government has set out a policy of phasing out all coal-fired generation in the province and increasing the use of distributed generation and renewable energy sources.

Electricity Planning:

A number of agencies play a role in planning for, developing and maintaining the transmission and supply systems required to meet the growing needs of the GTA and the Western portion of the GTA including Halton.

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[18] National Round Table on the Environment and the Economy, Advice on a Long-term Strategy on Energy and Climate Change – June 2006. The report is also available at the Round Table's web site: http://www.nrtee-trnee.ca/eng/programs/Current_Programs/Energy-Climate-Change/EEC-Wedge-Advisory-Note/ECC-Wedge-advisory-note_e.pdf

[19] National Round Table on the Economy, Advice on a Long-term Strategy on Energy and Climate Change. The background report on which this advice was based was prepared by ICF International. http://www.nrtee-trnee.ca/eng/programs/Current_Programs/Energy-Climate-Change/ECC_e.htm

- The ***Ontario Power Authority (OPA)*** is responsible for planning for new electricity supply in Ontario as well as fostering a "conservation culture". The OPA has initiated process to acquire new generating capacity in Halton Region, which will be discussed below.
- ***The Independent Electrical System Operator (IESO)*** is responsible for the operation of the wholesale power market in Ontario. The IESO has conducted reviews of system requirements for the area; identifying issues affecting system reliability and the need for new facilities.
- ***Hydro One,*** which is responsible for Ontario's transmission system and owns most transformer stations in the province, maintains and builds transformer capacity and transmission lines as needed to meet developing needs.
- ***Local Distribution Companies (LDC's)*** such as Burlington, Milton, Halton Hills and Oakville Hydro. In addition to building the distribution capacity to deliver power within their boundaries, the LDC's forecast their needs and work with Hydro One to ensure adequate transmission and transformation capacity is in place to serve their communities.

The GTA is the most rapidly growing region in Ontario. In 2004, two regions within the GTA were identified as priorities for new generation and transmission capacity as a result of this growth and the planned retirement of the Lakeview Generating station[20]. York Region had previously been identified for immediate action. Over the past few years a number of initiatives have been taken to reinforce supply in these areas.

- **Downtown Toronto** - In response to an urgent need identified by the IESO, the OPA approved construction of a 550 MW plant in the Portlands area of the Toronto waterfront. The first 250 MW of capacity is scheduled to be available by June, 2008, with the balance to come into service by 2009. In addition, Toronto Hydro and others have programs to reduce energy demand by 300 MW. About half of this reduction will come from large office buildings through measures such as building cooling systems upgrades. This 300 MW target is above and beyond Toronto Hydro's target of demand reductions of 250 MW[21].
- **GTA West area** – For power planning purposes the GTA West is defined "the area roughly bordered geographically by Highway 27 to the east, King Street to the north, Regional Road 25 to the west and Highway 403/407 to the south"22 As such it includes only a portion of Halton Region.

The area is now fed by two main connections to the 500 kV transmission system; the Trafalgar TS and the Claireville TS in Vaughan near the border with Brampton. The 230kV Richview Transformer Station also acts as a supply hub for the area. Electricity

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[20] Independent Market Operator (IMO), Locational Requirements for New Generation or Demand Initiatives (Ref.: Priority Zones in Ontario), August 3, 2004. The IMO has since been renamed the Independent Electricity System Operator (IESO).

[21] *OPA Conservation Bureau website.*

[22] Hydro One Networks Inc., GTA West Supply Study - Adequacy of Transmission Facilities and Transmission Supply Plan 2005 – 2015, February 16, 2006 Report prepared in conjunction with Enersource, Hydro One Brampton, Halton Hills Hydro and Milton Hydro.

demand is projected to grow at a rate double that for the province as a whole over the next 10 years 23 and the IESO has identified the GTA West as a priority area for new supply.

> In 2005, the Ontario Minister of Energy directed the OPA to procure up to 1,000 MW of new power supply in the GTA West area. The OPA has contracted to buy supply from the new 880 MW Goreway plant in Brampton. Working with the IESO, the OPA determined that new generation was also required to relieve congestion at the Trafalgar TS24, which is approaching its capacity. An RFP was issued to acquire that generation in a defined area around the station. On November 16th, the OPA announced that it had selected a proposal from TransCanada Corporation to build a 683MW gas-fired generating plant between the 401 and Steeles Avenue West of 6th line in Halton Hills. Appendix 2 includes a summary of the four proposals that were reviewed by the OPA under this RFP.

In addition to addressing these priority issues, the OPA is currently developing an Integrated Power System Plan (IPSP) that will set out how provincial power needs will be met over the coming 20 years (see box below).

In the Burlington area a new 230kV double circuit transmission line is being constructed from the Niagara peninsula that will add about 800 MW of capacity to support new growth.[25]

A smaller generator is also being built in Oakville using gas collected from the Halton Waste Management site. This 2 MW plant is connected through the local distribution system and is expected to operate for 20 years, capturing and using what would otherwise be a potent greenhouse gas. In addition, the Region of Halton is considering the addition of an energy-from-waste plant at its Waste Management site near Regional Road 25, which it reports could supply from 18,000 to 60,000 homes[26].

