Integrated Energy Mapping in Ontario Communities

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ABSTRACT

Integrated energy, land use and transportation mapping has emerged as a powerful tool for helping communities and energy utilities achieve energy efficiency and greenhouse gas (GHG) reduction targets. This approach allows communities to adopt integrated approaches to planning. It also allows them to plan from a future vision, backcasting to ensure that energy, land and transportation are integrated so as to achieve the vision. This paper sets out a methodology for mapping that has been used in a number of Canadian communities. The paper highlights some of the key lessons learned from the example of Guelph, Ontario, including the need to establish energy objectives early on with local community buy-in and the need for multi-disciplinary municipal teams to break through decision-making silos. The paper concludes with the potential benefits of mapping to utilities, including benefits to planning, regulatory affairs, DSM programs and relationships with the municipal sector.

Introduction

Across North America, jurisdictions are facing the multiple challenges of energy reliability, climate change and economic downturn. Communities – the places where we live, work and play - are at the centre of these challenges. The development of sustainable communities is increasingly seen as a way to address these challenges; a potentially high impact approach that does not depend on the leadership of national or international government. When buildings and places are designed in an integrated way to minimize resource consumption communities can begin to support an increasingly low carbon and prosperous lifestyle. A key step to achieving sustainability is effective community energy planning (CEP).

To assist communities in Ontario with balancing the impact of land use decisions for meeting population and employment growth with energy consumption and supply concerns, the Ontario Power Authority (OPA), Natural Resources Canada (NRCan), the Ontario Centres of Excellence (OCE) and the Canadian Urban Institute (CUI) initiated the Integrated Energy Mapping for Ontario Communities (IEMOC) research partnership. The purpose of the IEMOC initiative is to help communities in Ontario develop community energy plans using an energy, transportation and land use mapping approach.

The purpose of this paper is to demonstrate the contribution that integrated energy and land use planning, with a spatial, mapping component ("energy, transportation and land use mapping"), can make in the achievement of a community's goals related to energy, climate change and economic prosperity. This paper defines energy, transportation and land use mapping, and explains its contribution to traditional energy efficiency as well as the implementation of community energy plans. The paper presents a brief case-study of a recent community and utility that has participated in energy mapping and presents key lessons learned for connecting energy, land use and transportation to municipal development priorities. The paper concludes with a review of the potential benefits of energy, land use and transportation mapping to the energy utility and demand-side management (DSM) agencies and planners.

Background

Advancing Sustainable Energy Planning In Canada

The concept of energy planning has evolved dramatically over the last 40 years. At one time, planning was primarily done by energy supply agencies that only addressed the issue of supply. In the1970s, following the energy crisis, the scope of energy planning expanded. Planners began to think more in terms of *energy systems*, referred to as a combination of natural resources and technologies that provide, heating cooling and transportation and other *energy services*. However, energy planning remained focused on the efficiency of equipment and building envelope, and was largely unaffected by urban form and other social drivers of energy use.

Achieving sustainable energy planning requires not only increasing the efficiency of our energy system, but also looking at how the shape of our communities influences the way people access and use energy in their daily lives. Urban form influences all aspects of energy use. This relationship is depicted in Figure 1 below which shows how land use decisions made today can have a direct and long term impact on decisions related to buildings and equipment (Jaccard, Failing, Berry, 1997).

Figure 1 – Energy Decision Making Hierarchy

Energy Decision Making Hierarchy			
Energy-related Decisions	Dimensions		
	Time	Space	Private/ Public
Land use and infrastructure	Years to decades	A lot	Public
Building and site design	One to three years	Moderate	Public/Private
Energy-using equipment	Less than one year	Little	Private

Source: Jaccard et all, 1997

Despite this insight, energy consumption remains a side-effect of decisions by consumers, city councils, planners, engineers, builders of buildings, suppliers and others involved in the energy decision making hierarchy. Achieving sustainable energy planning requires linking all levels of the energy decision making hierarchy.

Energy Planning at the Municipal Level in Canada

Traditionally, municipal governments in Canada have not been actively involved in the energy industry and have treated energy consumption and supply as a side-effect of actions of local residents and businesses. This is true even in Ontario where the municipal government has owned or been the main shareholder of the electric local distribution company (LDC) for decades.

This is beginning to change and municipalities are becoming more involved in managing energy issues, either through service provision, e.g. district energy systems; or through the development of energy policies and plans, including community energy plans (CEP).

