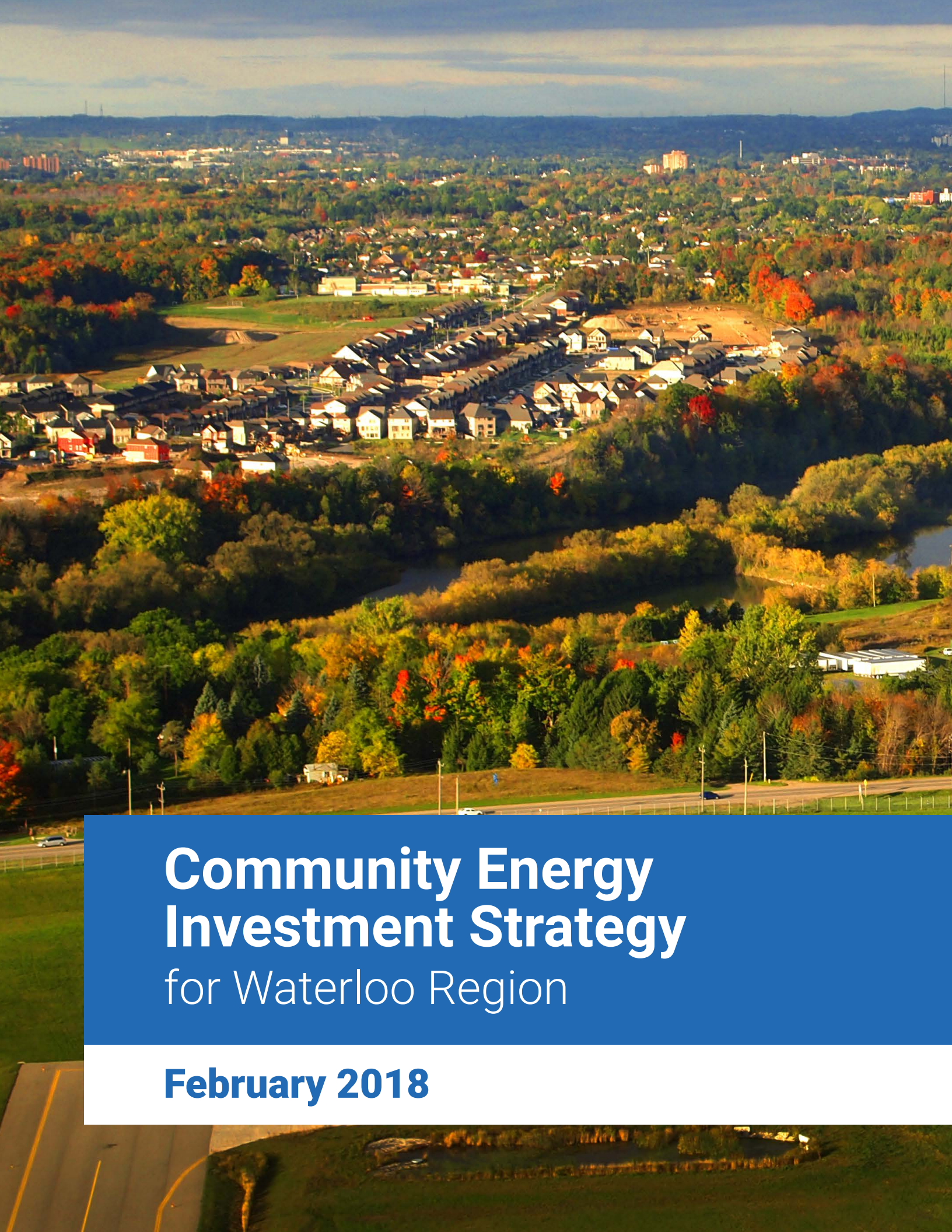

Community Energy Investment Strategy

for Waterloo Region

February 2018

This Strategy was developed in collaboration with the following organizations.

The parties involved in developing this Strategy acknowledge project funding support provided by the Government of Ontario's Municipal Energy Planning program.

However the content of this Strategy is reflective of the work conducted by the collaborating organizations identified above and does not necessarily represent the views and opinions of the Government of Ontario.

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EXECUTIVE SUMMARY

Canada's population is both growing and aging, and there is an ever present concern related to public spending, rising energy prices, economic competitiveness as well as climate change and environmental protection. In order to sustain a community's quality of life in the long-term, optimized infrastructure investments are required to improve energy efficiency and conservation, reduce costs and adverse environmental impacts. This includes ensuring the energy system is reliable while recognizing the need to implement innovative technologies that make better use of local energy resources.

Towards this end, many municipalities in Canada have developed community energy plans or greenhouse gas (GHG) emission reduction plans which include a comprehensive list of initiatives that should occur to achieve associated goals, objectives and targets. The challenge for proponents of these plans is to successfully access the resources required and gain the necessary policy support for implementation of initiatives even though there are a wide variety of sources of funding available.

In 2015, nine local organizations formed a partnership to collaboratively develop a Community Energy Investment Strategy (CEIS) for Waterloo Region. The partners included the Region of Waterloo, the Area Municipalities, the three local electric utilities and the two natural gas utilities serving this region. Waterloo Region already has a Community Climate Action Plan including a list of measures that broadly address its GHG emissions, the vast majority of which come from local energy consumption. In order to build on this plan, development of the CEIS has required key stakeholders to identify community perspectives on energy challenges, needs and opportunities. They also helped identify the supports necessary to implement local solutions that work for the Waterloo Region community.

The main components of the Strategy include a purpose, goals and objectives, description and evaluation of strategic energy opportunities, recommended actions to support implementation of the most promising opportunities, as well as progress indicators to monitor change periodically. With a time horizon of 25 years, the purpose of the CEIS is to improve and sustain Waterloo Region's economic competitiveness and quality of life through the coordination of targeted energy investments.

Appendices A and B include the list of 22 Energy Opportunities evaluated within the CEIS and the 20 Recommended Actions that aim to support and facilitate implementation of the opportunities towards achieving the CEIS goals and objectives.

> The purpose of the CEIS is to improve and sustain Waterloo Region's economic competitiveness and quality of life through the coordination of targeted energy investments.

The impact of fully implementing all 22 Opportunities on Waterloo Region's community-wide energy consumption in comparison with a business-as-usual (BAU) forecast is estimated to be a 39% reduction in use of imported electricity generation and fuel by the year 2041. This also translates to about 50% less GHG emissions compared to actual base year levels estimated using data from calendar year 2014 as the baseline year. In this context, the CEIS represents a potential lower energy and emissions path for Waterloo Region over the next two decades while keeping more energy dollars circulating within the local economy.

The CEIS is not intended to prescribe specific projects at pre-determined locations, but rather focusses on identifying better ways to attract investment towards projects that will provide the most community benefits to Waterloo Region. Achieving this focus is, in part, fundamentally dependent on how well we integrate energy management considerations into existing major community-scale planning activities within Waterloo Region including:

- the Economic Development Strategy which recognizes the need to create a green, sustainable and efficient region that anticipates growth;
- the Community Climate Action Plan involving GHG emission reduction targets;
- Provincial policy requiring municipal land-use and infrastructure master planning to influence development and transportation patterns regarding energy conservation along with climate change mitigation and adaptation; and,
- Energy infrastructure planning efforts focused on this region involving the local utilities and Independent Electricity System Operator starting in 2018.

Collaboration and commitment to the necessary governance structure, providing administrative resources to support implementation, ongoing stakeholder engagement, and periodic monitoring of the Strategy are critical success factors. Implementation of the CEIS will support better integrated decision-making on community energy planning within Waterloo Region over the next 25 years in an economic, environmental and social context. This is integral to attracting investment into energy projects that are responsive to local needs as well as their integration with development patterns.

1.0 INTRODUCTION AND BACKGROUND

For several decades, energy planning in Ontario and many other parts of Canada has involved three main groups: i) regulators, ii) energy generators or fuel suppliers and, iii) organizations who transmit and distribute energy services to where they are required. Traditionally, the focus of this type of infrastructure planning has primarily focused on ensuring adequate and reliable supply to serve populations, communities and to support economic development and growth.

More recently, the groups involved in energy planning have broadened and the focus expanded to include using energy more efficiently and effectively, captured under the concept of conservation and demand-side management, reducing greenhouse gas (GHG) emissions and trying to make energy more affordable. It is this broader focus that opens up the localized scale of energy planning as a means to yield value-added benefits for communities.

However, there are some significant system-wide and background influences that create challenges to effective energy planning. Urban growth and development pressures, aging infrastructure, the impact of extreme weather events on energy infrastructure and services along with the rising cost of supplying and delivering fuel and utilities are some of the challenges faced today. Additionally, the presence of multiple municipal governments and utility providers within a single community adds to the complexity of local decision making in this regard.

On top of all these influential factors, there is a low level of energy literacy amongst the general public as well as decision makers in the industrial, commercial and institutional sectors. Generally speaking, the energy system is poorly understood by those that it serves which affects the ability to recognize opportunities to influence energy costs that are within direct control of consumers. The critical role that smart energy planning and management play in ensuring a sustainable and prosperous level of economic development is also not widely understood.

Many of the aspects of our current energy system that require improvement are associated with too much energy being generated (or not enough) at the wrong time, too far away from where it is needed and often used inefficiently. Community energy planning enables greater local influence in meeting local energy needs with a focus on accessing the right type of energy services where we need them, in the right quantities and at an affordable price using environmentally responsible resources. Optimizing this influence requires progressively transforming or, in the short-term, incrementally evolving our current energy system into something that is more effective, equitable and sustainable.

Recognizing these issues, a small forum of local stakeholders gathered in the fall of 2014 to explore the collective interest in developing a community energy plan for Waterloo Region. The community energy plan was being considered in the context of the then recently approved Community Climate Action Plan, which focused on GHG emission reductions, existing utility Conservation and Demand Management Plans, and a growing interest by municipalities to meet climate

and energyrelated objectives within provincial regulations and land use policy. Participants in the local forum agreed that a proposal should be submitted to Ontario's Municipal Energy Planning (MEP) program in the hopes of securing funding support to conduct the necessary planning activities.

After successfully obtaining leveraged provincial funding, a local partnership was formally established in the fall of 2015 to develop the CEIS. The partners included the Region of Waterloo, as the lead, the Area Municipalities, the three local electric utilities as well as the two natural gas utilities serving this community. From the outset, the CEIS was intended to guide Waterloo Region in:

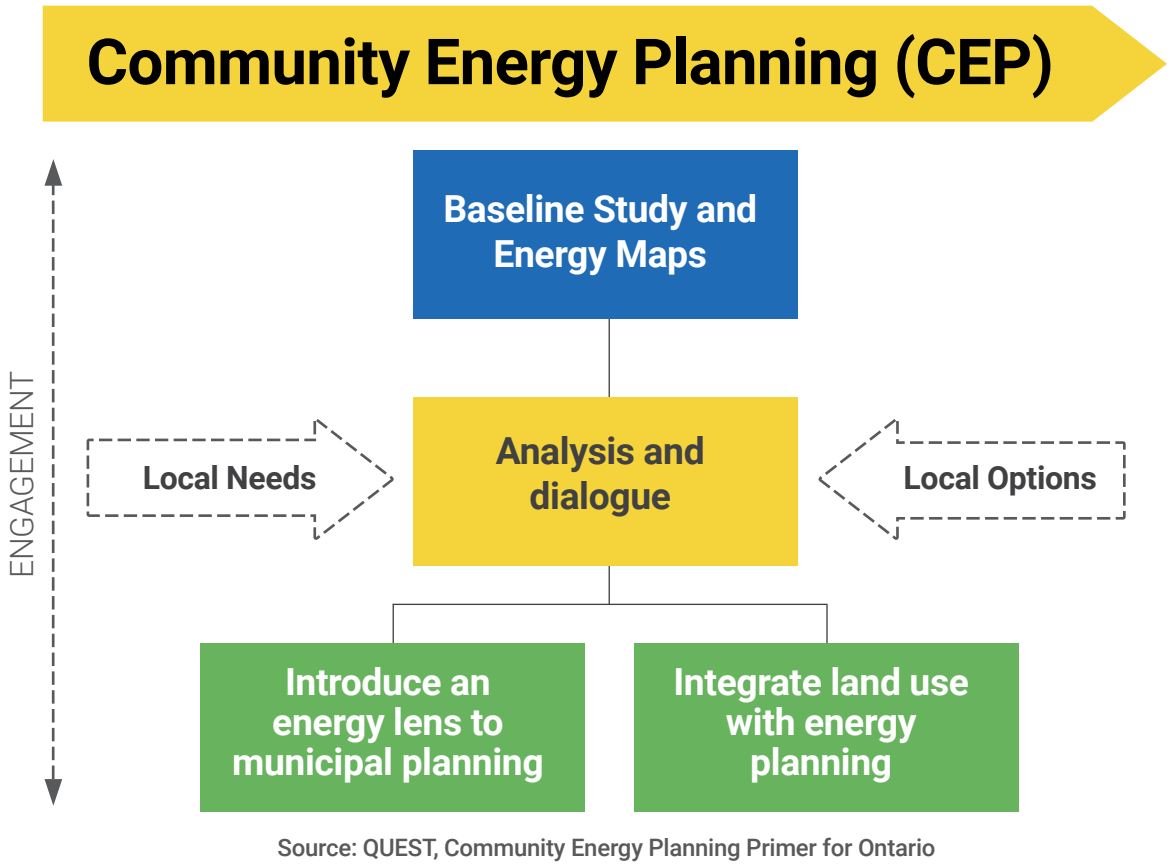
- optimizing its use of energy resources,
- improving energy resiliency,
- achieving several region-wide economic development objectives,
- reducing GHG emissions, and
- complementing long-term municipal land use and infrastructure master planning.