Locally, the LDC's are responsible for forecasting power requirements and initiating plans with Hydro One for new transformation capacity. Current expectations, based on 5 and 10 year plans, are that new transformer stations will be required in south Halton, near the existing Palermo TS and near James Snow Parkway in Milton (north of the 401).

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[23] LDC's in the area project an average summer growth rate of 2.6% per year (GTA West Supply Study). This compares to an expected growth of 1.3% per year for the province as a whole according to the IESO (IESO, An Assessment of the Adequacy of Generation and Transmission Facilities to Meet Future Electricity Needs in Ontario From January 2006 to December 2015, page 2.)

[24] *See OPA RFP website: http://www.powerauthority.on.ca/Page.asp?PageID=924&ContentID=825*

[25] IESO, An Assessment of the Reliability of the Ontario Electricity System From October 2006 to March 2008, October 2, 2006

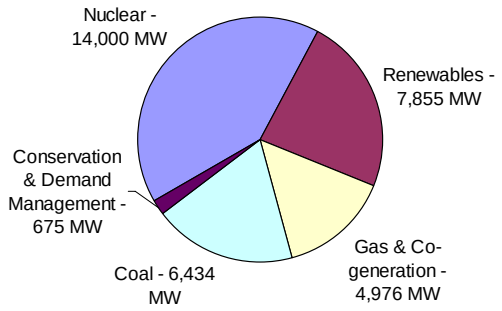
[26] Halton Region Energy-from-Waste website: http://www.halton.ca/ppw/waste/efw/big_picture_story.htm#current_situation_and_future_opportunities

Planning for Ontario's Future Electricity Supply:

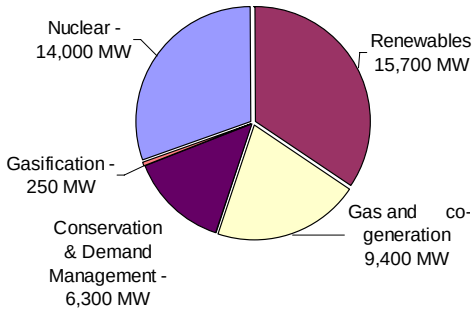
In 2002, the Ontario electricity industry was opened to competition to allow consumers to choose their electricity supply. In advance of that change, Ontario Hydro was broken up into several different companies and an independent agency was created to operate the wholesale market. Under this new structure, however, the long term planning functions which had been carried out by Ontario Hydro in past were not assigned to any of the market players. In 2004, the Ontario Power Authority was created with a mission to conduct independent planning for an adequate, reliable and secure supply of power for Ontario. The OPA was also given a number of directives from the Minister of Energy. These included issues with respect to the adequacy of supply in areas of the GTA, increasing the contribution of renewable energy sources and initiatives to encourage energy conservation.

It has been more than 15 years since an integrated supply plan was last prepared for Ontario. Following its creation, the OPA carried out a review of supply and demand options and in December, 2005 provided advice to the Minister of Energy on a future supply mix for Ontario. In June, 2006, after a public review process, the Minister issued a directive to the OPA specifying the supply mix that should be used in developing a supply plan for Ontario. The charts below shows the proposed supply mix relative to the current mix of generation sources.

Ontario's Current Energy Supply Mix - 2005



Government Plan for 2025 Supply Mix



The proposed mix of generation assumes that nuclear power will continue to supply about 50% of Ontario's power needs, while energy from gas and co-generation will roughly double. In 2005, the bulk of Ontario's renewable energy came from hydro-electric sources. By 2025, the Minister proposes that renewable sources will double; however, most of this increase will come from new wind generators, small hydro and biomass plants. In addition, the plan proposes an aggressive program of conservation and demand management, designed to reduce overall demand by 6,300 MW – equivalent to more than twice the capacity of the six nuclear units operating at the Pickering nuclear station.

8 GROWTH AND HALTON'S ENERGY FUTURE

Situated in Southwestern Ontario, Halton combines the convenience of proximity to the economic opportunities of the GTA while also enjoying the natural attributes of Lake Ontario and the Niagara escarpment. These unique local features play a role in determining the character of growth that Halton region is able to accommodate.

8.1 HOW MUCH GROWTH IS ANTICIPATED OVER THE NEXT 25 YEARS?

Region	Total Population 2001	% of Provincial Population
Ontario	11,410,046.00	100.00%
Halton Region	375,229.00	3.29%
Oakville	144,738.00	1.27%
Burlington	150,836.00	1.32%
Milton	31,471.00	0.28%
Halton Hills	48,184.00	0.42%

In 2001 the Census survey found that Halton's total population (Oakville, Burlington, Milton and Halton Hills) was approximately 375,000 people, representing 3.3% of the provincial population. Halton's recent Best Planning Estimates (2006) estimate that the Region could reach a population of 628,900 by 2021.