A number of communities across Canada have successfully developed some form of CEP to integrate energy issues associated with transportation, supply and end-use. The drivers for CEPs are varied, and include concerns about: climate change, economic competitiveness, the community's "brand", and energy security and reliability. Another important driver of energy efficiency at the community has involved the introduction of market transformation programs funded by governments, utilities and the private sector. For instance, the federal government's Commercial Building Incentive Program (CBIP) and Leadership in Energy and Environment Design (LEED) have helped municipalities recognize that developing more efficient both economic and in the public interest in terms of demonstrating community leadership for sustainability. The funding to support CEP efforts has come from the municipal tax base, grants from agencies like the Federation of Canadian Municipalities, as well as utility rate payer support.

The Energy Planning Challenge

Although the concept of CEPs is a recognized approach for addressing energy issues in municipalities across Canada, the wide-spread application of CEPs still face challenges.

At the community development level, energy is not well integrated into regulatory requirements that influence the development of communities, such as land use and transportation planning.

From the stand-point of implementation, the majority of CEPs established by communities (over 30 of them in Canada) have not been holistically implemented and, instead, energy reduction strategies that can be advanced through municipal corporate activities have been favoured, with minimal uptake of energy issues across a broader community.

Most CEPs in Canada have generally followed straight line projections for future growth in terms of all building types, as well as population and employment. This approach, while acceptable for short to medium forecasts, is challenging for longer term forecasts over 10-15 years.

Another limitation of CEPs prepared in Canada is the lack of a spatial element in preference for spreadsheet analysis. This spreadsheet approach minimizes the ability to actively evaluate and analyze where strategic investments or actions should be taken on the ground to reduce energy consumption.

Finally, in most CEPs minimal consideration is provided regarding the financial costs associated with the strategies for reducing energy consumption or achieving a greenhouse gas goal. This failure to incorporate cost-sensitivity can lead to high-priced and, possibly less effective, strategies being encouraged and favoured.

Energy Mapping

A Role for Energy, Land use and Transportation Mapping

Energy, transportation and land use mapping is directed at establishing a common platform that allows planners from all sectors to actively discuss, analyze and modify the multitude of decisions that impact a communities' energy profile. The mapping approach is directed at informing energy and other resource strategies and contributing to the development of CEPs that will last far into the future of a community.

Energy, land use and transportation mapping offers municipalities, gas and electric LDCs with a way to evaluate existing energy use in a community and plan to improve energy efficiency through the use of different land use and built form patterns, better building standards, transportation options and the integration of local alternative and renewable energy sources. The approach developed and in use across Canada was developed by the Canadian Urban Institute (CUI). The first Canadian based application of the energy mapping approach was applied in the City of Calgary by the CUI. Agencies, such as Natural Resources Canada, CanmetENERGY, are also engaged in advancing the concept of energy and carbon mapping in Canada (see http://canmetenergy-canmetenergie.nrcanrncan.gc.ca/eng/buildings_communities/communities/map.html)

The approach builds on accepted practices for the reduction in energy use in efficient ways, such as through reduced demand for transportation, and space heating and cooling in buildings. The process also incorporates the idea that maximizing energy efficiency of urban form requires integrating transportation issues, addressing improvements to and orientation of the built environment, and ensuring that energy needs of a community are met in the most efficient way possible, such as obtaining the highest and best use from a given primary source of energy. The process contributes to the connection of land use and built form to energy demand. This enables municipalities, as well as gas and electric LDCs to incorporate energy planning and actionable DSM and energy supply activities to address local energy challenges.

The Energy Mapping Approach

Energy mapping commences with a detailed analysis of the energy goals of a community. This approach encourages land use planners, transportation engineers, utility engineers and other community stakeholders to think of energy in holistic way rather than basing requirements on existing use patterns.

An important cornerstone of the energy mapping process is the use of life-cycle assessment and cost-sensitivity analysis. At every stage of assessment, consideration is given to the actual and potential costs of energy, and the associated selection and adoption of strategies for reducing energy and greenhouse gas emissions.

The usefulness of energy mapping is grounded on assembling a wide range of data inputs that are used to help baseline energy consumption in a community and evaluate the long-term effectiveness of energy reduction strategies. A key source of data to help visualize the community is the tax assessment roll. The assessment role data contains rich attribute information, including the size of buildings, height and other characteristics. For larger municipalities, the assessment data is often available in a shape file format (a standard file format used with geographic information systems – GIS), which provides additional information including the building footprint and parcel data.