Over the past two years, the core partners have worked to develop the CEIS, with assistance from various technical consultants, and input provided by the community. Although the CEIS was developed by the nine core partners, its implementation will involve stakeholders from across the community. The Strategy provides an opportunity to develop a bridge for residents and employers from being merely energy consumers to energy stakeholders. This transformation is critical in making our energy system better at meeting our local needs and objectives.

The following sections further describe the Strategy as well as the planning process that was followed in its development.

1.1 What is Community Energy Planning?

A Community Energy Plan (CEP) is a tool that can help communities realize smarter approaches to energy use at the local level by helping to define their priorities around energy with a view to improving efficiency, cutting emissions, and driving economic development.[i] Community energy planning involves examining how and where we use energy in relation to current and desired land use, growth management objectives, and initiating a dialogue with local stakeholders who are affected by energy policy, planning and management decisions. Figure 1 Illustrates this planning concept.



Source: QUEST, Community Energy Planning Primer for Ontario

Figure 1. Conceptual diagram of Community Energy Planning

How we develop and manage our communities, including all the buildings and transportation systems within them, is directly tied to our energy use. Establishing more clarity on this interconnection within decision-making frameworks in this regard is what the localized scale of energy planning can bring. It is a platform to offer community members more conscientious choice in a social, economic and environmental context.

Communities that have analyzed their local energy opportunities have identified opportunities for strong economic returns on investments, environmental and health benefits, and improved quality of life for local residents. More than 400 communities across Canada, representing more

than 50 percent of the population, are engaged in community energy planning.[ii] The benefits of community energy planning are summarized within Table 1 below.

Economic Benefits	Environmental Benefits	Health and Social Benefits	Resilience Benefits
• Reduce energy spending for households and businesses • Recirculate energy spending within the local economy • Create high-quality, local jobs • Attract and retain businesses • Increased retail sales • Increase property values • Capitalize on a growing clean technilogy market	• Reduce greenhouse gas emissions • Foster healthy ecosystems • Use land and natural resources more efficiently	• Improve social connectivity • Improve mental health • Reduce cardivascular diseases and respiratory illnesses • Increase physical activity • Improve air quality (indoor and outdoor) • Reduce healthcare costs • Reduce the heat island effect	• Improve access to reliable sources of energy • Reduce exposure to energy price volatility • Solutions for areas facing energy poverty • Recognize local priorities • Reduce the replacement cost of asset renewal

Table 1. Benfits of Community Energy Planning[iii]

1.2 Community Partners and Local Energy Stakeholders

Any successful community scale energy strategy can only be progressive, effective and responsive to local needs with the involved participation of a wide array of different stakeholders. In addition to the Region and local Cities, the core partners involved in developing this strategy included five utilities as outlined below.

Local Distribution Companies (LDCs)

There are three electrical utilities that distribute power throughout Waterloo Region as follows:

- Energy+ serving Cambridge, North Dumfries and Brant;
- Kitchener-Wilmot Hydro serving the City of Kitchener and Township of Wilmot; and,
- Waterloo North Hydro serving the City of Waterloo and the Townships of Wellesley and Woolwich.

LDCs are responsible for getting electricity from the major transmission lines through the distribution and feeder substations to individual business and residential customers. These utility companies are also responsible for delivering mandated conservation and demand management programs (e.g. incentives, rebates) as well as ensuring appropriate connections are made when installing rooftop solar photovoltaic (PV) systems, combined-heat and power (CHP) systems as well as electric vehicle (EV) charging stations. The LDCs are wholly owned by the three local Cities and four area Townships within Waterloo Region.

Natural Gas

Union Gas Limited (UGL) is the primary supplier of natural gas to this region, which was recently purchased by Enbridge Gas when they acquired UGLs parent company Spectra Energy. In addition, Kitchener Utilities purchases natural gas from a variety of suppliers and use the Union Gas storage and transmission network to get the gas to customers within the City of Kitchener. Both UGL and Kitchener Utilities are also responsible for new customer connections and delivery of conservation demand-side management programs.

There are other major stakeholders that have already or could influence energy planning and management throughout Waterloo Region. Section 2.0 of this Strategy provides a brief summary of what we heard from the broader community during the stakeholder engagement activities conducted in 2016 and 2017. A separate document entitled Community Perspectives on Energy includes more details of this stakeholder engagement as well as a list of the key local influencers related to energy planning and management.

1.3 A Changing Energy Market

Canada's population is both growing and aging, and there is an ever present concern related to public spending, climate change and the environment as well as increasing energy costs. Internationally, the cleantech and renewable energy market is expanding rapidly internationally as capital investment and jobs in renewable energy has surpassed the combined total for oil, gas, coal for the past five years in a row. However, Canada is struggling to remain competitive and earn more market share in this innovative emerging economic sector.[iv] In this context, affordable and sustainable energy is perceived as a challenge by many stakeholders. As a result, Canadian communities, businesses, industry and residents are missing opportunities to use energy resources more efficiently and to improve economic competitiveness.[v]

The evolving economy is also changing the energy marketplace. Innovations in energy and equipment technology such as energy storage in homes and businesses, new market players along with consumer demands for real-time information and control over energy decisions are requiring energy providers and distributers in the marketplace to adopt many new changes with regard to how they operate and interact with customers. Ontario's centralized electricity generation capacity and vast network of transmission lines and natural gas pipelines has many advantages. However, energy systems that are more localized and integrated with communities are increasingly showing potential to improve resiliency to extreme weather impacts and exposure to volatility in market pricing, enable local energy savings as well as GHG emission reductions.[vi]

Increasing consumer uptake of electric vehicles (EV) is motivating provincial and local policy changes to make EVs easier to charge. Growing consumer adoption of EVs represents the beginning of a potentially major shift in the long-term from powering vehicles with imported

fossil fuels to relatively cleaner and less expensive electricity[vii] created within the Province of Ontario. As more consumers recognize the opportunity to save money on fuel by driving EVs instead of gas powered vehicles, this shift could also translate into new revenues for the LDCs whose shareholders are usually municipalities representing a boost to local economies and communities.

Local energy generation is also seeing increased investment by residents, organizations and institutions, driving local interest in sharing energy between buildings, even when those buildings and the energy generation have different owners. As local energy needs continue to evolve, communities will need to anticipate and adapt to changes in the energy market to better support them. Communities that are sustainable in the long-term must make optimized infrastructure investments. They must also implement innovative technologies to reduce energy consumption, as well as the associated costs and environmental impacts, while ensuring the energy system is reliable and makes better use of local energy resources.

1.4 Policy Context

Communities, as end users of energy, are central to enabling federal, provincial and territorial governments to achieve their energy, climate change and related land-use planning objectives through the implementation of CEPs. This role is particularly evident as communities grow because energy and emissions are closely associated with development patterns over time in terms of the types of buildings and transportation networks that are constructed.

The following Acts, Plans and Policies, most of which are set by the Province of Ontario, are highly relevant to Waterloo Region's community energy planning efforts. Details of their relevance to the CEIS are provided as context within a supplementary document entitled Strategic Energy Opportunities for Waterloo Region.

Energy Planning and Management

- Ontario Long-Term Energy Plan
- 2015 - 2020 Conservation First Framework
- Ontario Municipal Energy Plan program
- Ontario Regulation 397/11: Energy Conservation and Demand Management Plans

Municipal Authority, Land-Use Planning and Buildings

- Ontario Provincial Policy Statement (2014)
- Section 147 of the Ontario Municipal Act (as amended May 2017, Ontario Bill 68)
- Ontario Building Code (2012)

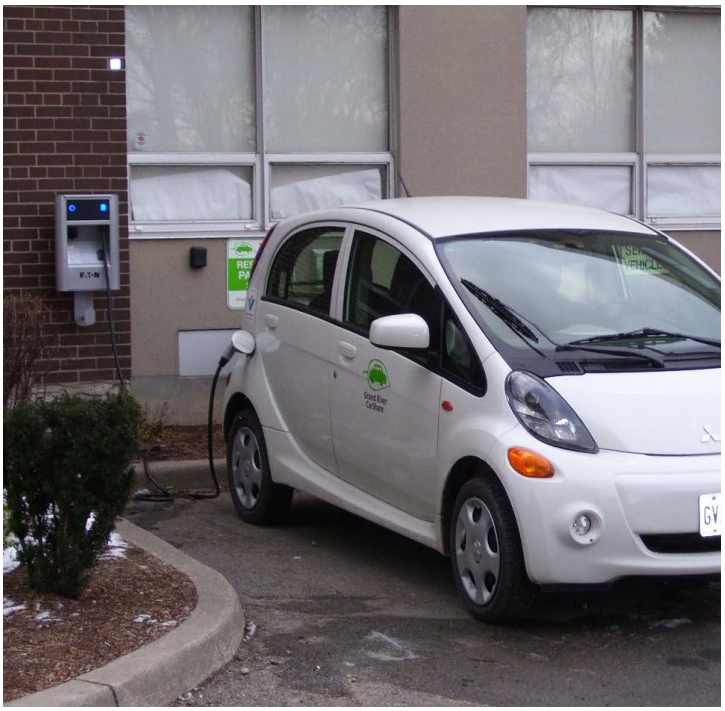
- Growth Plan for the Greater Golden Horseshoe (2017)
- The Regional Official Plan and the seven area Cities and Townships community-specific Official Plans

Climate Change and Economic Development

- Ontario's Climate Change Action Plan (2016)
- Ontario Green Energy and Green Economy Act (2011)
- Waterloo Region Economic Development Strategy (2014)
- Community Climate Action Plan for Waterloo Region (2013)

Long-term energy planning is an essential component of advancing sustainable community development. Municipalities have access to, as well as the authority to use, a variety of tools that can facilitate the implementation of community energy solutions and influence energy choices. Some examples include Official Plans and infrastructure master planning, zoning by-laws, site plan controls, community improvement plans, loan improvement charges as well as parking charges to support transportation demand management plans.[viii]

Many changes to the Ontario Building Code (OBC) related to energy and water efficiency have also been introduced through recent amendments with a continued "ratcheting up" expected in the future in order to facilitate the building construction industry to meet the provincial direction for all new construction to be built to "net zero" standards by 2030. A net zero home is designed, modelled and constructed to produce as much energy as it consumes on an annual basis. Significant changes to the OBC are proposed for the 2019 - 2022 period including energy efficiency, solar-ready roofs and infrastructure required to charge electric vehicles.



Planning solutions to increase energy investments made within Waterloo Region will also support local economic development, reduce the community's dependence on imported resources and exposure to volatile commodity markets.[x] Sustainable growth and an adequate energy system will require flexible partnerships involving a variety of stakeholders to collaborate on local policy changes, advocate for needed provincial and national policy, anticipate and adapt to changing technology and market forces, and continue to involve the community in integrated energy planning processes.

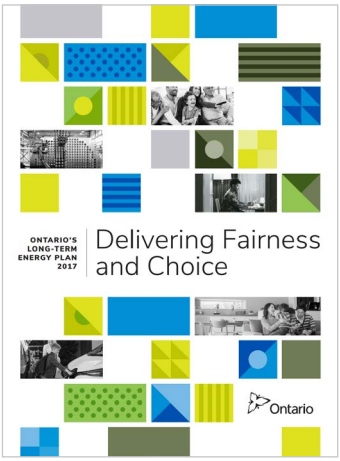
1.5 Energy Planning in Ontario

The Province of Ontario released its first Long-Term Energy Plan (LTEP) in 2010 to establish high level goals and objectives for energy infrastructure, particularly addressing electricity generation and demand. The Plan was subsequently reviewed with public consultation and updated in 2013 with an emphasis on the role of conservation as well as energy planning. In 2016, stakeholder consultation was initiated again to feed into the development of the third iteration of the LTEP, which was recently released late in October 2017.[xi]

The latest version of the LTEP builds on principles related to existing provincial initiatives such those listed below:

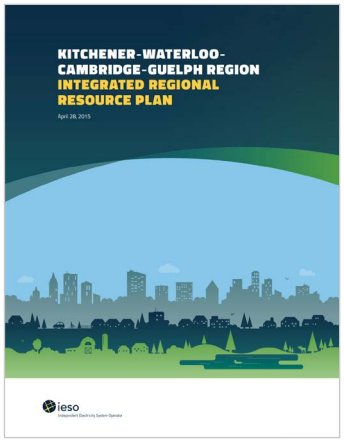
- Affordability including the Fair Hydro Plan regarding electricity prices;
- Reliability through regional energy planning of infrastructure and a vulnerability assessment of the energy transmission and distribution sector so utilities can develop state-of-the-art strategies to manage risk;
- Clean energy which largely refers to Ontario's Climate Change Action Plan;
- Community and Indigenous engagement with specific inclusion of a chapter on First Nations and Métis leadership; and,
- Conservation and demand management continued as a priority from previous versions of the LTEP as the cheapest way to provide a unit of energy.

While the LTEP addresses a province-wide scale, electricity system planning for communities has evolved in Ontario over many years. The Independent Electricity System Operator (IESO) and LDCs conduct regional-scale system planning to ensure a reliable supply and distribution of electricity to regions. Ontario has 21 electricity planning regions based on electrical infrastructure boundaries[xii]. Waterloo Region, including the Townships, is captured within the Kitchener, Cambridge, Waterloo, Guelph Planning area. This scale of regional electricity system planning looks at each area's specific needs and considers the entire spectrum from generation, transmission and distribution to end use and conservation.



Based on a process of needs assessment and consultation, energy planners develop recommendations on how best to meet the needs after considering a variety of factors. This process is known as Integrated Regional Resource Planning (IRRP). The objective of the IRRP process is to ensure regional long-term electricity plans consider and integrate all relevant resource options, such as conservation and demand-side management (CDM/DSM), distributed generation, large-scale generation, transmission and distribution. When an IRRP is needed, a working group involving the IESO, the electricity transmitter, and LDCs is convened to collaboratively develop the Plan while consulting local stakeholders.[xiv]

The IRRP for the Kitchener, Cambridge, Waterloo, Guelph Planning area was released in April 2015. The next five-year review and development process is expected to begin later in 2018 with an updated plan released in 2020. There will be an opportunity for Waterloo Region's CEIS to be integrated with the next IRRP for this area as it is required to consider a mix of the best available options including improved CDM/DSM, new or increased generation, investment in transmission or distribution facilities, or other innovative solutions. These solutions can give communities more influence and control over their energy costs and sources of energy supply, as well as associated benefits to the local economy as well as reduction of GHG emissions.