The Ministry of Public Infrastructure Renewal, undertook an assessment of growth in the Golden Horseshoe Region titled *Places to Grow*. This study suggested that Halton region should prepare to accommodate a population of 780,000 people by 2031. This means that Halton has to plan for an additional 151,000 people between 2021 and 2031.

8.2 WHAT MIGHT THIS GROWTH LOOK LIKE?

The Places to Grow indicates that much of this additional population, and the employment associated with it, will be accommodated within the existing developed areas in Halton Region:

- The plan specifies three "urban growth areas" in Halton: Burlington downtown, Oakville mid-town, and Milton downtown. These areas must achieve minimum densities of 200 residents/jobs per hectare.
- 40% of residential development must be in current built up areas by 2015 and that target must be maintained thereafter.
- Where development occurs in new, undeveloped or "Greenfield" areas the new developments "must be planned to achieve a target density of no less than 50 residents and jobs combined per hectare" as measured over the entire area, excluding protected areas[27].

The form of urban development can have significant implications for overall energy use in a community. In general, traditional suburban models have a relatively lower

[27] *Halton's Joint Submission on "Places to Grow--Proposed Growth Plan for the* Greater Golden Horseshoe (November 2005)" and A Multi-Year Work Plan Responding to Provincial Planning Initiatives. Report No.: PPW15-06, January 24, 2006.

population density causing residents to use more energy in daily activities such as getting to and from work as well as more energy heating and operating their homes.

The housing densities developed by Hemson Consulting Ltd. as part of this multi-study project, translate into the type of housing mixes shown in the table below. The highest of these density levels; 200 residents or jobs per hectare, would be roughly equivalent to the current densities in the downtown area of Burlington.

Hemson Housing Mix Options[28]			
		Single Detached and Semi Detached	Row and Apartments
2001	***Current Mix***	***63%***	***17%***
2031	Current Trends	64%	36%
	30% within built boundary	53%	47%
	40% within built boundary	39%	49%

Housing densities have a direct effect on overall residential energy use. While fully modelling future energy use is not within the scope of this report, it is possible to estimate the impact of housing densities using an illustrative housing mix.

If new housing required over the next 25 years were built in accordance with current trends, the 2031 housing stock would require about 21.1 PJ for space heating annually. If the region moved towards a housing mix of 40% within the built boundary, as presented in the table above, heating energy use would drop to 20 PJ. To put this in context, the energy savings from higher density would be enough to fill all of the energy requirements for a small city of 13,000, including transportation[29].

Actual energy use per household is also expected to change over the period, both as new building code and equipment requirements come into effect, as a result of trends in appliance and equipment use, and in response to utility and government initiatives.

In order to meet the requirements of the "Places to Grow" document, densities will almost certainly be higher in future than in most areas of the Region today. By choosing the mix of housing densities the Region can significantly influence the resources, space and liveability of the community in years to come.

Delivering energy to service this growth will present a number of challenges. In addition to the 'big picture' issues of developing sufficient supply and delivering it to the region as a whole, there will be additional challenges in expanding existing service infrastructure within built-up areas. Unlike Greenfield development, this will require the installation or expansion of distribution wires and pipes in heavily populated areas of region, without disrupting service to existing users. Local utilities will have an obvious interest in being involved in advance planning of growth in these areas.

In sum, the overall energy demand of a community can be reduced through planning strategies aimed at changing the population density and housing mix of target areas. Given the increased challenge of building, distributing and acquiring supply to meet growing demand across southwestern Ontario, and especially in the GTA and Greater Golden Horseshoe, reducing the overall demand first will remove some of this pressure. Strategies to reduce the region's end use include: increasing housing densities in

[28] Hemson Consulting.

[29] *NRCan indicates that one petajoule is equivalent to the "energy consumed by a small town of about 3700 people in a year for all uses, from housing and transportation to local services and industry". http://oee.nrcan.gc.ca/Publications/statistics/trends06/chapter2.cfm?attr=0*

targeted areas; improving building codes, standards and siting requirements; as well as removing barriers and encouraging conservation and demand management as well as the use of renewable energy.

8.3 WHAT SUPPLY OPTIONS DOES HALTON HAVE?

In looking at supply options, the first and generally least expensive option is to reduce energy demands through more efficient design and operation. The second step is to then look at available supply resources within the region or acquiring electricity from outside the region.

8.3.1 Demand Side

Future energy requirements can be reduced both by improving the efficiency of existing energy using equipment and through the design of new buildings and processes. It is generally far easier and less expensive to build efficiency into new buildings than to retrofit existing buildings. If the population doubles over the coming 25 years, then the opportunity exists today to influence the efficiency of fully half of the ultimate building stock.

The OPA has set a target of 6,300 MW of conservation and demand management in Ontario by 2025. Approximately 230MW of this CDM would be expected to occur in Halton. This is roughly equivalent to eliminating twice the current demand for Milton Hydro. Union Gas has also been active in pursuing CDM programs aimed at reducing natural gas consumption.