Figure 2, below, provides an overview of the basic types of data that are assembled at the outset of energy mapping to enable long-term evaluation, monitoring and verification of energy consumption for a municipality.

Figure 2: Energy Mapping Inputs and Direct Model Outputs

<table>
<tr><th colspan="3">Energy Mapping Inputs and Direct Model Outputs</th></tr>
<tr><td>Building Inputs
• Building energy models
• Tax assessment roll for building areas/parcel data
• Building improvement costs (energy efficiency) for new and retrofit</td><td rowspan="5">Community Energy Model</td><td rowspan="2">Mapping Outputs
• Baseline energy use
• Project building and transportation density
• Project greenhouse gas emissions
• Alternative and renewable technology option locations
• Energy use per capita/ per GJ / per m^2
• Linkage of land use, built form, transportation and utility impacts.</td></tr>
<tr><td>Transportation Inputs
• Community trip travel information
• Municipal trip tables
• Existing and projected fuel economics</td></tr>
<tr><td>Fuel Inputs
• $C0_2$ emission factors
• Utility data (energy consumption and cost for community at most accurate level)
• Provincial power system plan</td><td rowspan="2">Scenario Outputs
• Existing land use, built-form, transportation and energy use.
• Future business as usual for land use, built-form, transportation and energy use (incorporating energy and conservation strategies).
• Future efficiency levels relative to different energy and conservation policy scenarios (driven by energy, greenhouse gas, energy cost and other community benchmark objectives)</td></tr>
<tr><td>Renewable Energy Technology Inputs
• Technology options & capital and operating costs
• Technology emissions factors
• Energy displacement level</td></tr>
<tr><td>Land use Inputs
• Land use designations and built form
• Projected population & employment
• Project transportation</td><td>Economic Outputs
• Scenario capital and operating costs
• Scenario fuel costs
• Inflation and fuel price escalation impacts.
• Avoided energy infrastructure costs.
• Direct employment related opportunities from policy scenarios.
• Impact of subsidies, carbon pricing and other financial mechanisms.</td></tr>
<tr><td colspan="3">• Community specific inputs from the municipality and/or utility</td></tr>
</table>

A central approach to energy mapping is the use of backcasting and scenario building – creating a desired energy future, and then planning from the future back to the present to understand the types of land use, technology and transportation options that should be considered to achieve the future. The backcasting approach encourages planners, engineers and other key community stakeholders to assess various combinations of pricing, technologies, land use and transportation patterns and other policies to evaluate a wide range of energy strategies to meet their long-term goals. An overview of the energy mapping approach is provided in Figure 3, below.

Figure 3: Energy Mapping Approach for Community Energy Planning

Evaluate more than one growth scenario.

Repeat process as needed to establish desired scenario.