1.5.1 Municipal (Community) Energy Planning Process

The Ontario Ministry of Energy launched the Municipal Energy Plan (MEP) program in 2013. This voluntary program provides grants for local municipal governments and communities to develop local energy and GHG inventories, engage in stakeholder consultations (with particular focus on securing the support of local utility companies), and identify opportunities for conserving energy and improving energy efficiency.[xv]

With the financial support secured from the MEP program, and collaboration with its core community partners in place, the Region of Waterloo followed the three stages required by the MEP program which are included in a diagram below as Figure 2.

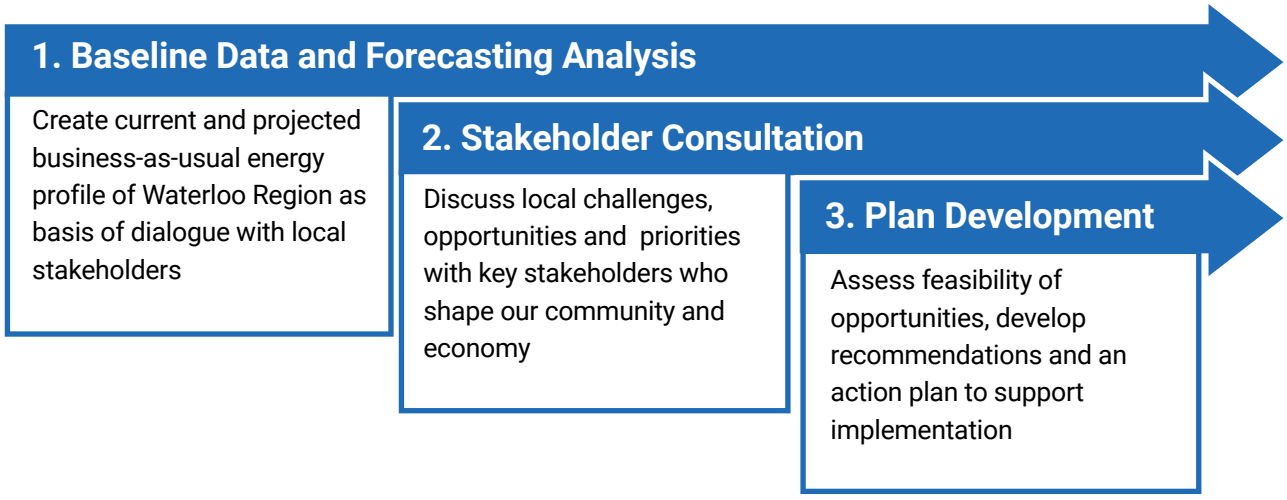


Figure 2. Three Required Stages of Community Energy Planning

These stages have been carried out commencing in late 2015 until the end of 2017. Sections 2, 3 and 4 of this document provide a summary of outcomes from each stage. However, the details of this work are contained in supplementary documents including:

a. **A Baseline Analysis and Business-as-usual Energy Forecast for Waterloo Region** – using 2014 as the base year and forecasted out to 2041 as a planning time horizon; [xvi]
b. **Community Perspectives on Energy** - Results of stakeholder consultations;
c. **Strategic Energy Opportunities** - Background on the energy system serving Waterloo Region and policy context supporting community energy planning in Ontario as well as a description and assessment of energy opportunities; and,
d. **Finance Mechanisms and Business Models that Support Community Energy Projects** - Research to support development and implementation of local energy opportunities.

1.6 Development of the CEIS: Investment Strategy Versus Energy Plan

Many CEPs and GHG emission reduction action plans in Canada identify a comprehensive list of actions and initiatives that should occur to achieve associated targets, goals and objectives. Yet, it is often difficult for proponents to access the resources required and gain the necessary policy support for implementation of actions within the plans even though there are a wide variety of sources of funding available in this regard. Aligning the most suitable financing and policy mechanisms as well as business model to specific projects is key to accessing funding resources at an acceptable cost to ensure effective and timely implementation.

Figure 3. Linking Community Energy with Major Local Planning Activities

Waterloo Region already has a Community Climate Action Plan which includes a list of actions and opportunities that broadly address the 94% of GHG emissions that come from local energy use.[xvii] In order to build on

this plan, local energy planning efforts have been focused on identifying what needs to be done to attract investment in the energy projects that would meet the most community needs and how to go about assessing priorities. Therefore, the core partners have focused this current local energy planning initiative towards developing a **Community Energy Investment Strategy**.

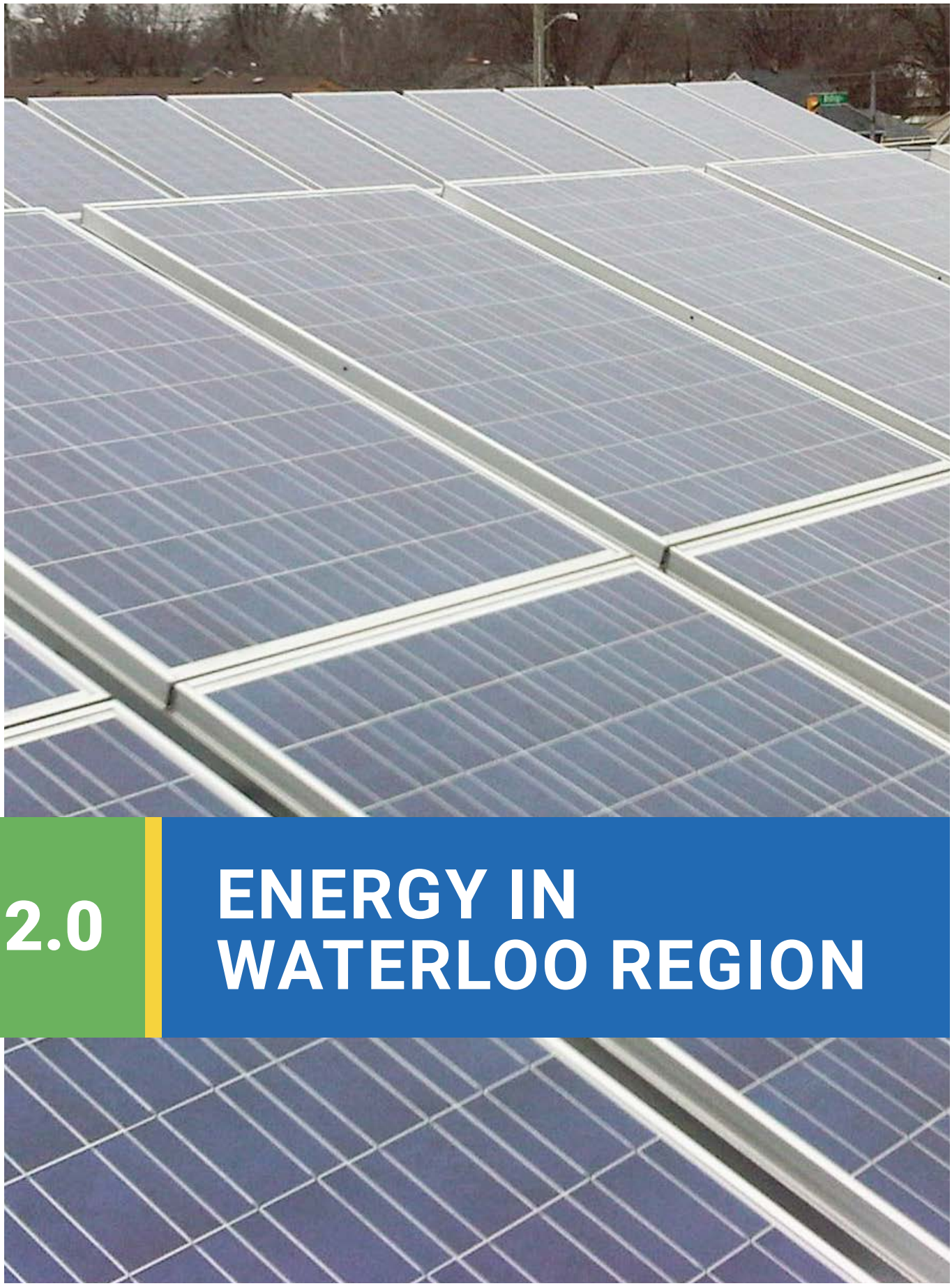
This Strategy builds on important inter-relationships between major community-scale planning activities as illustrated in Figure 3.

The inter-relationship between these planning and development activities is summarized below:

- The Economic Development Strategy for Waterloo Region includes objectives related to ensuring sufficient infrastructure capacity to accommodate growth including power, the need to create a green, sustainable and efficient region that anticipates growth as well as the desire to support and stimulate new and existing high growth sectors, including green energy;
- ClimateActionWR is currently developing long-term Community Climate Action Plan emission reduction targets for consideration of local government councils;
- Provincial policy is requiring municipal land-use and infrastructure master planning to influence development and transportation patterns regarding energy conservation along with climate change mitigation and adaptation; and,
- The IESO will be working with local utilities on its next iteration of their Integrated Regional Resource Plan for electricity planning in this region starting in 2018.

Creating and implementing this Strategy should contribute to advancing energy master planning at a community scale to go beyond ensuring adequate centralized supply of energy resources. This will fill a gap amongst the existing infrastructure master plans that are already in place within Waterloo Region and periodically reviewed regarding land-use, water/wastewater, transportation and waste management. Having a strategy to attract investment into further improving our local energy system over the next 25 years will also help support economic development as a core pillar for prosperity, growth and sustaining a high quality of life as energy is a part of our every day lives.

The CEIS complements the broader planning processes and provincial policy context previously described and aspires to keep more energy dollars circulating within the local economy through more local energy generation and reduced energy spending overall. An important social and economic link includes supporting local businesses to reduce energy costs and encourage new investment as well as business retention, with local job creation in related industries in addition to improving energy savings for residents through increased conservation efforts, making it more affordable to live in the community. Garnering support for energy based GHG emission reduction projects can also yield other environmental and social benefits such as reducing tail pipe emissions from vehicles using fossil fuels which help to reduce healthcare costs due to improved air quality and access to transit and active transportation.[xviii]



2.0 ENERGY IN WATERLOO REGION

This section provides a summary energy profile of Waterloo Region regarding generation, consumption, and community perspectives.

2.1 How We Use Energy Today in Waterloo Region

Defining the strategic direction that a community wants to go with respect to energy planning requires an understanding of how we currently utilize energy resources. This is broken down into two main elements: how much is used, such as the quantity by activity and cost by energy source, and where it is used spatially within the community including by sector (i.e. residential, industrial and commercial including institutional). A summary of this information is provided below with more details included in two separate supplementary documents on a) Baseline Analysis and Business-As-Usual Forecast of Energy Use in Waterloo Region and b) a background section within the supplement that describes the Strategic Energy Opportunities for this region.

Based on the local data collected, Waterloo Region used an estimated 78 Petajoules of energy during the year 2014 to heat and cool our buildings, provide power to lights, equipment and machinery and to fuel our automated transportation.[xix] Figure 4 Illustrates this consumption by end use and Figure 5 shows consumption by energy type.

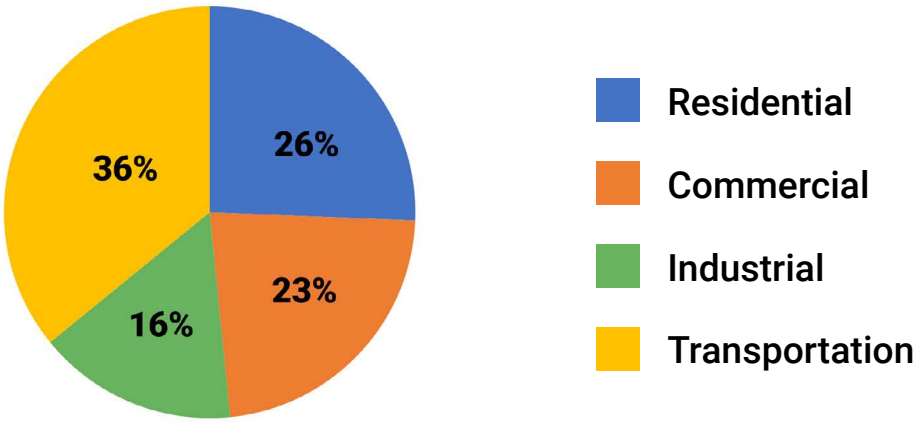


Figure 4. Energy Consumption in Waterloo Region (2014) by End Use

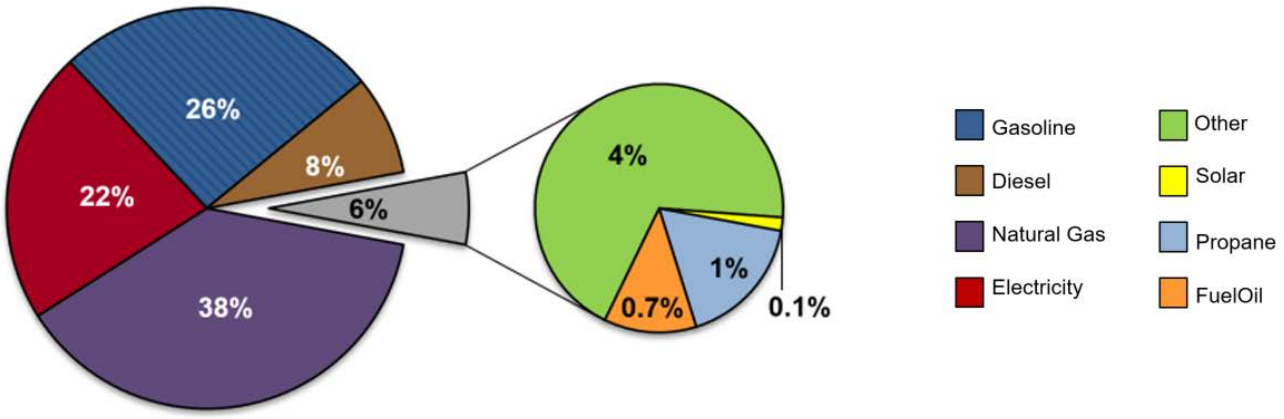


Figure 5. Energy Consumption in Waterloo Region (2014) by Energy Type.