In addition to this CDM activity, there are a number of opportunities for improving the efficiency of new buildings and equipment. Local governments can play a role in supporting these opportunities both through active support of efficiency initiatives and by ensuring that existing policies and practices don't impede them. For example:

- Subdivisions may be designed to optimize the ability to access solar energy (i.e. for solar domestic water heating, passive solar design to reduce space heating requirements and potentially for photovoltaic applications). Even where these options are not pursued immediately, appropriate design can preserve the potential to install solar equipment in future.
- Building codes, by-laws and standards may be reviewed to address unintentional limits on the ability to use more efficient designs or technologies (i.e. ground source heat pumps, particularly for commercial buildings, green roofs for commercial buildings, apartments and condominiums, deep lake water cooling for large commercial buildings located near Lake Ontario, etc.).

8.3.2 Supply Side

<u>Natural Gas</u>

It is expected that the bulk of natural gas requirements will continue to be met through supply from Western Canada over the next 25 years. Given that Halton is located on the major gas pipeline serving the GTA and northeastern U.S. access issues are not anticipated, though volatility in gas prices is expected to continue. Locally, new

distribution infrastructure will be required to service new residential and commercial growth and expanded service will need to be built in areas of intensification.

Electricity

The picture for electricity supply is more complex. This review of potential growth in Halton Region is taking place in the context of a major review of Ontario's future electricity supply. As described above, the OPA is currently working on the development of an Integrated Power System Plan (IPSP). This is the first such exercise in more that 15 years and is intended to set out a plan to meet Ontario's power needs to 2025. In part this plan will address the future needs of growth in Halton region, however, these plans are more likely to require new programs and supply facilities within the region. For example, several projects are now underway to arrange for additional generating capacity to be added in the GTA. As discussed earlier for example, the new TransCanada combined cycle gas plant is to be built in Halton region to address overloading at the Trafalgar Station.

As we move forward, the electricity system is expected to begin moving from its traditional reliance on large, central generating stations linked with transmission to a more distributed system. This doesn't mean that the need for transmission lines and large plants will disappear, but that new growth will tend to be on a smaller scale and will be more dispersed across Ontario. A growing portion of our future electricity needs are expected to be provided by generation that occurs at the point of use (i.e. co-generation, photovoltaics). To the extent that this generation meets its "customer's" needs it will not appear as "grid" electricity. Local businesses may continue to use electricity to operate their processes but buy far less electricity from the grid; although each industry may rely on the grid for some portion of their use.

Local generation, or increased efficiency, can reduce or eliminate the need for expanded transmission and distribution facilities and the associated energy losses (i.e. line losses). This also impacts relative costs; as the cost of producing or saving a kWh of power on-site must be compared to the full delivered cost of power from the grid, including all applicable distribution and transmission costs, not just the commodity or generation cost.

Recent changes in Ontario's electricity system have helped remove some of the barriers to distributed generation, particularly for small-scale generation:

- The "Standard Offer" from the OPA provides a fixed price for specified types of generation. This provides greater economic certainty for those considering the installation of new renewable generation. The current standard offer for renewable sources provides a price of 11 c/kWh for wind and other renewable sources, and a higher price of 42c/kWh for electricity produced by photovoltaic systems. A "Standard Offer" program for other clean sources, such as gas-fired co-generation, is now under development by the OPA.
- Standardization of LDC "Conditions of Service" requirements and "net metering" rules have made it easier for small power producers to connect to the grid and to effectively sell excess electricity to the grid at the same rates that the user pays to take power from the grid.

Supply Option	Comments
Nuclear	New plants are being considered for two new existing nuclear sites in Ontario (Darlington and Pickering). Not an option within Halton.
Coal	No new coal plants will be considered in Ontario.
Gas	A new 680 MW gas-fired plant is to be built by TransCanada Inc. in the Halton Hills area. Additional plants proposed under OPA RFP could be pursued by other proponents.
Co-generation	In its proposed IPSP, the OPA has estimated that over the next 20 years, co-generation could contribute between 117 and 1,015 MW to provincial supply. If this were distributed proportionately, this would mean that 4 to 36 MW of co-generation could be located in Halton Region. The technical and economic potential of co-generation is quite significant if institutional barriers limiting this potential are overcome. Co-generation, micro-turbines or combined heat and power (CHP) applications are significantly more efficient than traditional generation; simultaneously serving both a heating load and power requirements. To be economic, such applications must be matched to a consistent heating requirement such as an industrial load or a space or water heating requirement. CHP applications can also be linked to district heating systems which generally become more economical in areas with higher densities[30].
Small Hydro	The Small Hydro Atlas shows no significant small hydro potential in Halton. As a result, small hydro is not expected to be a significant source of supply in Halton.
Wind	According to assessments prepared for the OPA wind resources across the Halton region are marginal[31], with speeds of 6m/s or less across the majority of the region. This analysis excluded environmentally sensitive areas such as the Niagara Escarpment. While some specific sites within Halton may have economic potential, none of the priority sites identified for development in Ontario is located within the region[32]. Over the next 25 years some small-scale wind generation may be developed to serve farms or other applications, however, it is not expected that significant wind power development will occur in the region.
Solar	Solar energy may be used to reduce commercial energy requirements or may be used to produce power which can be fed back into the grid. Homes designed to take advantage of passive solar gain require less space heating, while solar domestic water

[30] *Federation of Canadian Municipalities, Community Energy Management Foundation Paper, prepared by Torrie Smith Associates, page 19.*
[31] *OPA, Analysis of Wind Power Potential in Ontario, November 2005, prepared by Helimax Energy Inc.*
[32] OPA, IESO and CanWEA, Ontario Wind Integration Study, October 2006.