<table>
<tr><th colspan="6">Energy Mapping Approach for Community Energy Planning</th></tr>
<tr><td>step 1: identify vision and energy sources</td><td colspan="5">Community vision
• Identify key attributes of desired energy future.
• Identify all sources of energy production and resources (renewable fuels).</td></tr>
<tr><td>step 2: collect baseline information (energy, land use and transportation)</td><td>Baseline Building & Energy Sources
• Map all buildings in a community at parcel level.</td><td colspan="2">Baseline Transportation
• Evaluate transportation zones using trip tables.</td><td colspan="2">Collect Energy Data
• Identify and quantify existing sources of data at community/ neighbourhood, block or building site level.</td></tr>
<tr><td>step 3: prepare GHG baseline</td><td colspan="5">Prepare emission coefficients
• GHG intensity factors [tonnes C02/GJ] quantified</td></tr>
<tr><td>step 4: assess future growth projections (people, jobs, transportation land and building types)</td><td colspan="2">Compile future building data
• Conduct an analysis of the predicted future building stock.
• Information required at GJ/m^2</td><td colspan="3">Model future transportation needs
• Future energy use and emissions can be estimated based on trip tables developed to model future transportation needs.
• Transit scenarios can be described by high-level questions and do not require trip tables</td></tr>
<tr><td>step 5: evaluate energy fuel & technology options</td><td colspan="2">Relevant renewable and alternative energy technologies evaluated
• Can include: district heating, cogeneration, wind energy, solar hot water, photovoltaics, solar air, earth energy (Geoexchange), energy from waste, sewer heat capture, biofuels, and others
• Intensity factors for environmental impact [GHG/GJ] and cost [$/GJ] determined.</td><td colspan="3">Air Emissions
• Air emission factors can be incorporated to establish air-shed assessment.</td></tr>
<tr><td>step 6: incorporate financial analysis</td><td colspan="2">Energy Cost Analysis
• Financial impacts of proposed scenarios developed and compared with the conventional scenario of BAU.
• Energy price forecast and inflation forecasts should be taken from reputable public sources.</td><td colspan="3">Avoided Energy Costs
• Assess value of deferred electrical/gas infrastructure required.
• Assess costs and savings with improvements through relying on alternative and renewable fuels vs. fossil fuel sources.</td></tr>
<tr><td>step 7: build scenarios (energy and conservation option/ policies)</td><td>Existing
• Prepare baseline map.</td><td>Future Business as Usual (BAU)
• Prepare Future BAU map.
• See information at GJ/m^2, GJ/ ha & GJ/cap)</td><td>Standard High Efficiency
• Prepare map.
• See information at GJ/m^2, GJ/ ha & GJ/cap)</td><td>Ultra High Efficiency
• Prepare map.
• See information at GJ/m^2, GJ/ ha & GJ/cap).</td><td>Other Scenarios
• Prepare map.
• See information at GJ/m^2, GJ/ ha & GJ/cap)</td></tr>
<tr><td>step 8: evaluate</td><td>• Compare backcasting results with community goals</td><td colspan="2">• Consult with community/ stakeholders.</td><td colspan="2">• Move to implement preferred scenario or perform other scenarios</td></tr>
<tr><td colspan="6">Community engagement can be held throughout the entire process through workshops to learn about energy use in a community. Involvement should include as diverse a range of people as possible.</td></tr>
</table>

As part of the evaluation processes, cost estimates for the various scenario options are prepared, as well as cost savings for avoided fuel purchases and avoided capital costs for electrical infrastructure. The analysis evaluates all efficiency and conservation strategies at cost through a life-cycle approach and then applies cost sensitivity in terms of future energy prices and inflation to identify key risks and uncertainties. The main metric for evaluation is dollar per tonne of greenhouse gas ($/tonne of GHGs) reduced. This metric allows all conservation and supply strategies to be ranked and compared against one another in terms of cost effectiveness in achieving a desired community goal. The analysis offers planners and engineers with a way to effectively develop a business case that can be presented to decision-makers and investors.

A central component of energy mapping is the ability to take baseline information and future scenarios for energy consumption in terms of land use, built form and transportation and visualize the results using geographic information systems (GIS) to produce maps. This is where the energy mapping process differs significantly from other traditional CEP activities. The ability to illustrate the results of the energy base-lining and future forecasting offers a powerful way to understand the impacts of land use and transportation decisions by planners and engineers at one time on the same platform - a map.

Applying Energy, Land Use and Transportation Mapping in Guelph Ontario

As part of the IEMOC initiative studying four cities in Ontario, the City of Guelph became the inaugural community to participate in the study, along with Hamilton, Barrie and London (to be confirmed). In 2008, Guelph was awarded the Environmental Excellence Award by the Electricity Distributors Association for the development of a comprehensive City of Guelph Community Energy Plan. The Guelph CEP established an ambitious goal of cutting energy usage in half for Guelph, while simultaneously supporting sustained economic and population growth over the next 25 years. The impetus for the plan was initiated by the Mayor of Guelph who, upon the return of a study tour to Europe to review the use of integrated community energy solutions, identified the need for a comprehensive approach to managing Guelph's energy and water resources to maintain community competitiveness, while also enhancing the quality of life for local residents. In 2009, the City of Guelph hired a dedicated Community Energy Plan Manager to oversee the implementation of the CEP.

A core objective of the City of Guelph's CEP was to rapidly advance the development of energy reduction strategies, including the introduction of higher energy efficiency building and retrofit standards, encouragement of more compact urban form and reduction of energy consumption from vehicle use (see . http://www.guelph.ca) To assist with accelerating the up-take of the Guelph CEP, the IEMOC research team engaged City of Guelph staff to integrate and connect the expected population and transportation growth of the community with the Guelph CEP, using the energy, transportation and land use model approach. The process of connecting existing land use planning with energy impacts allowed the City of Guelph to identify early on potential opportunities to enhance various land use configurations that could better accommodate nearly 52,000 people, while maintaining 50 percent less energy use per capita and 60 percent less GHG per capita.