The cost of using all of this energy every year is significant. When considering all local buildings and transportation activity by residents and organizations throughout Waterloo Region, this community spent nearly $2.1 billion on energy in the year 2014 as illustrated in Figure 6. Waterloo Region currently relies on imports for approximately 99.9% of its energy supply including electricity, natural gas and transportation fuels which are shipped in to various depots and local filling stations. As of year-end 2015, approximately 57,000 megawatt hours (MWh) of renewable electricity generation was created within Waterloo Region, by a number of different facility and landowners, with almost the entire amount of energy being sold to the Province and connected to Ontario's power grid. Only a nominal portion of local energy generated was used on site where the landfill gas, solar photovoltaic, geothermal or biomass energy generation occurred.

As virtually all the energy supply used within the region is imported, only 13% of the energy dollars spent within the community stayed locally with distribution companies and retailers. This current situation represents a very large hole in our local economic bucket as this translates to approximately $1.8 billion of our energy expenditures leaving our community each year. Keeping more energy dollars circulating within our local economy is directly related to a number of opportunities such as conserving energy and using it more efficiently, the continued shift over to electric vehicles as well as generating and distributing locally sourced energy. These opportunities, which can save money on energy costs for other uses, are further addressed in section 3.

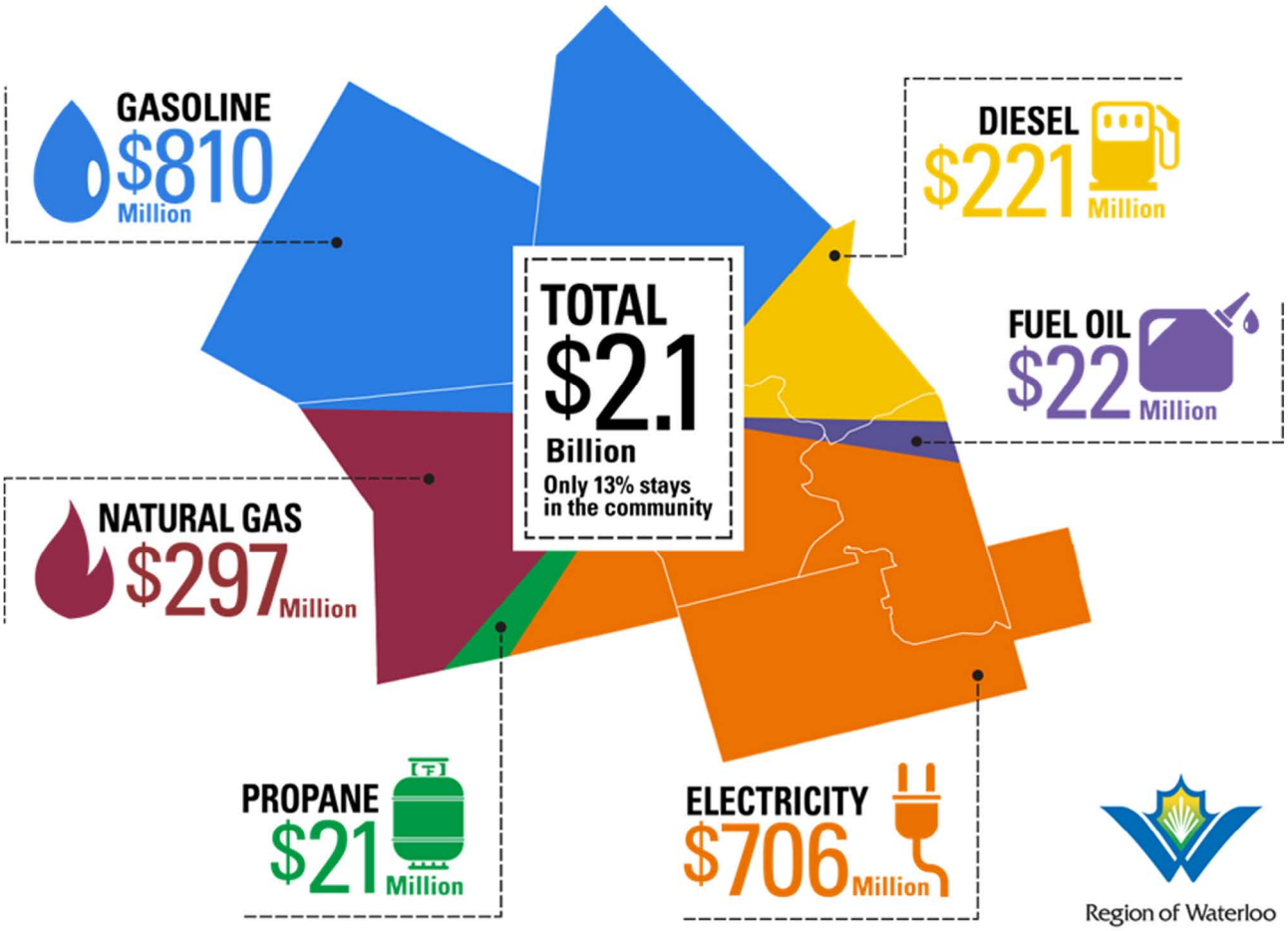


Figure 6. Cost of energy used in Waterloo Region (2014)

There is an important distinction between energy prices and energy costs particularly in terms of a community's more direct influence and control over costs. Prices for various energy resources such as power or fuel, for example, reflect the province-wide per kilowatt hour rates for electricity or price at the pump for vehicle fuel at gas stations. Energy prices have definitely increased significantly over the past 10 to 15 years as can be seen in Figure 7. Energy costs on the other hand are more representative of our individual or organizational energy consumption patterns. Our costs are directly influenced by our consumption behaviours and the types of residential or employment buildings that we live and work in as well as the equipment used within those buildings for heat, power or mechanical processes. Our transportation costs are similarly influenced by our choices in terms of where we live and work for example and how we get to and from our destinations with regard to the mode of travel and how it is fueled.

Although communities will have no influence over prices at gas pumps, an individual or organization can change the type of vehicle or mode of transportation used over time to reduce their overall transportation costs. It is a similar case for energy prices for power or heating fuel whereas conservation and efficiency actions can effectively lower costs for an individual resident or organization. The CEIS presents opportunities for residents and employers to lower their direct energy costs to respond to rising energy prices while also helping Waterloo Region remain more competitive by keeping energy dollars circulating within our local economy.

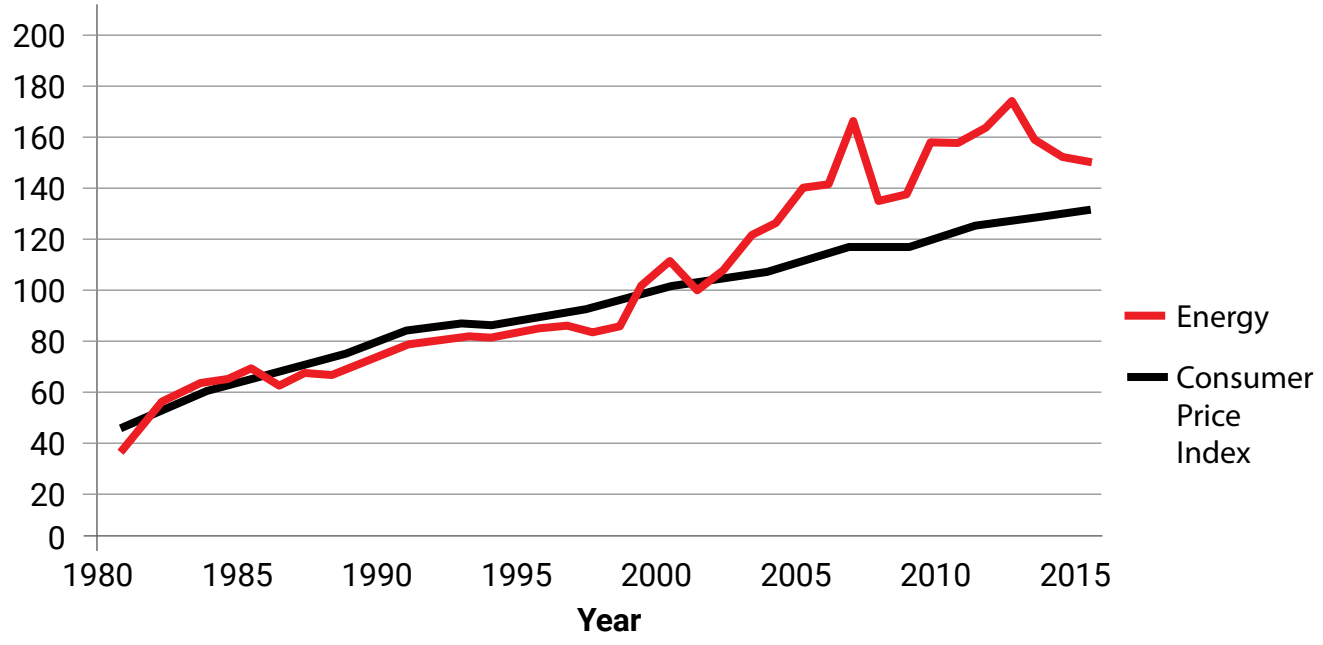


Figure 7. Energy prices in Canada rising faster than inflation 2000 – 2015[xx]

Note: Energy includes: "electricity", "natural gas", "fuel oil and other fuels", "gasoline", and "fuel, parts and accessories for recreational vehicles".

Energy use is separated into two main categories in this regard i) stationary energy as used in buildings or process equipment and, ii) transportation fuels as used in vehicles. In terms of where stationary energy is used throughout the region, the highest total energy use is concentrated in the built-up urban cores, as expected. However, high levels of energy intensity, or consumption per square metre of building space, are more dispersed throughout the region depending on the level of energy efficiency within buildings as well as type of business activity as illustrated in Figure 8.

From this perspective, age of the building or the type of activities taking place in certain facilities, such as a community centre with swimming pools and ice rinks, will influence the intensity of energy use. This can provide insight into energy opportunities such as potential sites for locally distributed generation or where to target energy conservation and demand-side management programs.

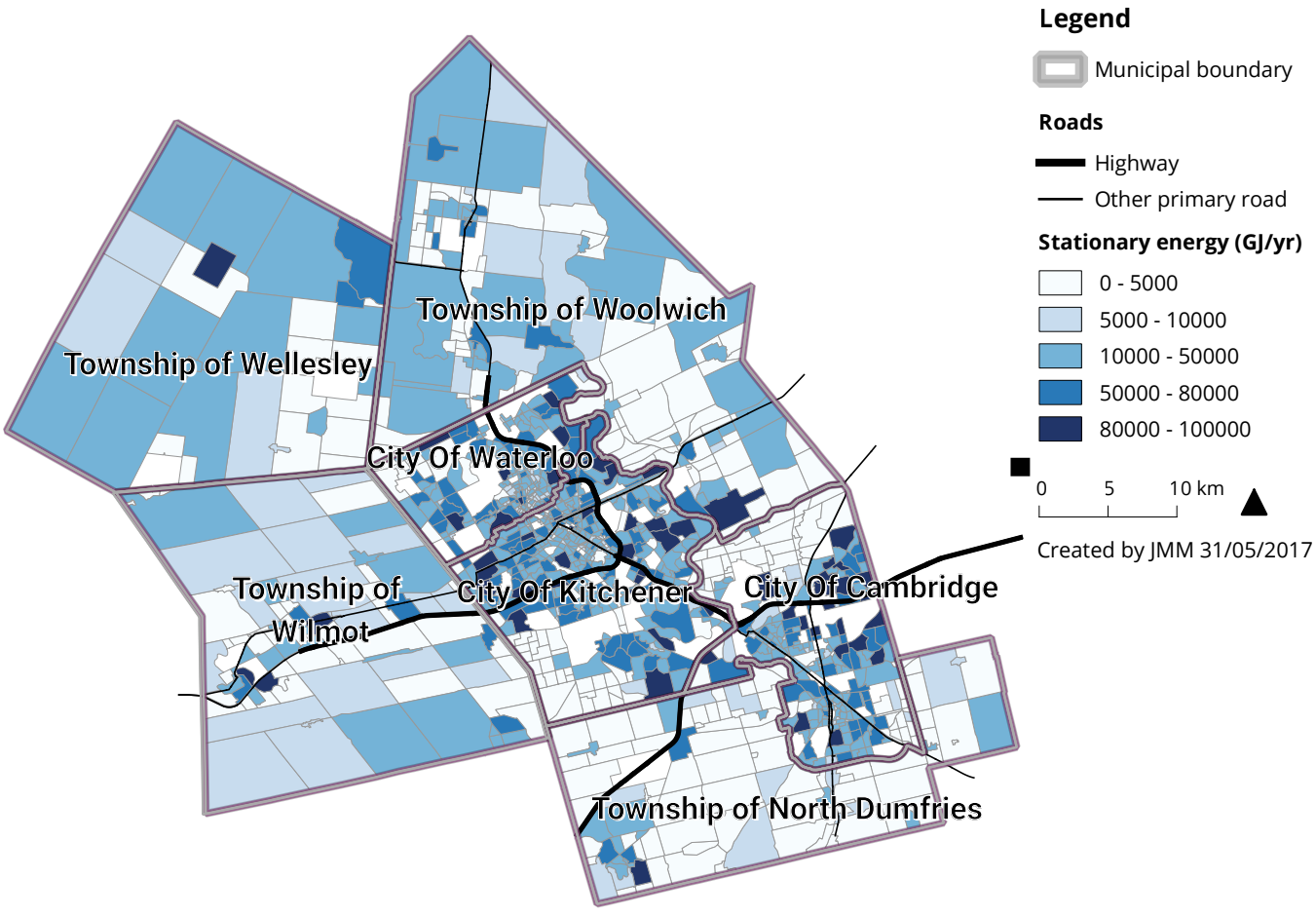


Figure 8. Stationary Energy Intensity within Waterloo Region 2014 (GJ/m2)

According to Ontario's Long-Term Energy Planning Outlook documents, demand for both stationary energy and transportation fuel has declined within Ontario from 2005 – 2015.[xxi] In Waterloo Region, the Community Climate Action Plan,[xxii] which measures and aims to reduce GHG emissions, indicated that total local electricity consumption was essentially flat between 2010 and 2015 (only increasing by <1%) and total stationary fuel consumption (natural gas, propane and fuel oil) in the industrial, commercial and institutional (ICI) sector increased by approximately 4% during the same period.[xxiii] Transportation fuel consumption within Waterloo Region, predominantly gasoline and diesel, grew by almost 7% between 2010 and 2015.[xxiv]

The change in energy use over this time should also be considered with the context of growth within the community and economy. As the population within Waterloo Region grew by 6% and an increase of 14% in GDP occurred from 2010 to 2015, per capita, per household and per employee values can illustrate changes in the efficient use of energy as indicated in Table 2. The table shows that consumption intensity decreased in almost all sectors within Waterloo Region from 2010 compared to 2015. The one noteworthy exception was natural gas consumption in residences which is heavily influenced by the demand for more space and hot water heating during the colder winter months of 2015 compared to 2010.