Supply Option	Comments
	heating systems are commonly sized to reduce water heating energy requirements by 50%. Electricity produced by photovoltaic systems, can also be fed into the local distribution system when more power is produced than is required on site. The PV market has shown substantial growth both internationally and in Canada; growing at an average rate of 25% per year in the late 1990's. Over the past 15 years, the cost of PV electricity has fallen to the 30-50¢/kWh and is expected to fall to the 8-14¢/kWh range between 2010 and 2020.[33] If a pro-active program is launched to encourage photovoltaic power, such as the US Million Roof's initiative, solar power could make a significant contribution to supply by 2031.
Landfill Gas and Energy from Waste	One site is now under development in the region that will use landfill gas to generate power. Additional landfill gas capacity may be developed; however, these contributions will be fairly small in terms of overall supply. The Region of Halton is currently analysing the business case for an energy-from-waste facility to be built at its Waste Management site. With a capacity to supply from 18,000 to 60,000 homes, this type of facility could make a significant contribution to Halton's electricity supply; roughly equivalent to up to 10% of the new gas-fired plant proposed by TransCanada.

8.4 WHAT ISSUES ARE ASSOCIATED WITH POTENTIAL GENERATING FACILITIES?

Society uses energy to provide a variety of different services. We pay for these services both in an economic sense and in terms of the health and environmental impacts associated with energy use. Beyond these on-going impacts, there are a number of issues associated with building new supply facilities or expanding existing infrastructure to accommodate new growth.

8.4.1 Health Issues

The majority of energy use in Ontario relies on burning fossil fuels; either directly using fuels such as natural gas or indirectly by using electricity that is created by burning coal or natural gas. Fossil fuels combustion releases a variety of air emissions; including Greenhouse Gas (GHG) emissions that affect climate change and smog related emissions that affect human health. Burning fossil fuels results in the release of NOx, SO2, CO, Volatile Organic Compounds (VOC's) and particulate matter that contribute to smog and health effects.

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[33] *Industry Canada, Unleashing the Potential of On Grid Photovoltaics in Canada - An Action Plan to make PV an Integral Component of Canada's Energy Future, 2003*

Climate change is anticipated to affect human health both directly, through more frequent extreme weather events such as severe storms and periods of higher temperature, and indirectly, as a warmer climate allows diseases to reach into new areas (i.e. malaria, dengue fever, etc.). More periods of consecutive hot days may also result in an increase in the number of "smog days" with their associated health effects.

The air emissions associated with burning fossil fuels comprise the main ingredients of smog and acid rain. The Ontario Medical Association estimates that in 2005 smog and poor air quality resulted in 5,800 premature deaths in the province, that over 17,000 Ontarians were admitted to hospital due to health complications resulting from air pollution and that air pollution could cost the Ontario economy over $12 Billion by 2015[34].

As the population of Halton doubles, with a corresponding increase in energy use, the costs associated with emissions would be expected to increase as well.

8.4.2 Economic Issues:

In general, investments in energy supply create fewer jobs per dollar invested than almost any other sector of the economy. Typically each million dollars invested in new electric supply produces about half the number of direct and indirect jobs (defined as person-years of employment) that construction does, and about one-third the number that would be produced in the Retail sector. As a result, investments in new buildings to make them more efficient, or conservation and demand management programs aimed at improving energy use in existing operations tend to yield greater economic benefits than investments in new supply. In addition, more of these benefits tend to accrue locally, rather than leaving the community.

Studies of the employment impacts of energy savings show that the "re-spending" effect of energy savings is also significant. A survey of several such studies indicated that investments in Demand Side Management (DSM) resulted in *a "net gain of 7.6 jobs per million dollars to 20.4 jobs per million dollars. In percentage terms, the studies indicate that between 50% and 500% more jobs are created through investment in DSM than through equivalent investment in new supply".* [35]

To the extent that future energy demands can be met by improved efficiency, this will tend to create more jobs and increase local economic activity

In addition to these considerations, each supply option has a different set of associated issue.

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[34] *Ontario Medical Association, Illness Costs of Air Pollution, prepared by DSS Management Consultants Inc., July 26, 2000.*

[35] Torrie Smith Associates, Employment Impacts of Energy Efficiency: Literature Review and Implications to Newfoundland, page 11, June 1993.

