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CITY OF
Guelph

Making a Difference

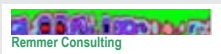
Community Energy Plan



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MVV Energie



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Prepared For
Guelph Community Energy Plan Consortium

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2. EXECUTIVE SUMMARY

For over two centuries, the ready availability of low cost energy has allowed the world's industrialized countries to achieve unprecedented levels of well being and prosperity. Recent dramatic increases in costs and price volatility are putting the spotlight globally on how effectively we use energy. The rapid growth of China and India is putting further pressure on the world's energy supplies and climate. Despite its plentiful energy resources, Canada is increasingly exposed to the full force of the global energy market pressures and can look forward to energy costs trading upwards combined with pricing uncertainty.

The evidence is growing that the human use of energy is causing greenhouse gas emissions that are beginning to have significant effects on the climate. Recent opinion polls indicate that this is now viewed as the most critical issue for most Canadians, underlined by the renewed political commitment to meet international greenhouse gas emissions targets.

Over half of the world's population lives in cities, and in Canada that proportion is closer to 80%. Of all the energy used in Canada, over half is for buildings, homes, and transportation within cities. Homes and buildings use over 30% of all energy in the country and consume more than half of all the electricity. Cities are increasingly recognizing that the quality of life and competitiveness will in part be driven by how effectively they manage the use of their energy and water resources.

Guelph's leaders recognized the growing importance of effective management of energy and water to the economy and environment, and in 2004 formed a Consortium to proactively develop a community energy plan. The Consortium represents all facets of the community including the administration, academia, business, the gas and electric utilities, and other community groups. In 2006, the Consortium decided to formalize a long-term Community Energy Plan (CEP) which would guide the city's energy future for years to come. The CEP team had a balanced mix of local and global expertise ensuring the plan incorporated the best elements of urban energy management from around the world.

Guelph, with its current population of 115,000, plus an additional 18,000 students during the academic year, is a thriving town well situated in the "Golden Triangle", an area to the west of Toronto that is attracting significant growth. Guelph's population is expected to grow to 180,000, probably within its current boundaries, supported by significant commercial and industrial development.

In rough numbers, the growth will add about 20,000 homes and somewhere between 400,000 and 500,000 square meters of non-residential construction, along with significant industrial growth.

To support this growth, the city has made a commitment to implement an energy plan that will ensure the long-term competitiveness and environmental performance of the city. The Guelph CEP was developed to be much more than an inspirational statement. It was created very much with implementation in mind. For this reason the team looked at success stories from the USA, Canada and Europe to adopt the best ideas that had clearly worked elsewhere. All of these success stories underlined the need to take a long-term, multi-decade view and to have community leadership that ensured long-term, consistent implementation of the basic strategies year after year. Another key element was to see the energy supply of the city as an integrated whole.

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The overall vision of the CEP is simple:

Guelph will create a healthy, reliable and sustainable energy future by continually increasing the effectiveness of how we use and manage our energy and water resources

This vision is supported by five goals that focus on the CEP's role in attracting quality investment, in ensuring reliable and affordable energy, in reducing environmental impacts, in enhancing Guelph's competitiveness, and in aligning public investment with the CEP. Each has recommended long-term measurements detailed in the plan.

- *Guelph will be the place to invest, supported by its commitment to a sustainable energy future*
- *Guelph will have a variety of reliable, competitive energy, water, and transport services available to all*
- *Guelph energy use per capita and resulting greenhouse gas emissions will be less than the current global average*
- *Guelph will use less energy and water per capita than comparable Canadian cities*
- *All publicly funded investments will visibly contribute to meeting the other four CEP goals*

Successful delivery of these goals brings tangible financial and other benefits to residents, local business, the city administration, developers and builders, banks and investors, and the energy suppliers.

Guelph was an early pioneer in the development of community energy solutions by being a key player in developing municipal energy distribution in Ontario 100 years ago. Taking the lead for the next 100 years is entirely consistent with this tradition. Today the city covers about 86,000 km². The population of 115,000 is estimated to grow by at least 2% per year to approximately 180,000 by 2031. Residential growth will be from a mixture of redevelopment in some older areas, and new development on greenfield sites. Industrial and commercial developments are planned in six areas around the city.

Today, Guelph uses a total of 6,030 gigawatt hours of equivalent energy (GWh_e) from fuels of all types, or 52.45 megawatt hours of equivalent energy (MWh_e) for every inhabitant of the city. If the heat wasted in the production of electricity for the city is included, the total rises to 8,475 GWh_e or 73.71 MWh_e/capita. This is the energy directly consumed in the cities buildings, vehicles, and industries, and does not include energy used in ships, airplanes, long-haul freight or other transportation. In general, the Guelph CEP focuses on the energy directly used in the city as this can be more easily influenced by community action. In 2005 a total of 19.2 million cubic meters of water was pumped and treated. Lost water totaled approximately 14 percent of all water pumped. The average daily water demand was 52,579 cubic meters.²

² http://guelph.ca/uploads/ET_Group/waterworks/Waterworks_Summary_Report_2005.pdf

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This use is comprised of 230-250 litres per equivalent population per day for household use, with the balance being used by commerce and industry.