Table 2. Energy consumption factoring in Waterloo Region's growth 2010 – 2015
(Consumption values rounded to nearest whole number)

Residential Sector	Unit	Per Capita 2010	Per-Capita 2015	% Change	Per-Household 2010	Per-Household 2015	% Change
Electricity Consumption	kWh	2,623	2,510	-4%	7,347	6,973	-5.1%
Electricity GHGs	t CO2e	0.39	0.14	-64%	1.1	0.4	-64%
NG Consumption	m3	563	586	4.1%	1,576	1,629	3.4%
NG GHGs	t CO2e	1.06	1.11	4.7%	2.98	3.08	3.4%
All Energy Sources Consumption	GJ	33	32.87	-0.4%	92.45	91.31	-1.2%
All Energy Sources GHGs	t CO2e	1.63	1.39	-15%	4.58	3.85	-16%
ICI Sector	**Unit**	**Per-Capita 2010**	**Per-Capita 2015**	**% Change**	**Per-Employee 2010**	**Per-Employee 2015**	**% Change**
Electricity Consumption	kWh	5,945	5,645	-5.0%	12,379	11,543	-6.8%
Electricity GHGs	t CO2e	0.89	0.32	-64%	1.86	0.66	-65%
NG Consumption	m3	776	769	-0.9%	1,614	1,573	-2.5%
NG GHGs	t CO2e	1.47	1.45	-1.4%	3.05	2.97	-2.6%
All Energy Sources Consumption	GJ	53.42	52.45	-1.8%	149.64	145.7	-2.6%
All Energy Sources GHGs	t CO2e	2.56	2	-22%	5.33	4.09	-23%
Transportation Sector	**Unit**	**Per-Capita 2010**	**Per-Capita 2015**	**% Change**			
Gasoline Consumption	L	1,214	1,226	1.0%			
Gasoline GHGs	t CO2e	2.87	2.84	-1.0%			
Diesel Consumption	L	305	308	1.0%			
Diesel GHGs	t CO2e	0.83	0.83	0%			
All Energy Sources Consumption	GJ	52.67	53.14	0.9%			
All Energy Sources GHGs	t CO2e	3.7	3.67	-0.8%			

Total aggregated demand for electricity and fuel supply within Waterloo Region is expected to decline by about 1% over the next 25 years as illustrated in Figure 9. The projected energy demand trend for Waterloo Region was modelled on the local baseline energy analysis using data for the calendar years 2014 and 2015. The business-as-usual forecast was done by factoring in projected population growth rates and local economic development as well as anticipated changes to heating and cooling demands due to changing climate conditions over time. This is consistent with the Provincial outlook with respect to the combined impact of forecasted increases in electricity demand and decreases in fuels demand (primarily natural gas, gasoline, diesel, fuel oil, propane).[xxvi]

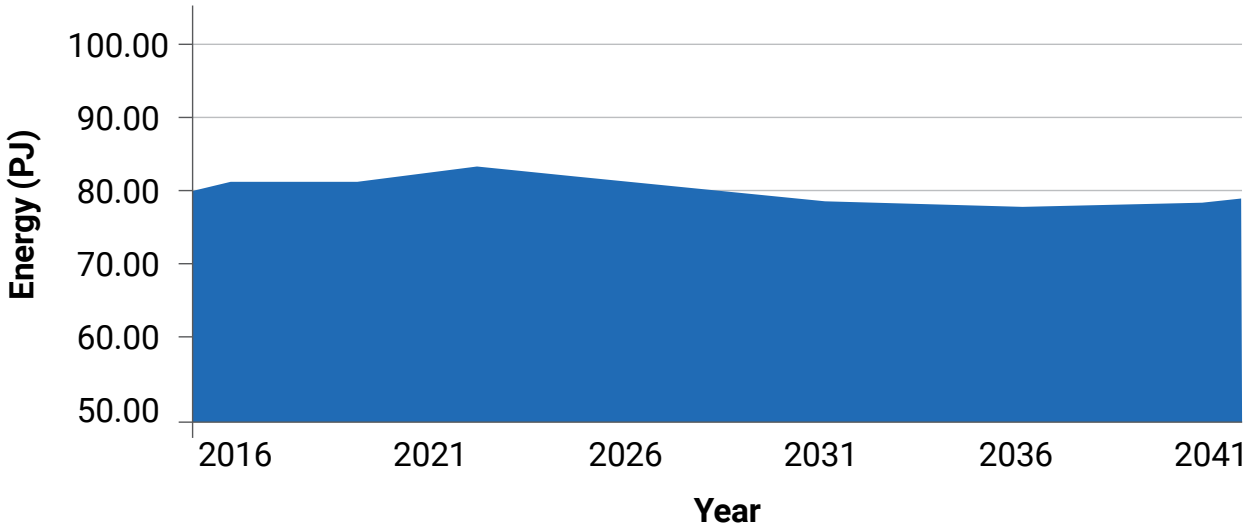


Figure 9. Forecasted Total Energy Consumption Waterloo Region 2016 - 2041 (Petajoules)

Another important factor in local scale energy planning includes different perspectives of community stakeholders. The next section summarizes this less technical but equally influential factor in decision-making for the CEIS.

2.2 What We Heard from the Community

A critical part of developing the CEIS has been to identify and discuss local priorities, challenges and opportunities with the stakeholders who shape our community. During 2016 and 2017, a wide variety of workshops, presentations, on-line and telephone surveys of both residents and local organizations, meetings and interviews took place as part of the community energy planning process.

The community perspectives that we heard during these stakeholder engagement activities have been organized into the following three overarching themes:

1. Drivers behind community energy projects in Waterloo Region
2. Barriers and challenges facing implementing community energy projects
3. Opportunities and future outlook for community energy projects

The stakeholder engagement activities, along with these themes, are explained in more detail within the supplementary document entitled Community Perspectives on Energy. The following list includes some of the common or main points heard under each theme.

Drivers behind Community Energy Projects

- Shifting energy consumption habits is recognized as a way to enhance the local economy, community health and the environment.
- Local energy generation is also seen as a way to keep more energy dollars circulating locally and supporting economic development.
- Rising energy prices and affordability issues are behind the expressed desire to save money through reducing energy costs which is the primary motivator in local utility customers consideration of conservation and efficiency projects within their homes and businesses.
- Many stakeholders also identified a strong willingness and ability to find creative, collaborative solutions to better support clean and local energy generation.
- 70% of residential survey respondents indicated that they 'definitely' or 'probably would' pay a higher price for a house that is more energy efficient and 77% said they would be interested in knowing the energy rating of a home to compare with other homes prior to purchasing.

> **"The energy strategic dynamic of cost, reliability and future infrastructure is of real significance to WEDC and our ability to attract/retain capital investment."**
>
> Tony LaMantia, CEO Waterloo Economic Development Corporation (WEDC)

Barriers and Challenges to Local Energy Projects

- Low energy literacy is seen as a limiting factor to implementing energy projects.
- Incentives for energy projects are available, but uptake is low.
- Many survey respondents look for short payback on energy projects with little financial risk.
- Two thirds of industrial, commercial and institutional survey respondents indicated that they either have not yet implemented an energy management strategy within their organization of have not even developed such a strategy to control their energy consumption and costs.
- New technologies and methods have a lot of potential, but there may be technological, social and/or regulatory barriers facing their implementation.
- Financing challenges are affecting the viability of net zero energy homes and renewable energy projects (particularly solar PV, in light of the FIT phase-out).

Just two in every five residential telephone survey respondents feel that they as homeowners or renters are responsible for conserving energy.

Opportunities and Future Outlook

- Technology and / or revised incentive frameworks could help change energy consumption behaviours and improve participation in energy efficiency programs.
- Targeted local programs and the updated Building Code will help local builders improve the energy efficiency of new construction.
- There are many opportunities to implement new sources of local energy supply for stationary and transportation applications.
- There is a desire to see increased local energy generation and energy sharing between buildings and properties.
- Current partnerships, and a willingness to forge new collaborative groups, will provide many opportunities to generate creative energy solutions for Waterloo Region.
- Stakeholders want additional land use and infrastructure planning outcomes to influence a greater shift in transportation choices towards more sustainable solutions and away from the prevalent culture of single occupant vehicle trips.

> **"If communities are enabled to share ownership of local energy generation, then the knee-jerk reaction against clean and renewable energy makes much less sense."**
>
> Survey respondent

There was also an expressed desire for local government, utilities and other community partners to play a supportive role in advancing education on opportunities to lower operating costs pertaining to energy use within buildings as a means to collaborate on driving greater market demand for construction of more energy efficient homes and buildings. One developer indicated that they are easily fulfilling demand for approximately 120 net zero residential units in Guelph but struggle to effectively market these highly energy efficient homes here in Waterloo Region. Given the interest of local residential survey respondents regarding their desire for more energy efficient homes, this may represent an opportunity to improve and coordinate marketing efforts rather than an indication of an actual lack of demand locally.

When considering how to tackle energy planning locally, we also heard from the community that the CEIS should consider the varying circumstances and characteristics of different urban and rural areas within Waterloo Region. Stakeholders further indicated that they believe the CEIS should influence and integrate with, but not control, other parallel processes such as local land use and infrastructure master planning, economic development strategies across the area municipalities as well as tie into both municipal and community scale GHG emissions reduction plans. The area municipalities and utilities can lead by example by facilitating advancement of local energy initiatives within their own facilities and fleets of vehicles. As public organizations, this is essential leadership in order to demonstrate what the CEIS aims to achieve. Additionally, there is a role to play by the CEIS partners in bringing local stakeholders together, supporting

efforts to improve local energy literacy, and collaborating on consistent development policy, where appropriate, across Waterloo Region.

Community stakeholders have also flagged the need to ensure that local leaders provide accessibility to initiatives that promote energy resiliency in the face of uncertainty and changes to our climate conditions including extreme weather events. Burying overhead hydro wires along the ION light rail transit (LRT) route is a good example of how this can be done effectively in alignment with other infrastructure planning activities. Locally utilized energy generation and storage is also seen as a means to potentially provide alternative back-up power when needed.

As the CEIS aims to benefit a wide variety of local stakeholders, its implementation will need to involve ongoing consultation and engagement. There are already many organizations and programs in place to encourage energy efficiency, local energy generation and development, but there is room to increase participation rates, improve programs and remove obstacles that are preventing action. Empowering community stakeholders to lead actions and providing meaningful involvement in ongoing local energy planning activities will be critical for the successful implementation of the CEIS. Section 4.2 further addresses how implementation of the CEIS will need to be informed by ongoing engagement with community stakeholders in the future.

3.0 OUR COMMUNITY ENERGY STRATEGY

3.1 Purpose, Goals and Objectives

The CEIS is guided by an overall purpose and four goals with supporting objectives as outlined below. The fourth goal is seen as foundational as it supports action towards the other three goals.

PURPOSE

To improve and sustain Waterloo Region's economic competitiveness and quality of life through the coordination of targeted energy investments.

GOAL 1

Significantly Improve the Energy Performance of Buildings

a. Promote construction of high performance and energy self-sufficient buildings
b. Increase energy efficiency of existing buildings
c. Increase the use of on-site renewable energy in buildings
d. Empower energy users to utilize consumption data for smart energy management

GOAL 2

Enhance Local Energy Generation and Security

a. Optimize use of local resources for energy generation
b. Assess and support opportunities to develop distributed and integrated energy systems
c. Investigate energy storage options (technologies and scenarios/scale) and support their use where feasible

GOAL 3

Transition to a Low-Carbon Local Transportation Network

a. Increase reliance on active transportation and transit
b. Increase electrification of local transportation
c. Increase use of clean low carbon fuels

GOAL 4

Cultivate a Supportive and Innovative Environment for Energy Investments

a. Raise energy literacy within the community regarding the need to evolve how we locally manage our energy.
b. Proactively integrate energy considerations into ongoing land development and local infrastructure planning processes.
c. Build on Waterloo Region's competitive advantage and capacity for delivering research, innovation, technology and support services for the energy sector as well as economic sectors with high energy demands.