Energy Supply Option	Associated Issues
Extending current supply infrastructure (new transmission or distribution facilities)	✓ Land use issues for transmission, transformer stations. ✓ Disruption in existing areas to upgrade existing distribution facilities for natural gas and electricity in areas targeted for intensification.
Co-generation and Combined Heat & Power (CHP)	✓ Land use - generation is normally located on-site with the heat load (i.e. within existing industry or commercial footprint) ✓ Potential links to District Heating. ✓ Noise and Emissions - local emissions from fuel combustion are similar to the emissions for underlying heat load. Noise levels may be higher depending on location and technology used. ✓ Matching generation to available heating load.
Wind	✓ Potential siting issues and relationship to the Escarpment or water front, etc. ✓ Land use issues – are wind turbines compatible with other recreational or agricultural land uses? Potential conflicts with other uses if off-shore wind installations are pursued. ✓ Perceptions regarding noise, impact on birds and aesthetics.
Solar	✓ Land use – generally located on site where energy is used (i.e. rooftop installations). ✓ As reliance on solar systems increases, issues may arise regarding right to light, limitations on ability to access solar energy due to building orientation, etc..
Energy from Waste	✓ Energy from waste - Perceptions regarding emissions, and conflicts with recycling objectives, etc., ✓ Politics surrounding source of waste, etc.. ✓ Landfill gas applications – Generally viewed positively; capturing and using waste gases that otherwise affect climate change.

8.5 WHAT IF ENERGY SUPPLY FALLS SHORT OF ENERGY DEMAND IN THE REGION?

The Region of Halton imports the vast majority of the energy it consumes from outside of the region. As discussed above, there appears to be no shortage of capacity to deliver natural gas to the region. The capacity to supply electricity to the area is now being addressed with plans now underway to strengthen transmission links to the GTA and add of the new gas-fired generator in Halton Hills. The ultimate source of the power to supply those links, however, has not been determined pending the completion of the IPSP process.

Ontario projected a “gap” between projected demand and the available supply of electricity when it began its Integrated Power System Plan. Failing to meet the “gap”

would have very significant implications for the Ontario economy. Electricity grids are operated by continuously balancing supply to electrical demand. In the summer of 2005, when extended periods of hot weather strained the capacity of the power system, the IESO issued emergency appeals for consumers to reduce power use, lowered voltage levels, and contemplated the need for rotating "brownouts" or blackouts.

The IESO has improved its outlook for reliability based on recent actions taken to bring new generation on-line and improve transmission links. If the OPA's plans for additional capacity and Conservation and Demand Management initiatives succeed then supply should be adequate to meet demand over the planning period. To the extent that supply or the ability to deliver CDM reductions fails to deliver adequate capacity, Ontario would be forced to import power to offset the shortfall.

Increased reliance on imported power from other jurisdictions would be expected to have two effects. The first impact would be an increase in price volatility and rising energy costs as were experienced in the summer following Ontario's market opening. The second impact would be that the imported power often comes from less "clean" sources, such as coal plants, resulting in increased health and environmental impacts from trans-boundary air pollution.

At more extreme levels inadequate capacity would result in decreased reliability. While the impact of higher power costs on certain industries have recently made news, the impact of lower reliability could be more significant. The costs of power disruptions to industry are very significant. Many industries will not expand in areas where reliability goals not met.

To the extent that the energy requirements of new development are reduced through efficiency and higher density the likelihood of demand exceeding supply can be reduced. Similarly, as Ontario's power system increases its reliance on distributed sources the likelihood of reliability issues arising from transmission disruptions or the loss of a single source of generation will be reduced.

8.6 WHAT KEY POINTS SHOULD ENERGY PLANNERS AND MUNICIPAL LEADERS CONSIDER IN PREPARING FOR POPULATION GROWTH TO 2031.

The following summarizes some of the key points that should be considered in planning for future energy requirements as the Region contemplates projected growth over the next 25 years.

Current Energy Use and Demand:

- ✓ The largest share of Halton's non-transportation energy use is for industry (32%) followed by the residential (21%) and commercial (16%) sectors.
- ✓ Halton represents about 3% of Ontario's population but accounts for 3.6% of provincial electricity use.
- ✓ Approximately 80% of residential energy use and 60% of commercial energy use is for low-temperature space and water heating. The majority of heating needs is provided by natural gas, with electric heat being used in only about 10% of homes.

- ✓ Industries use a more diverse mix of energy sources; natural gas supplies only 36% of industrial energy needs and electricity a further 17%.
- ✓ Apart from a small number of "energy intensive industries" most industries use a comparable amount of energy per dollar of output.
- ✓ Residential and industrial energy intensities, measured as energy use per household or per dollar of output, have been declining as efficiencies have improved. Since 1990, residential energy use has risen more slowly than household growth and industrial electricity use has actually declined.
- ✓ The Services sector has been and is expected to be the main driver of energy and electricity growth. Electricity intensity, measured as energy used per unit of floor area has actually increased since has 1990.