A variety of key insights were gained during the initial exercise with the City of Guelph, including the importance of establishing energy objectives early on with local stakeholders, including utilities, business associations, and residents, to develop buy-in to the process and of having corporate commitment and multi-disciplinary teams to overcome traditional decision making silos. In addition, the importance of linking land use objectives and energy goals was recognized. For the City of Guelph, careful consideration was given to how different land uses and built form types could be optimized to meet population growth requirements, while also minimizing energy consumption. The objective for the City was to create an energy density map that integrated, to the fullest extent possible, the goals of the Guelph CEP, including accommodating 52,000 new people, while striving to achieve a 25 percent level of energy efficiency over Ontario's current building code requirements. To assist with connecting land use and energy together, a measure of gigajoule per hectare (GJ/ha) was used. This measure has garnered increased support within the planning community to assess the level of appropriateness of land uses and built form from an energy consumption perspective.

For the City of Guelph, an energy baseline of the existing built environment was established and various energy efficiency scenarios for the built environment were developed to analyze the most cost effective approach in terms of $/tonne of GHGs emissions reduced (see Figure 4). It was determined that if Guelph were to undertake no improvements in the built environment, it could expect to see a 35 percent increase in energy demand for the project planning period which was until 2031. From the review of various building energy efficiency scenarios, it was identified that a 50 percent improvement in energy efficiency over the existing Ontario building code would be required for all new buildings and that a 25 percent improvement through retrofits of existing buildings would be needed to meet the goals for Guelph. Figure 4 illustrates a 35 percent decrease in Guelph's GHG/ha for all built form between businesses as usual and ultra high efficiency scenario based on land use efficiencies and energy efficiency within the built-from.

Guelph has a mix of building types, e.g. low rise, medium high rise and high rise, each of which has a different energy profile. An important insight from the mapping exercise was the challenge of maximizing a building type to reduce energy consumption without leading to undesirable land use mixes. It was also identified by Guelph during the mapping exercise that accommodating higher energy consuming building types, such as high rise, can be offset from reductions in transportation related emissions due to lower automobile usage and can support the use of integrated community energy systems (ICES), such as district energy.

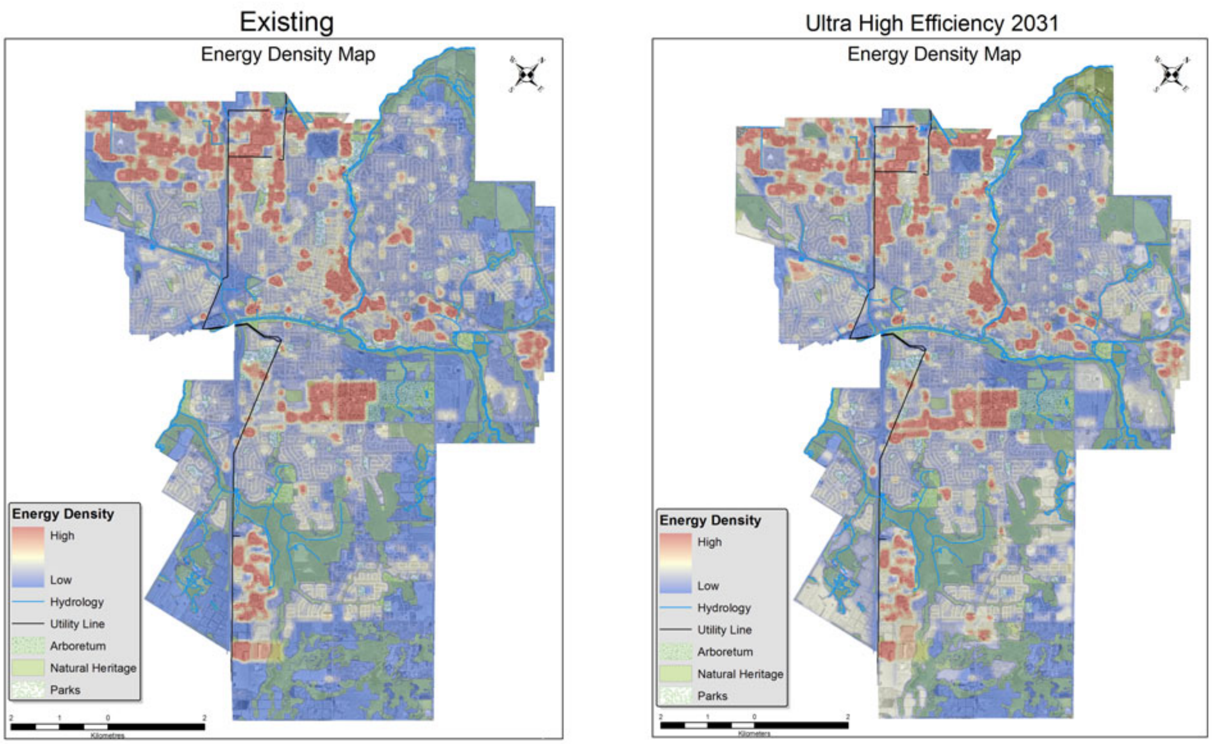
Another important finding from the initial work with Guelph was that an appropriate mix of development types influences transportation patterns for a community. For Guelph, transportation represented just under half of all GHGs. With no changes in Guelph's transportation pattern by 2031, it was revealed that a 50 percent increase could be expected in fuel energy demand.