3.2 Identification and Screening of Energy Opportunities

Within Waterloo Region, there are already a number of progressive energy initiatives that are complete or in progress such as numerous rooftop solar photovoltaic installations, use of solar thermal hot water and geo exchange heating systems, energy storage pilots, construction of a net positive energy commercial building, the impending launch of the new electrically powered ION LRT system and a growing number of local EV charging stations and vehicles throughout the community. Building on the progress achieved to date, Figure 10 provides a diagram of how additional energy opportunities were identified and evaluated including the inputs and tools used within the Strategy development process.

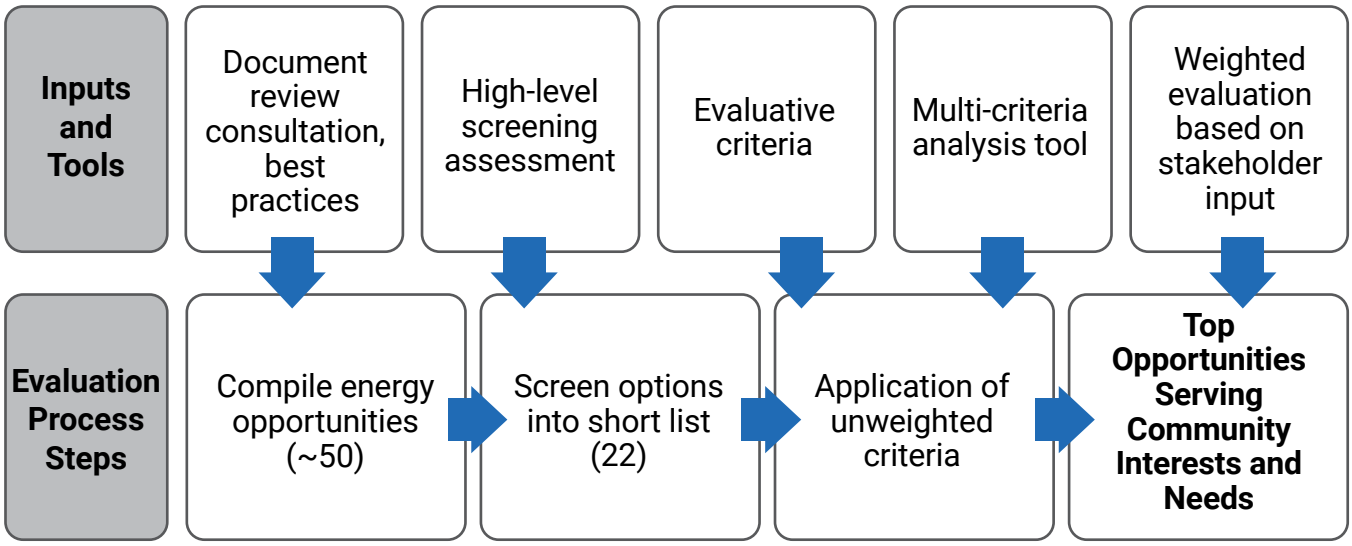


Figure 10. Process Used for Identification and Screening of Energy Opportunities

Approximately 50 energy opportunities were initially identified by the energy modelling consultants through document review, stakeholder consultation, review of best management practices from other communities and analysis of Waterloo Region's local energy profile. A screening assessment, influenced by stakeholder feedback, was used to ensure the energy opportunities passed at least one of the following base requirements prior to being subjected to a more detailed evaluation:

- Cost and reliability – potential to lower energy costs for local customers, reduce power outages or need for imported fuel supply;
- Performance and value - potential to improve energy conservation, efficiency and demand side management or increased local ownership of energy systems within Waterloo Region; and,
- Scale of Benefits - potential to reduce GHG emissions from Waterloo Region or achieve other environmental benefits such as reduced waste sent to landfill.

After the screening assessment, 22 opportunities remained and proceeded to the more detailed evaluation as described in the next section. The list of 22 Energy Opportunities is included in Appendix A and are categorized into four main types as listed below:

a. Those that could be applied to existing buildings to improve their energy efficiency or reduce their energy use through conservation;
b. Those that could be incorporated into new buildings as they are constructed;
c. Locally utilized renewable energy and/or distributed generation as a source of on-site power, or for use in space and water heating and cooling; or
d. Opportunities to reduce use of fossil fuels within the transportation sector.

The impact of fully implementing all 22 Opportunities on Waterloo Region's community-wide energy consumption is illustrated in Figure 11 in comparison with a projected virtually flat business-as-usual (BAU) forecast as previously outlined within Section 2.1.

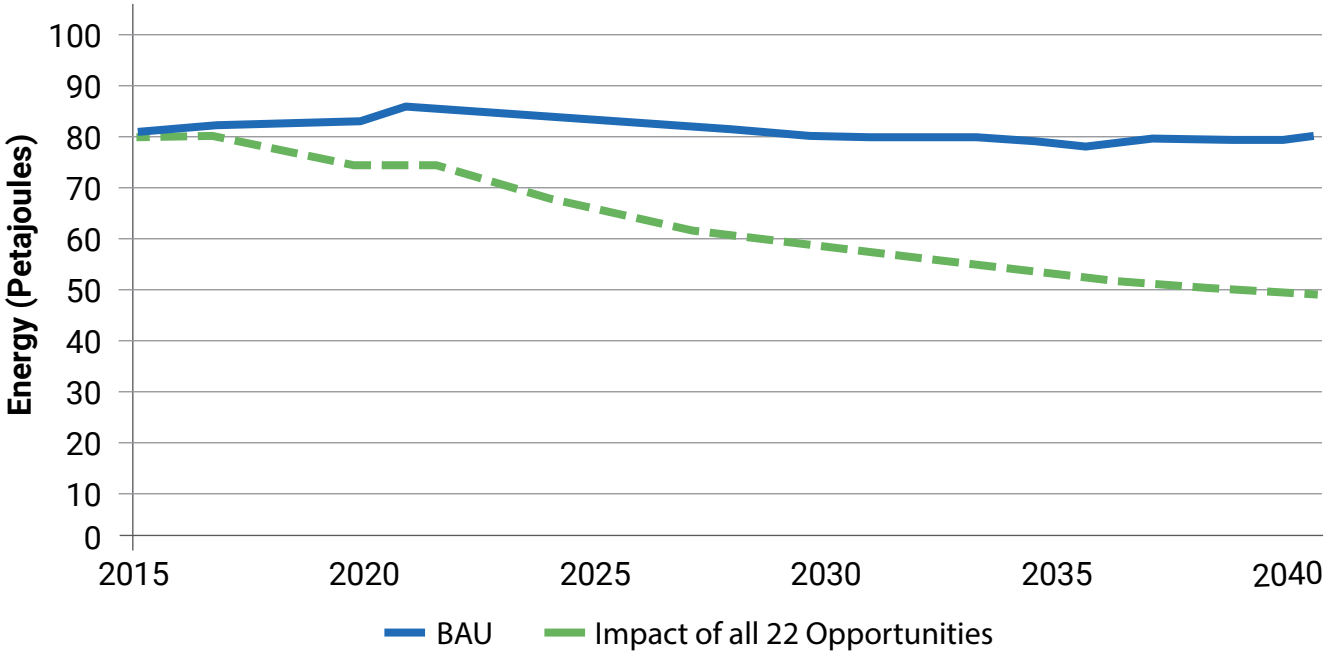


Figure 11. Total Forecasted Energy Consumption in Waterloo Region: 2015 – 2041

The difference between these two scenarios in Waterloo Region equals a 39% reduction in use of imported electricity generation and fuel by the year 2041 which translates to about 50% less GHG emissions compared to actual base year levels estimated using data from calendar year 2014. This reduction represents a potential lower energy and emissions path for this community over the next two decades.

3.3. Evaluating Opportunities

Criteria for evaluating the energy opportunities were developed by the core partners, with input from the Cities' economic development and environmental advisory committees and the local utility boards. A total of 12 criteria were identified which are illustrated below within four categories:

The application of the criteria was one step in identifying which opportunities would best serve the most community needs within Waterloo Region. Another important step in this evaluation process

Effectiveness - Degree of impact associated with an opportunity
• Generates or saves energy relative to dollars spent • Lowers energy costs • Reduces GHG emissions
Security - Long term reliability of an opportunity and extent to which it enhances local energy self-reliance
• Results in fuel switching or reduced power supply interruptions • Utilizes local energy resources • Increases local influence on energy decision-making and ownership of energy asset
Feasibility - Extent to which the logistics of implementing an opportunity are reasonably achievable
• Sound technology (commercially proven, operated minimum 1 year) • Enabled by existing regulation, agreement, process or policy direction • Aligns with land use frameworks, infrastructure master plans and/or can be coordinated with planned capital works
Investment Appeal - Attractiveness to fund the opportunity
• Demonstrated rate of return on investment or income opportunity • Eligible for incentives, grants or attracts partners/sponsors • Achieves other community benefits e.g. employment, health, waste management

was to incorporate what we heard from the community during the stakeholder consultations. This was achieved in part by changing the weighting of individual evaluative criterion. For example lowering energy costs and reducing reliance on imported energy were weighted high whereas being enabled by existing regulation criterion was scored with no additional weighting. The full evaluation process and a detailed description of the individual Opportunities are included within the supplementary CEIS document entitled **Strategic Energy Opportunities.**

3.3.1 Evaluation Results

Interpreting the results of the evaluation needs to consider a number of factors as directly comparing between the four categories of opportunities previously outlined within section 3.2 is not recommended due to major differences in scale, complexity and ease of implementation. Larger capital oriented projects, for example, require more detailed feasibility analysis in order to inform the final design and construction of the initiative. Differences in scale of projects and specific site characteristics may also dramatically influence costs and return on investment. Retrofitting homes as another example may provide very meaningful reductions in energy costs at an individual household level even if it scores relatively lower than more innovative and impactful opportunities at a community-wide scale. With this in mind, Table 3 includes the top three ranked opportunities, at a community scale, based on the weighted evaluation for each of the four categories considering all of the criteria as previously described.

Table 3. Top Three Weighted Ranking of Energy Opportunities by Category

Category	Opportunity
Existing Buildings (Goal 1)	Retrofits to industrial, commercial and institutional (ICI) buildings
	Increasing number of buildings re- commissioned each year
	Retrofits to townhouses and multi-unit residential buildings
New Building Construction (Goal 1)	Passive House standard for new multi-residential and commercial buildings
	Net zero new residential dwellings
	Enhanced energy performance for new ICI buildings
Renewable Energy Generation (Goal 2)	Local hydro electric power plants
	Biomass or biogas fuelled district energy systems
	Ground mounted Solar PV community energy generation
Transportation (Goal 3)	Expand local EV Charging Network to support increased EVs
	Incrementally switch local transit buses to EVs or Hydrogen
	Expanded local car sharing network using electric vehicles

A ranking of all 22 opportunities by reductions in cost, energy consumption and GHG emissions are included within the appendices of the Strategic Energy Opportunities supplementary document.

There are additional and complimentary opportunities that should also be considered on a case-by-case basis as they could yield multiple benefits that align with the CEIS. This includes but is not limited to the following initiatives:

- Use of combined heat and power or energy storage for some ICI customers and multi-residential buildings, such as condominiums and apartment buildings, in addition to exploring use of micro-grids in industrial or business parks;
- Installation of rooftop solar PV on buildings for use on-site (net metering) and capturing excess heat from the photovoltaic panels for use with an air-source heat pump for space or water heating;
- Investigating district energy in new high-density development areas;
- Construction of new high-performance ICI buildings optimizing use of utilities;

- Pilot projects for Energy from Waste to better understand potential for distributed generation or for production of biofuels such as renewable natural gas as a transportation fuel or for direct injection into natural gas pipelines;
- Retrofitting existing single detached residential homes;
- Continuing to build transit oriented communities which includes investing in active transportation infrastructure (pedestrian pathways, trails, bike lanes) to help achieve the goals set out in the Regional Transportation Master Plan.

It is important to understand that the list of ranked opportunities is not intended to be a definitive set of energy priorities for Waterloo Region. The opportunities are broad options for community stakeholders to meet the various expressed needs heard during the engagement consultations. Prioritization should be considered at the appropriate scale on a case-by-case basis in terms of specific options available to proponents and beneficiaries including their perspectives on using the evaluative criteria. Furthermore, as the regulatory landscape continues to evolve in Ontario and Canada, opportunities such as net metering of solar PV electricity generated on building rooftops and energy from waste can significantly change regarding their financial viability and investment appeal. The impact of carbon pricing over time will also likely influence many of these opportunities in comparison to the status quo where fossil fuel use is the current base case scenario.

3.4 Recommended Actions

Local partners and stakeholders have an important supporting role to play to enable our community to benefit from implementation of the Energy Opportunities. Twenty recommended actions have been identified which focus on the tasks and processes that support or facilitate advancement of the Opportunities in terms of attracting the investment and leadership required for their implementation. These Actions are included within Appendix B in alignment with the goals of the CEIS. Collectively, the recommended actions support the objectives under each goal of the Strategy.

Each of the Recommended Actions listed in Appendix B include the following:

- the lead organizations needed to carry out the action;
- an initial estimation of timing for implementation categorized by short, medium, and long – term during the years 2018 – 2041;
- the potential financial and staff resource requirements; and,
- the energy opportunities which are supported by implementation of the recommendation.

The next section details the implementation approach including ongoing stakeholder engagement and governance considerations to optimize the impact of the actions.

4.0 MOVING THE STRATEGY INTO ACTION

4.1 Implementation Requirements and Options

Experience from other communities who have developed CEPs has consistently proven that introducing a robust governance and administration model to oversee and implement the plan is necessary for success. Best practices show that, at minimum, the new model should provide a platform for politicians, municipal staff and stakeholders to engage regularly; ensure that a process is in place to monitor and report periodically on implementation of the CEIS; and support further development of actions and projects. In some cases, the chosen model may also provide a legal framework needed to implement projects.