Current Supply:

- ✓ Electricity supply is now based around central generating facilities and transmission lines.
- ✓ The main supply into Halton Region is the Trafalgar Transformer Station in Milton, supplied by 500kV lines connecting to Bruce nuclear station and Nanticoke coal station. The Trafalgar TS is approaching its capacity. The planned removal of the Nanticoke generating station from service will require both additional generation and transmission changes. Additional units coming into service at the Bruce GS will also require transmission changes.
- ✓ The addition of a new gas-fired generating station in Halton Hills, the landfill gas generator in Oakville and upgrades to transmission facilities, as well as local Conservation and Demand Management efforts will help alleviate loading problems.
- ✓ The OPA is currently reviewing a proposed Integrated Power System Plan (IPSP) to address long term supply and demand issues; including changes to transmission facilities. The Region will want to monitor the development of this plan.
- ✓ The main gas pipeline serving the GTA and the northeastern U.S. bisects Halton Region. This line has recently been expanded. As a result, access to sufficient supplies of natural gas is not anticipated to be an issue.

Future Demand:

- ✓ Through its land use planning and other processes, the Region can significantly influence future energy use.
- ✓ Higher densities, with more attached housing and apartments, result in significantly lower energy use. Apartments, for example, typically use about half as much energy as single detached homes.
- ✓ Moving to a higher density housing mix, where more than half of housing units are attached or apartments would lower heating energy use in the community by about 20% relative to current densities; saving enough energy to supply a small city.
- ✓ The OPA has set an objective to achieve 6,300MW of demand reduction from CDM by 2025. This implies an aggressive program to eliminate 230 MW of

demand reductions in Halton; an amount roughly double the load for Milton Hydro today.

Future Supply:

- ✓ By 2025, the OPA expects about half of Ontario's electricity to come from nuclear power. At the same time, the system is expected to become much more reliant on more distributed sources of power.
- ✓ To accommodate growth, existing transmission links may need to be upgraded and new transformer stations constructed.
- ✓ Some supply will be located with the Region. In addition to the proposed generation in Halton Hills, other proponents may decide to proceed with their projects.
- ✓ Additional capacity may be added using landfill gas or energy-from-waste.
- ✓ Co-generation is likely to play a much greater role both for industrial self-generation and in conjunction with large residential and commercial development.
- ✓ District heating and cooling will become an option as densities increase.
- ✓ Small hydro and wind power are unlikely to play a role in Halton, though they will contribute to the grid provincially.
- ✓ Solar energy may make a contribution both in terms of supplying low temperature heating needs (i.e. Water heating) and to distributed electric power (i.e. photovoltaics). Solar PV is only expected to become significant if supported by a provincial or federal initiative.
- ✓ Concern around the health and environment impacts of energy use are expected to grow as the population expands. Much of this will centre around transportation issues, however, all use of fossil fuels will come under increasing scrutiny.
- ✓ Improving energy efficiency and spending on CDM efforts will yield local economic benefits in terms of job creation and improved competitiveness.
- ✓ Each supply option brings a different set of issues that must be acknowledged and managed. Regardless of the supply options chosen, intensification will bring challenges in terms of extending and expanding supply infrastructure into existing serviced areas. Advance discussions with supplier will help alleviate these challenges.

ACRONYMS

GTA	Greater Toronto Area
IESO	Independent Electricity System Operator
IPSP	Integrated Power System Plan
kWh	kilowatt hours – the amount of power used by one 100 watt bulb operating for 10 hours.
LDC's	Local Distribution Companies (such as Oakville Hydro, Burlington Hydro, Milton Hydro and Halton Hills Hydro.
MW	Megawatt – a measure of electrical capacity equal to 1,000 kilowatts. One kilowatt is equal to the power drawn by ten 100 watt bulbs.
OPA	Ontario Power Authority

APPENDIX 1: ENERGY CONSERVATION IN THE OFFICIAL PLAN

A number of sections in the Official Plan for the Region of Halton, presented below, describe goals and objectives relating to energy use and conservation. Bold and italics have been added to highlight elements specifically related to energy use.

Housing

85. The objectives of the Region are:

(8) To encourage the Local Municipalities and the building and development industry to develop innovative urban housing designs that stress flexibility in use, mix of compatible land uses, good environmental practices, universal physical access, public safety and security needs, cost-efficiency, affordability and ***energy and natural resource conservation*** while maintaining sound engineering and planning principles.

86. It is the policy of the Region to:

(23) Encourage the Local Municipalities to consider innovative residential development designs which contribute to affordability and ***energy and natural resource conservation***.

141. It is the policy of the Region to:

(6) Engage the Halton community in the pursuit of measures, including the undertaking of pilot projects, to improve air quality, ***promote energy and water conservation*** and generally improve environmental quality in Halton.

Energy and Utilities

174. The *goal* for energy and *utilities* is to encourage and ensure the conservation and wise economic use of energy and to minimize adverse impacts caused by its provision.

175. The *objectives* of the *Region* are:

175(1) To guide *development* and transportation services so that energy consumption is held to a minimum.

175(2) To reduce energy used in public and private buildings.

175(3) To promote the use of those forms of energy that pose the least environmental risk.

175(4) To achieve active participation of energy conservation by all residents and businesses in *Halton*.