The ability to overlay transportation patterns with land use activities provided an opportunity for planners and transportation engineers to review variations of transportation impacts at one time and maximize various strategies in terms of transportation demand management and other mass public transit options. For Guelph, it was found that automobile use would continue to increase even with continued investments in bus transit. This led to a concerted effort to place more focus on modifying land uses forms to influence demand scenarios and the use of vehicle efficiency scenarios.

For Guelph, it was identified that to achieve the per capita goals would require a 100 percent increase in the use of transit, cycling and walking over business as usual. In addition, the average trip length would need to be reduced by about 10 percent and overall number of trips reduced by 10 percent. At the same time, vehicle efficiencies in Guelph would need to improve with a high reliance on hybrid and plug in hybrid cars. The heavier reliance of plug in hybrid cars was based on the expected improvements in Ontario's grid efficiency in terms of reduced GHG emissions from the use of alternative and renewable generation. The resulting combinations of transportation demand management and vehicle efficiency options identify that a 65 percent reduction in energy demand associated with transportation would be required to help Guelph move towards its per capita goals.

As a result of the mapping work, the City of Guelph undertook to maximize the transportation and land use activities prior to the establishment of a community official plan and integrate an energy and land use map into the land use approval process to help guide long-term growth and decision making for the community.

Figure 4: Businesses as Usual and Ultra-High Efficiency Scenario for Buildings the City of Guelph by 2031



Opportunities to Advance Energy Mapping with Utilities

A number of energy utilities and agencies in Canada are now supporting or undertaking community energy planning and mapping. Varied benefits are anticipated in the areas of: planning & consultation, regulatory processes, energy efficiency program delivery, and municipal government relations. The following discussion summarizes the benefits of mapping based on the views of five Canadian entities:

- Ontario Power Authority: the corporation responsible for long-term electricity system planning, as well as the procurement of new supply and demand resources.
- Horizon Utilities Corporation: the electric LDC serving Hamilton and St. Catharines, Ontario.
- BC Hydro: a soon to be vertically integrated electricity company serving the Province of British Columbia. BC Hydro runs Powersmart, one of the most mature DSM programs in North America.
- Union Gas: one of two largest private, natural gas local distribution companies serving Ontario customers, and
- Powerstream Utility: the electric LDC serving communities located immediately north of Toronto and in Central Ontario

Planning

All of the entities interviewed saw integration of various planning processes as a source of potential value for their companies.

Horizon and BC Hydro see significant potential for mapping to inform the distribution system planning process. Specifically, integrated planning will give the utility a more detailed and nuanced understanding of municipal growth patterns, which should result in better distribution system plans. This is expected to result in more intelligent infrastructure decisions and potentially huge savings for rate payers through capital deferrals.

Horizon has publicly positioned itself as a leader in sustainability and DSM. Horizon has one of the best records of DSM program success in Ontario, and was the first LDC in Ontario to voluntarily adopt Global Reporting Initiative sustainability reporting as a corporate priority (see http://www.horizonutilities.com/HHSC/html/leadership/sustainableDevelopment.jsp). Horizon wants to build on this record. It sees the data from the mapping process as valuable information to be deployed throughout its business (Cananzi, 2009).