Through discussion about local context and reviewing practices from other communities, the following components were determined to be necessary to successfully implement the CEIS in Waterloo Region:

- **Governance:**
    - Ongoing partnership and coordination between municipalities and utilities.
    - Oversight by representatives who have decision-making authority and influence.
- **Human resources/administration:**
    - Some level of dedicated staff time to lead the Strategy's administration, move projects forward, and support the governance team.
    - Capacity and ability to move projects forward by developing partnerships, and determine feasibility and next steps for implementing energy projects
- **Community participation:**
    - Generating regular dialogue with local elected officials, staff and community stakeholders to learn about the Strategy, and engage them in discussions on contributing to solutions regarding local energy issues and projects.
- **Financial resources:**
    - Costs and benefits of individual projects will be analyzed and implemented through typical organizational budgeting cycles and preparation of project-based action plans
    - Dedicated financial resources through organizational budgets or external funding sources will be needed commensurate to the level of any additional human resources determined as necessary.

Given these requirements, the core partners on the CEIS Steering Committee considered a number of implementation approaches based on the ability of each option to provide the necessary components for successful implementation. Four main options were considered with variations on two of them as outlined below.

1. **Existing external body takes on the responsibilities**
    - Grand River Energy (GRE) - a Corporation currently funded and administered by the LDCs to invest in and manage innovative energy assets;
    - ClimateActionWR - currently funded by municipalities, administered by Sustainable Waterloo Region and Reep Green Solutions;
2. **New organization is formed** - community-wide, non-political, not-for-profit, funded by municipalities and utilities, e.g. Economic Development Corporation;
3. **New municipal body with political representation is established** - reports to Municipal/ Regional Council such as the existing Environmental Advisory Committees, Mayor's Task Force, etc..
4. **Governance and administration is led by staff**
    - Maintain existing Steering Committee with one representative from each of 9 organizations – members have mix of strategic and administration roles.
    - Split existing Steering Committee into two: a Governance Committee with decision-making role, and an Implementation Committee with a support and administration role. Municipalities and utilities appoint an existing staff person to sit on each committee. Have a rotating chair so that each organization takes turns leading administration of the committee and Strategy.
    - Transition Steering Committee into a Governance Committee, and support this committee and the Strategy's administration through creation of a temporary dedicated staff resource at one of the municipalities.
    - Transition Steering Committee into a Governance Committee (same as C), and support this committee and the strategy's administration through creation of a permanent dedicated staff resource at one of the municipalities.

Other options used in other municipalities that were deemed to not be appropriate for Waterloo Region at this time and thus not explored further include:

- Assigning energy plan management to a local economic development division or corporation as done in Wawa and in other municipalities in B.C.
- Despite the strong connections between economic development and energy as explored throughout this Strategy, adding energy to the mandate of the local economic development organization and related groups was not seen as ideal at this time given significant changes that have just recently occurred to the structure and function of that service. Successful implementation will, however, require strong coordination with and participation from economic development groups.

- Work with local energy distributors to establish a new holding company within the municipality as done in Brant County and Guelph.
- GRE Corporation is a relatively new company established by the LDCs within Waterloo Region although this option was determined by the CEIS Steering Committee not to be appropriate for housing the overall implementation of the community-wide Strategy. However, GRE is a locally oriented business model of ownership that may be considered to implement specific energy projects in order to provide the legal jurisdiction and partnership structure needed for development and operation including ongoing asset management.

4.2 Recommended Implementation Approach

The preliminary preferred implementation model was identified as one of the four sub-options under number 4 as outlined above. This preferred option is as follows:

- Governance and administration is led by staff: Transition the existing Steering Committee into a Governance Committee, and support this committee and the Strategy's administration through creation of a temporary dedicated staff resource.

This includes a critical task for the temporary staff person to identify and secure long-term funding or other options to establish and sustain a permanent human resource for ongoing implementation of the CEIS. This approach requires a moderate level of new financial resources, but also meets the need to establish new staff time and a dedicated governance body in order to ensure successful Strategy implementation. It is further recommended that this model is supplemented in the area of community participation by utilizing some established communication channels through engagement of existing bodies (part of Option 1). The four local Townships will also need to be given an opportunity to participate in the CEIS Governance Committee which was communicated during the final stakeholder consultation period of the Strategy development process.

There are three critical elements to successfully moving the preferred implementation approach forward.

1. Working together on implementation through shared governance

Why this is important.

A total of eight municipal and regional local government organizations and the presence of five energy utilities in Waterloo Region present a complex energy planning environment in which each of the partnering organizations needs to be part of the decision-making to achieve maximum impact. Collaboration is critical here much in the way it has been locally recognized as essential to advance economic development within the region.

The CEIS flags the need to better integrate energy and land use planning processes, and points to an opportunity to align existing local planning processes with LDC objectives and provincial

policies. These opportunities need to be recognized as development sites and areas within the region go through normal planning processes. For example, there are opportunities to incorporate innovative and more efficient energy features within new development in areas such as the proposed transportation hub in downtown Kitchener and in emerging greenfield developments such as the East Lands south of the Regional Airport and the west-side employment lands in Waterloo.

How we will do it.

Ongoing partnership and coordination between municipalities and utilities will be managed through the transition of the Steering Committee into a Governance Committee that will, at minimum, have a mandate to fulfill the following responsibilities:

- Ensure the recommended actions contained in this Strategy are included in ongoing work plans and budget at each respective partner organization and advance opportunities to embed energy planning into local decision-making.
- Oversee the development of more specific action plans as needed to support implementation of the Strategy's objectives.
- Guide a review and update the Strategy as required based on progress reports every three years.
- Advocate on behalf of the CEIS stakeholders for supportive policy and programming from municipal, provincial and federal levels of government.
- Provide oversight and strategic direction to the staff resource person.

This Committee should meet a minimum of twice a year and include a senior staff level representative who has decision-making authority and influence from each organization. Committee members need to champion embedding energy considerations into local policy, planning and development decision-making as the most direct and effective way to achieve transformational changes over time. As this region continues to grow and evolve, incorporating progressive community energy considerations into ongoing land-use planning and development patterns can positively influence local energy needs for several decades into the future such as in building and transportation infrastructure.

Involvement of area municipalities, local utilities, and special interest stakeholders such as local developers, renewable energy co-ops and other local organizations focused on achieving energy and/or emission reductions are necessary in order to collaborate on recommendations for planning or policy amendments and updates. This collaboration should ideally strive for consistent policies and programs across the region where possible to avoid confusion for residents, employers and developers. This must include municipal staff that can influence success of the initiative and may require additional education to raise their awareness to help put policy into practice. A collaborative dialogue needs to be established in order to determine any additional training required to enable effective implementation by municipal staff, in addition to any engagement of the public or other affected stakeholder groups.

2. Prioritizing implementation of the strategy by increasing staff capacity

Why this is important.

Plans without dedicated staff support to lead them have very little chance for success. Assigning dedicated staff time to lead the administration and management of the CEIS will provide the capacity to keep the Governance Committee moving forward towards the objectives of the Strategy and ensure that someone is regularly engaging with the community on energy issues. In absence of this, the CEIS would be lost amidst other competing priorities and the efforts put into its creation will be for naught. An important component of the temporary position will be to recognize that long-term success is predicated on finding ways to incorporate energy planning into municipal and key stakeholder planning and decision-making processes.

How we will do it.

This capacity could be provided through re-allocation of responsibilities for current staff, or, ideally, creation of a new temporary dedicated staff position. Key elements of this capacity will include responsibility to:

- Provide support to the Governance Committee
- Liaise and partnering with other key implementation bodies working locally in climate and energy such as municipal staff and ClimateActionWR teams
- Develop more specific action plans, including partnership and funding development, as needed to support follow-through on the Strategy's objectives.
- Monitor and report on the status of the Strategy's actions annually and the Progress indicators every three years.
- Advocate for development and use of land use planning tools that will enhance energy and GHG performance of municipalities.
- Collaborate with partner organizations on opportunities to increase energy literacy and uptake of energy programs through engagement of groups such as manufacturers and large process facilities, school boards, small/medium-sized commercial and retail businesses, owners/operators of condos and multi-residential buildings and residents.
- Cultivate relationships to stimulate growth of the local clean tech sector regarding improving the efficient utilization of alternative energy resources
- Search for and acquire outside sources of funding to facilitate CEIS implementation.

3. Empowering community stakeholders to lead actions and provide meaningful input

Why this is important.

Access to energy is a vital component of keeping our society and economy moving every day. Changes to the energy system impact a wide variety of local stakeholders, so implementation of the CEIS must involve local governments and elected officials, municipal staff, utilities, not-for-profit organizations, energy co-operatives and other businesses, financial institutions, public sector institutions, and the general public. As the CEIS is likely to impact a wide variety of local stakeholders, its implementation will need to involve ongoing consultation and engagement.

Staff from all of the core partners will need play a key role to help engage and convene local stakeholders to enable the implementation efforts (see Section 3.4 for examples of stakeholder groups assigned to Recommended Actions). Ideally, the CEIS will stimulate community 'champions' to emerge and take ownership and/or leadership in one or more aspects of the CEIS in relation to their organizational mandate and expected benefits.

There are already many organizations and programs in place to encourage energy efficiency, local energy generation and development, but there is room to increase participation rates. CEIS collaborators and partner organizations will need to develop joint strategies to raise awareness of existing incentives and communicate the benefits of longer-term energy projects, energy audits, green development options such as the Canadian Green Building Council LEED standards and net zero buildings and other local energy generation/efficiency initiatives. These collaborations could also help the local utilities, municipalities, and/or other key stakeholders develop financing options to reduce up-front costs and risk to reduce barriers for residential and small business participation in community energy projects. Implementation of the CEIS will need to leverage existing and new relationships with established groups and will support the capacity and/or reach of these organizations as necessary.

How we will do it.

Local organizations have been key partners in the development of the CEIS and will continue to lead community members in meeting their energy goals. For example, Sustainable Waterloo Region (SWR) has a network of more than 70 local organizations that are actively looking for ways to reduce their energy costs and environmental impacts. Additionally, local Chambers of Commerce have wide networks of small businesses who can be engaged with relevant information to help them lower their energy costs. Reep Green Solutions successfully engages residential clients with energy efficiency retrofits and residential outreach which can be further augmented by involving neighbourhood associations and community groups. Local municipalities, TravelWise, local carshare and bike share organizations are already raising the profile and viability of alternative transportation modes. SWR, Reep and local municipalities are also collaborating on implementing the closely aligned Community Climate Action Plan and therefore further integration of related community engagement activities would be prudent to optimize impact. As a source of community leadership, these and other local organizations are recognized as critical in continuing to champion implementation of energy related conservation and efficiency opportunities.

Collaborative work with researchers and local business leaders will be encouraged to help anticipate and/or develop new energy solutions to meet local needs. Facilities and property owned by local municipalities and utilities may be able to host pilot demonstration projects or act as proponents for new technologies/systems to lead progress in this area. These efforts need to leverage the Waterloo Institute for Sustainable Energy (WISE), which has a multidisciplinary network of more than 100 experts who are working on innovative energy solutions, and already works closely with utilities, non-profit, private- and public-sector partners. WISE is also an important partner in reaching out to venture capital groups and supporting local incubators when their research projects are ready for demonstration or pilot level projects where there is scalability and/or broad application within this community and beyond.

Feedback from local stakeholders acknowledged a growing recognition of the potential for Waterloo Region to be marketed as a key CleanTech hub for investment and innovation which includes the need to engage local incubators and venture capital groups. Several economic development professionals in Waterloo Region have also expressed a strong interest in the CEIS, and the energy issue has become important for business attraction and retention.

The CEIS Governance Committee and dedicated staff resource will need to continue to inform economic developers and the local business community of local energy generation opportunities and efficiency incentives. While this began during the CEIS development process, CEIS partners will be encouraged to adopt more creative and audience-segmented approaches to inform economic development professionals and the local business community of local energy generation and efficiency opportunities that improve economic competitiveness.

Leveraging existing two-way communication channels between area municipalities, utilities, local residents and other stakeholders will continue to encourage the sharing of ideas, opportunities, and constructive feedback. This can be accomplished in several ways such as by using social media and/or other online tools to deliver pertinent information and obtain feedback on energy issues; by supporting booths at existing events to communicate information on local conservation and demand-side management and/or renewable energy programs; and by supporting local organizations to deliver new events and/or develop other communication methods to raise energy literacy with area residents. At minimum, this will include:

- Maintaining a CEIS page on the Region of Waterloo website to share information
- Periodically asking for community input through the Engage social media platform currently used by the Region of Waterloo and Area Municipalities
- Soliciting input and support for moving actions forward through the ClimateActionWR Residential, ICI, and Transportation Sector Committees.

More specifically, workshops for private and public investment should be considered to engage those with the available capital to potentially steer towards local community energy investments. Local renewable energy co-ops have done this successfully with solar PV under the Provincial FIT program. However, now that the FIT program has concluded, other models should be considered to cultivate opportunities for local investment in energy projects with the most community benefits as previously outlined in Section 2.0. An event inviting local banks, credit unions, insurance companies, developers in addition to local energy co-ops and other related stakeholders, organized with the collaboration of local chambers of commerce and perhaps economic development personnel, could advance the dialogue on why, where, and how to invest in specific community energy projects including which initiatives garner local interest.

Investment and policy support must also come from provincial and federal governments. The CEIS partners will collaborate to jointly advocate for policy changes that advance community energy projects, including incentives or financing, continued support for research, development and demonstration of innovative energy applications as well as providing a complementary and stable policy environment that is essential to attracting investment. QUEST (Quality Urban Energy Systems of Tomorrow) , GTA Clean Air Council and the Association of Municipalities of Ontario are existing advocacy channels that should also be utilized to assist with advancing this local collaborative input as the need for policy consultations arise.