175(5) To take an active part in decisions regarding the planning and *development* of *utility* corridors in *Halton*.

176. It is the *policy* of the *Region* to:

176(1) Recognize the importance of energy and *utility* provision, but assist in minimizing possible impacts of *utility* corridors and generating facilities, and to this end:

a) Act as coordinator of the interests of the Local Municipalities and work in conjunction with *utility* bodies in the process of selecting sites and routes.

b) Coordinate with the Local Municipalities, agencies, *utilities* and developers the design, construction, operation and maintenance of all *utility* services to minimize community and environmental impact and to ensure timely and cost-efficient services to the public.

c) Endorse the principle of multiple-use *utility* corridors and trenches and secure the cooperation of agencies and developers having authority in this matter.

d) Promote within the Urban Areas, where appropriate, the availability and use of transmission corridors for recreational purposes.

e) Seek participation in discussions on any energy-generating facilities which could affect the *Region*.

f) Urge those authorities having jurisdiction, as permitted by legislation, over the planning and *development* of *utility* facilities and corridors affecting *Halton*, to have regard for the *goals*, *objectives* and *policies* of this Plan.

g) Require that Local Official Plans include, for lands within or adjacent to *utility* corridors, *policies* that address public safety and environmental protection.

h) Urge the Province to retain all major facilities for the generation or transmission of energy/*utility* under the provisions of The Environmental Assessment Act.

176(2) Facilitate energy conservation by:

a) including energy conservation as a criterion in evaluating private and public undertakings of regional significance,

b) encouraging all levels of government to provide recreational opportunities locally in *Halton* to discourage long distance trips for short term recreational purposes,

c) promoting compact growth,

d) encouraging the Local Municipalities to adopt energy conservation *policies*, including building design, treescaping and site plan criteria, to improve the efficiency of energy use,

e) encouraging public agencies, private industries and individuals to participate in energy conservation programs,

f) evaluating and implementing cost-effective resource recovery techniques including the use of recycled wastes and waste byproducts such as methane gas as an energy source,

g) applying energy conservation techniques in Regional facilities and projects, and

h) supporting energy conservation research projects and encouraging the Federal and Provincial governments to provide funds for such projects.

176(3) Support the use of full cost accounting principles in evaluating proposals for alternative energy sources.

176(4) Investigate, through the Green Projects Advisory Committee, energy conservation measures and alternate energy generation methods that would minimize impact to the environment.

APPENDIX 2: OPA RFP FOR NEW SUPPLY IN HALTON:

The move to more distributed power sources is evidenced in the proposals submitted to build a new gas-fired plant in Halton region. As the Trafalgar transformer station in Milton rapidly approaches its capacity, the OPA initiated an RFP to have new generation built in the area; both to provide capacity relief and voltage support.

Four proposals were put forward for consideration (see table below). The proposed plants were all similar in size (600-680 MW) and technology (natural gas-fired combined cycle turbines) with a similar foot print (25 acres). All of the plants were to be located within a few kilometres of the transmission lines and major gas pipelines serving the area. On November 16, the OPA announced that it had selected the TransCanada proposal to proceed. It is unclear at this time whether any of the remaining proposals will be pursued independent of the OPA process.

All of the proposals used a more efficient combined cycle turbine design. Unlike conventional thermal power stations, which typically convert less than 30% of the fuel into electricity, combined cycle plants recover some of the waste heat through a secondary heat exchanger, converting up to twice as much of heat to usable electricity.

The proposals also all used natural gas and a combined cycle design resulting in very similar air emissions. Each proposal was subject to an environmental screening process as part of the RFP process and was required to meet Ontario's existing air regulations. Some of the proposals incorporated different environmental benefits. For example, the Palermo plant was designed to use wastewater from the nearby Mid-Halton Waste Treatment plant[36], while the TransCanada project proposed the creation of an 8-acre conservation area on the north-eastern corner of the property to protect an area of 16-mile creek, and the Milton Clean Energy Project proposed both a commitment to a conservation area and $500,000 Sustainability Fund for Environmental and energy efficiency projects[37].

The proposals quoted varying numbers for employment created during construction (200 to 300 jobs over a 2 year period) but all would result in only 24-25 permanent jobs once in operation.

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[36] CMS Energy Generation, Clean Energy Center Natural gas-fired combined-cycle power plant, undated.

[37] Pristine Power Inc., Milton Clean Energy Center Environmental Review Report, September 2006.

OPA Clean Power RFP - Proposals for Halton:					
Proposal Name	**Location**	**Size (MW)**	**Site Size (acres)**	**Building (acres)**	**No. of Permanent Jobs**
Milton Clean Energy Center	SE corner of Main St. and 5th Line, Milton	680	22	15	Up to 25
Selected Applicant: Trans Canada	Between 401 and Steeles Avenue West of 6th line, Halton Hills	680	80	Unknown	24
EPCOR	Auburn Road between Trafalgar Road and 8th Line in Milton	600	20	unknown	unknown
Palermo	NE corner of Bronte Rd. and Burnhamthorpe Rd. in north Oakville.	600	140	20	25