All of the interviewed utilities and the OPA see mapping as a method to improve the planning of energy efficiency and renewable incentive programs. Through mapping an entity can better identify areas of high demand or renewable potential, and thus better target programs to that community. Union Gas also noted the potential value of mapping historic program participation on land use and energy map to identify trends and linkages that can be used in program targeting and marketing.

In addition, mapping is seen as an important tool to assist with public consultation and communication. Energy planning can be a difficult topic to discuss with the community on: the issues are technical, and often data sharing is limited due to privacy concerns. BC Hydro sees real benefit in using maps to visually depict energy trends in communities. This is expected to support the development of energy and GHG reduction strategies. Since it relies on estimates and archetypes, mapping avoids problems related to privacy of data which can otherwise hamper public consultation around energy use.

Regulatory Process

Mapping is seen as a powerful tool in the regulatory forum. For a transmission planner, it allows for clear communication, in a visual format, of sources of alternative supply, demand and transmission. The integration of land use and energy can also allow for the regulator to consider a utility's plans based not just on weather and historical growth patterns, but on the details of expected growth patterns driven by the market and government policy. Horizon, in particular, sees this as a major benefit. Currently, in the regulatory process, Hamilton, one of Horizon's communities, is compared to the City of Brampton in benchmarking. However, in Horizon's view, this is a misleading comparison as Hamilton is an older, densely populated urban city with aging infrastructure, while Brampton is a rapidly growing new, suburban, lower density community with relatively new infrastructure. The mapping process will also help Horizon to bring such differences forward to the regulator.

DSM Potential

To the extent that mapping enables action at the level of urban form and infrastructure (the highest level in the energy decision making hierarchy depicted in Figure 1, above), it can contribute to the achievement of demand and GHG emissions reductions incremental to the end use savings typically targeted by DSM programs. Evidence indicates that changing the form and infrastructure in cities can deliver energy and emissions reductions. A recent study indicates that stringent land use policy to encourage densification, including constraints on the geographic footprint of cities, specification of densification corridors with fast and reliable transit, and reform of the property tax system to reflect marginal infrastructure building and maintenance costs, has the capacity to reduce direct and indirect urban emissions by approximately 40 to 50 percent in the long run, while reducing overall national emissions by about 17-20 percent (MKJA, 2009).

All of the utilities interviewed expect the information from mapping to be incorporated into the next generation of DSM planning. BC Hydro, the Canadian leader in this area, has gone one step further by launching a comprehensive sustainable communities program to support the municipal sector contribute to BC's ambitious climate change goals (see http://www.bchydro.com/powersmart/ps_communities.html). As part of BC Hydro's sustainable communities program, BC Hydro is providing support to communities to undertake community energy planning and mapping. For instance, they are currently help the City of Vancouver to undertake a building heat density mapping process to identify district energy opportunities.

Relationship with Municipal Government

Energy and land use mapping is seen as a way to create strong bridges between LDCs and municipal governments. Horizon has discovered that the mapping process creates common cause between the two entities. While the bridge might first be built with mapping, opportunities for further collaboration can grow out of this process. For instance, the City of Vancouver and BC Hydro have recently entered a memorandum of understanding to collaborate on a four issues of interest: electric vehicles, on-bill financing, renewable energy development and integrated infrastructure planning.

Powerstream has been an Ontario leader on building relationships with the municipalities in its service territory. One step that it has taken was the creation of a municipal working group that meets regularly to discuss matters of shared concern, especially relating to DSM.

Powerstream sees energy, transportation and land use mapping as a powerful tool for building on the existing relationship and giving the working group new focus.

Conclusion

The energy, land use and transportation mapping approach offers a cost-effective opportunity to link the built environment, land use, transportation, as well as renewable/alternative energy sources and other utility factors to inform long-range planning and investment in power infrastructure for regional and local energy uses. The benefit of an energy, transportation and land use mapping approach is the ability for municipalities to graphically illustrate, track and monitor energy consumption and provide a clear link to land use, transportation and utility strategies across an entire city. The process also offers valuable information to gas and electric LDCs in terms of forecasting load growth and keeping capital investment to a minimum. To fully recognize these opportunities, there remains a need for the planning, engineering and utility community to become increasingly engaged in understanding how daily land use, transportation and energy infrastructure decisions directly impact on the long-term energy consumption and cost for a community.

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