Guelph's climate, with over 4,352 heating degree days compared to only 180 cooling degree days, puts a high demand on space heating, and the plan addresses the heating alternatives in some detail.

The CEP was developed using the following priorities:

- Maximize the energy and water efficiency for buildings, vehicles and industry
- Maximize use of heat generated in electricity generation and existing industrial processes
- Incorporate as many renewable energy sources as feasible
- Team with the existing electricity and gas networks to avoid wasteful duplication of assets

Cities that systematically implement these principles year after year typically have energy levels at least half of the current levels of Guelph, with all the associated economic and environmental benefits that this brings.

On the first priority, efficiency, detailed assessments were made of the present 33,000 homes and 1.7 million m² non-residential buildings by age and energy use. The needs for the future industrial energy use and transport fuels use were similarly assessed.

Following these priorities, the CEP recommendations are:

Use efficiency to create at minimum all the energy needed to support the growth of the residential sector

It is feasible to add about 20,000 homes with no net increase in energy needs and this is the recommended target. Ontario recently passed stringent new energy efficiency building codes that will be fully in force by 2012. The CEP is recommending that the city explore incentives and other approaches to immediately implement the full code. This alone, combined with energy efficiency requirements on major residential renovations creates all the energy needed for growth.

From 2012 onwards, the CEP is recommending a steady annual improvement in energy efficiency of about 1% per year, which by 2031, would be a level that aligns with global best practice from Scandinavia and Germany.

Use efficiency to create all the energy needed to support the growth of the commercial and institutional sectors

Similarly, all the energy needed to support the entirety of the growth of commercial and institutional buildings energy needs can be met by the same combination of immediate implementation of the new codes and efficient renovation.

Adopt an energy performance labeling scheme for buildings as a voluntary initiative for the city, teamed with Natural Resources Canada and a local mortgage bank, to act as a pilot for the whole of Canada to gain about 5% incremental delivered efficiency

The CEP is recommending that all new and existing buildings have an Energy Performance (EP) Certificate that guarantees the building's energy consumption in normal operation at the

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time the building is sold or even rented. There is no Canadian EP Certification at present. It is the subject of much discussion at a Federal level in Canada, and the recommendation is to offer Guelph as a national pilot.

The recommendation is to model around an emerging approach being discussed in Canada that is an amalgam of the Canadian Energy Guide and the European Union approach.

The experience in other jurisdictions is that this stimulates somewhat higher quality buildings and a certain amount of “efficiency competition” between developers.

Add to Guelph’s attractiveness for quality industrial investment by offering world class tailored energy services and achieve annual investment growth rates higher than the underlying population growth, with no overall increase of the primary energy needed to serve the first fifteen years of growth.

Increasingly, industrial investors are looking at energy services as a key part of their decision on where to invest. The CEP is recommending developing tailored energy services for selected industrial development areas that not only deliver gas and electricity, but also selectively deliver other energy forms such as compressed air, process steam heating and cooling, etc.

Meet Guelph’s growing transport requirements while reducing the transportation energy use by 25%, using sensitive urban design, effective alternative transport options, and encouraging vehicle efficiencies.

Transport fuels collectively represent 30% of all the energy used in Guelph, and account for a huge 45% of all the greenhouse gas emissions caused by the city. The CEP recommends a multi-pronged approach that includes various measures to encourage more efficient vehicles, urban design that reduces vehicle journeys, and focused attention on appropriate competitive mass transit.

Many of these measures were already being developed in detail in Guelph’s wider transport and urban planning. The CEP is underlining the importance of their success to meeting the overall energy and climate change goals.

Incrementally create energy distribution architecture in Guelph that will allow the majority of the city to be served with fuel choices that optimize cost, availability, and environmental impact long into the future.

Over the coming years major changes will happen in energy and environmental legislation, fuel availability, the viability of emerging alternative energy technologies and their relative costs. To be able to achieve maximum benefit from these changes, the CEP is recommending a stepwise development of district heating networks covering the higher density areas of the city to supply space heating and domestic hot water. These networks also provide an efficient and economic way to distribute heat from a variety of existing and new energy sources.

In evaluating benchmark cities such as Mannheim or Copenhagen, we find that a common feature of these very efficient and reliable energy and water systems was the existence of all energy services being supplied by a single company. This avoids the inefficient use of primary fuel, and allows a rational integration of alternative energy sources. The CEP is recommending this approach.

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Within fifteen years, at least a quarter of Guelph’s total energy requirement will be competitively sourced from locally created renewable resources

The challenge around climate change will increasingly turn the focus on renewable fuels as a viable and essential way to reduce greenhouse gas emissions. Currently the economic value of greenhouse gas reductions is zero, but this is likely to change as various market mechanisms come into force.

The CEP is strongly recommending a target to install the equivalent of a “Thousand Roofs” of solar photovoltaic electricity.

The heat demand of the area makes it a natural fit for integrating bio-mass heat sources combined with district heating to provide about 10% of the base load heat needs through the winter. The local wind quality makes energy from turbines marginal under the current technology. Last but not least, the growing need to find environmentally acceptable ways to manage municipal waste merits a rigorous assessment of the waste-to-energy potential.

Target – At least 30% of Guelph’s anticipated electricity requirements will be associated with Combined Heat and Power (cogeneration) by 2031.

As the city’s energy evolves to include more district energy, it begins to include small and medium scale combined heat and power installations. Today Guelph’s 1,627 GWh annual electricity use in reality uses 4,074 GWh_e of fuel, the difference being lost as heat, creating non-productive costs and significant greenhouse gas emissions. By implementing CHP within larger developments, much of this heat can be effectively captured and used, creating major cost and environmental benefits. The CEP recommendation is to proactively seek CHP projects with a total electric capacity in the 75 to 100 MW range with a comparable level of heat recovery.

Guelph will reduce the magnitude of the summer grid electrical peak by at least 40% by 2031 to avoid the need for investment in new electrical infrastructure to serve the growth of the city

One of the consequences of growing prosperity and the norms of new construction is the increasing use of air-conditioning, even though climatically there is relatively little need. The result is very high electrical demands for a few hours a day during the summer months. This peak drives substantial investments in underutilized generation, transmission and distribution assets by the electric utility.

The cumulative effect of many of the preceding measures including efficiency, cogeneration, heat recovery and solar PV will moderate and reduce the peak.

Guelph will systematically create an integrated energy metering, billing and management network across the entire city to allow cost-effective management of all energy forms

The energy breakthroughs foreseen by the CEP arise as a result of seamless integration of energy efficiency along electrical, gas and district heating networks, with a flexible and, over time, changing mix of renewable and non-renewable energy sources. Such an approach requires a high degree of management and data sharing across the different parts of the system to deliver maximum benefit. The recommendation is to establish a common data management and metering architecture within the city.

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Guelph will implement large area high-efficiency Scale Projects that accelerate progress towards a successful implementation of the CEP by creating early success and developing a deep pool of community expertise

All too often, CEPs fail to deliver due to a lack of sufficient scale and early success. The Consortium was committed to make sure that did not happen in Guelph. As a result, the CEP is recommending implementing neighborhood energy plans in relatively large, but bounded areas of the city.

The plan is calling for the early identification and implementation of Scale Projects. Some specific ideas are included as part of the CEP, and include various business and industrial areas, the greenfield mixed use developments targeted for the south of the city, the University of Guelph Campus as a whole, and the revitalization of the St. Patrick's Ward. These are offered as viable examples of potential Scale Projects.

The CEP also recommends elements that will ensure long-term successful implementation. Many Federal, Provincial and local programs exist and the CEP is recommending the city maintain information and offer assistance to capture as many of these resources as possible. The Consortium clearly recognizes that some of the measures proposed will require adjustment or interpretation of regulatory or other legal constraints, and is committed to clear these kinds of market barriers wherever possible. Since many of these challenges will be of interest beyond Guelph, the CEP is suggesting that Guelph can be a national prototype as these market and regulatory structures emerge. A high priority in this area will be to establish the market framework of a municipal energy service organization that is structured to ensure the highest reliability, least cost and least environmental impact energy services of all types.

Guelph's elected officials, business community, financial institutions, neighborhood groups, utilities, architects, developers, construction industry, academia and the city administration are clearly committed to the vision, goals, recommended actions and progress of the CEP as a key measure of Guelph's overall success in becoming a world class city in which to live, work and play.

In support of this, the CEP is recommending community and neighborhood groups be instrumental in ensuring Scale Projects are sensitively implemented and the energy and environmental goals are fully achieved. The CEP also presents an amazing opportunity for the University of Guelph and other colleges to build on the city's commitment to the CEP by developing specialist areas of study, training and research such that Guelph will become a center of excellence on the theory and practice of sustainable urban development.

The goals that the CEP has established are intentionally very aggressive and are generational in nature. The CEP is strongly recommending the city put in place a regular reporting system to track the progress towards the goals and to share best practices with the community, both through conventional and electronic media, and as a regular topic at City Council Meetings.

Guelph is already blessed with a number of commercial, non-profit and general interest groups as well as individuals working towards sustainability, energy efficiency and alternative energy in some way. The CEP made a first step to create an inventory of some of these resources, and this should be the basis of a developing resource database.

Despite the anticipated growth of the population and increase in economic activity, the overall fuel use required by the city to deliver all its energy service will actually decrease from today's total of 8,475 GWh_e to 6,135 GWh_e in 2031. This represents a decrease of greenhouse gas

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emissions, currently at an estimated 16 tonnes per inhabitant, to about 7 tonnes. This is still some distance from the ambitious goal, but at a level that is clearly putting Guelph among the top energy performers in the world.

At the same time, Guelph will take its place as one of the most competitive and attractive cities in Ontario and Canada, with a core energy productivity expertise that will be sought out around the world.