4.3 Finance Mechanisms and Business Models

Community energy projects typically require upfront capital expenditures and as such are often constrained by both real and perceived investment risks, competing investment priorities, and a lack of an appropriate business model that provides structure to the implementation, operation and ownership of the project. As a preliminary effort to address these challenges, the Region of Waterloo, QUEST and Master's students from the University of Waterloo and York University collaborated on research that investigates available finance mechanisms to support community investments in local energy projects and business model considerations that support their operation and maintenance.

Perspectives of different proponents were considered from the public and institutional sector such as municipalities, universities, and hospitals; the commercial sector including small-medium businesses, developers or condo boards; as well as the not-for-profit sector including social housing organizations. Different types of projects were also considered including energy efficiency projects, energy generation, supply, and storage as well as new green building development. A wide variety of different funding and finance mechanisms were researched and divided into three broad categories as illustrated in Figure 12.

Three case studies were included within this research to highlight the approach used and its benefits. The case studies included the following:

- Municipal LED retrofits using capital reserves
- Multi unit residential building using energy supply agreement for CHP
- Hospital deep retrofit using an energy savings performance contract

The suitability of a particular financing mechanism is usually related to a combination of factors such as building or equipment ownership, financial status of the project proponent or host organization, cash flow between finance provider, customer or end user, along with expected return on investment and payback period. There are a number of existing organizations that offer various financing mechanisms and services specifically that advance the types of opportunities listed in Appendix A. These organizations who support energy investments often recommend assessing the business case prior to use of one-time grants or incentives from government sources. Some mechanisms that were researched can potentially enhance the business case or investment appeal for a project. For example, utilizing third party ownership and asset management of advanced energy equipment with service and/or energy supply agreements is a means to share the burden of investment and risk with building owners and operators. This approach in turn provides the third party investor with a stable revenue from the agreements in place to provide energy services related to the assets.

In terms of business models, pros and cons of publically-owned projects, privately owned projects and those involving hybrid public-private partnerships were identified.

Business models and involvement of partnerships can significantly influence the choice of financing mechanism used to develop an energy project. Level of risk acceptance, control over the project in the short and long-term, access to capital and its cost along with desired return on investment and payback targets all are criteria which should be considerations in this regard.

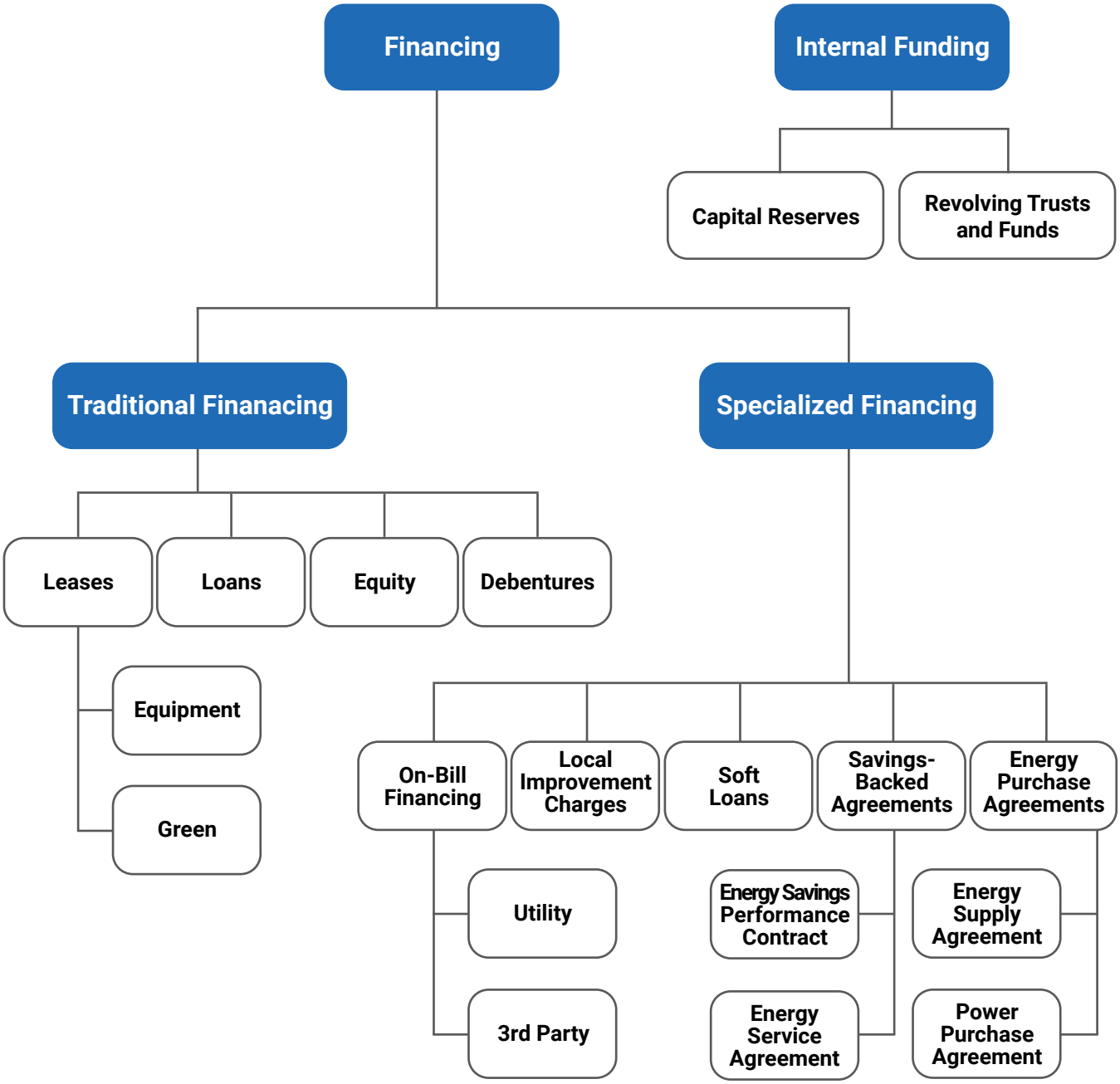


Figure 12. Finance Mechanisms Researched That Can Support Implementation of Various Energy Projects

Addressing these considerations early in the planning and design stages of the project will help the proponent make a prudent financing choice for their specific initiative.

Full details of the research are included within the CEIS supplementary document entitled **Finance Mechanisms and Business Models to support Community Energy Projects.**

4.4 Measuring Progress

It will be important to periodically monitor progress as this Strategy is implemented to ensure its effectiveness at meeting the goals and objectives. To ensure objectivity and relevance, measurability of indicators and the degree to which the community can influence them were considered. Ten measurable progress indicators were developed that will indicate if improvements are being made in this regard which are listed below. Those with an asterisk* indicate that they are already collected.

- Decreased energy intensity costs - $/Megajoule/m2
- *Increased leveraged value from local CDM/DSM incentives and return on investment
- Decreased energy density - Gigajoule/km2
- Increased % of local energy expenditures staying in Waterloo Region
- *Decreased overall peak demand
- Increased GJ of local energy generation by source
- *Decreased energy consumption per capita/household
- *Increased transit ridership and Decreased vehicles registered per household
- *Decreased energy consumption to GDP ratio
- *Decreased GHG emissions compared to 2015

Although many of these datasets are already collected, it is done so by different organizations for various purposes which will require a degree of coordination and cooperation to consolidate for this purpose. Subject to the approved governance structure overseeing implementation of the Strategy, it is likely most efficient to have a single organization, such as the Region of Waterloo, to be responsible for compiling the data to report on the indicators every three to five years. It is at this interval that we are likely to see more meaningful trends and changes emerge over time as the Strategy is implemented. Following a progress report, the Strategy should be revisited by the governance body to assess if any course corrections are necessary or new recommendations are needed in the areas requiring improvement.

5.0 CONCLUSION

"Opportunity is missed by most people because it is dressed in overalls and looks like work."

-Thomas Edison

Community-scale energy planning provides an opportunity to develop a bridge from being merely energy consumers to energy stakeholders. The CEIS for Waterloo Region is built on a premise that, engaging local stakeholders and establishing a forward looking dialogue is critical in making our energy system better at meeting our local needs and objectives. Stakeholder engagement conducted in Waterloo Region during 2016 and 2017 revealed that lowering energy costs, using local energy resources along with environmental responsibility and supporting our local economy are important to this community. These goals are all within local influence and provide the strategic direction for Waterloo Region's community energy planning efforts.

The CEIS is not intended to prescribe specific projects at pre-determined locations, as this will be subject to suitability of sites/ facilities, utilizing appropriate business models and financing mechanisms on a case-by-case basis among many other influential variables. Access to a much greater level of data granularity than was obtained for this Strategy would be needed for this specificity. Instead, the focus of developing this Strategy was to identify how to better attract investment towards the projects that will provide the most community benefits to Waterloo Region. Achieving this focus is, in part, fundamentally dependent on how well we integrate energy management considerations into land use and infrastructure planning and related policy to influence development patterns. Optimizing community benefits will also require effective collaboration as a regional community in implementing the Strategy.

The recommended actions within this Strategy support improvements in integrated decision-making regarding community energy planning within Waterloo Region over the next 25 years in an economic, environmental and social context. Collaboration and commitment to establishing the necessary governance oversight structure, providing the administrative resources to support implementation, ongoing effective stakeholder engagement, as well as periodic monitoring and review of the Strategy are all critical factors in achieving the goals and objectives of the CEIS.

Appendix A: Summary Description of Energy Opportunities (2018 to 2041)

New Buildings	
1	Net zero new residential construction – Incrementally encourage increased percentage of new dwelling construction achieving net zero energy, culminating in 100% of new dwellings by 2030 (expected in Building Code): e.g. 2021 = 10%, 2022 = 20%, 2030 = 100% new construction.
2	Passive House or LEED Standard for new multi-unit residential and commercial buildings – Incrementally encourage increased percentage of new multi-unit residential (e.g. apartments) and commercial buildings achieving Passive House Standard or LEED, culminating in 100% of new buildings by 2030.
3	Enhanced energy performance for new commercial, institutional and industrial buildings – Introduce incentivized optional green building performance standard of 10% better energy performance over the Ontario Building Code starting in 2021.
Existing Buildings	
4	Retrofit older homes constructed before 1980 – Retrofit 500 to 1000 homes per year with electrical savings of and heating savings of ~25%.
5	Retrofit newer homes built after 1980 – 500 to 1000 homes per year with electrical savings of ~20% and heating savings of ~15%.
6	Retrofits to townhouses and multi-unit residential buildings - similar targets as opportunities 4 and 5 above
7	Re-commissioning of buildings – Reset the Building Automation Systems that heat and cool buildings. Starting in 2019, re-commission 20 buildings per year to a total of 400 buildings by 2038.
8	Retrofits in the industrial, commercial and institutional sector – 100 to 200 buildings per year with an average savings of 61,000 kW per building and heating savings of ~25%.
9	Enhanced energy performance of renovated spaces – Promoting an energy performance standard when buildings are renovated starting with 10% of renovations in 2021, increasing to 100% by 2041.
10	Install air source heating/cooling – Incrementally increase the number of residential buildings served by air source heat pumps to 30% by 2041 and the number of commercial buildings served to 40% by 2041.

Local Renewable Energy and Distributed Generation	
11	Install ground source heating/cooling – Incrementally increase the number of residential buildings served by ground source heat pumps to 20% by 2041 and the number of commercial buildings served to 40% by 2041.
12	Solar PV on rooftops of existing buildings – Install solar PV on 50% of all existing buildings in the Region by 2041 for net metering.
13	Solar PV on new building construction – Increase the number of new buildings installing solar PV for net metering, culminating in 100% of new buildings by 2030.
14	Identify suitable locations for ground mount solar PV – Feasibility assessment and business case for a community scale project. (1 MW is assumed to take up 10 acres of space)
15	Develop local Hydro power plant(s) where suitable – Complete feasibility studies and Environmental Assessments for identified sites as required (already completed for hydro plant at Park Hill, Cambridge).
16	Complete feasibility study for combined heat and power district energy – Identify areas that meet heating and energy intensity thresholds of greater than 250 MJ/m2 for further investigation including the use of biomass as a feedstock.
17	Energy storage – Investigate energy storage options and candidate facilities (i.e. feasible technologies/applications) and preliminary costs.
Low Carbon Transportation	
18	Active transportation – Continue coordination of municipal plans to improve walking and cycling networks in the urban centres and Central Transportation Corridor. Triples mode share for walking and cycling in affected transportation zones.
19	Car sharing using EVs – Expand car share network using EVs and identify costs and suitable locations (charging stations) and number of vehicles.
20	Transition to electric or other alternatively fueled transit buses. Further evaluate the financial, service and environmental implications of introducing electric or hydrogen buses into the Region's bus fleet by 2022 achieving 100% electric or alternative fuel by 2041.
21	Switch public sector fleets to electric vehicles as appropriate – Promote purchase of electric vehicles through public sector procurement co-operative. Target 80% of 1000 public sector vehicles to be electric by 2041.
22	Increased uptake of EVs – Build EV charger network to promote increased use of EV's target of 100% personal automated vehicles within Waterloo Region being electric (or alternative fuel e.g. hydrogen) by 2041.

Appendix B: Recommended Actions Categorized by Strategic Goals

Overview of the Community Energy Investment Strategy for Waterloo Region				
Overall Purpose	To improve and sustain Waterloo Region's economic competitiveness and quality of life through the coordination of targeted energy investments			
Goals	1. Significantly Improve the Energy Performance of Buildings	2. Enhance Local Energy Generation and Security	3. Transition to a Low-Carbon Local Transportation Network	4. Cultivate a Supportive and Innovative Environment for Energy Investments
Objectives	a) Promote construction of high performance and energy self-sufficient buildings b) Increase energy efficiency of existing buildings c) Increase the use of on-site renewable energy in buildings d) Empower energy users to utilize consumption data for smart energy management	a) Optimize use of local resources for energy generation b) Assess and support opportunities to develop distributed and integrated energy systems c) Investigate energy storage options (technologies and scenarios/scale) and support their use where feasible	a) Increase reliance on active transportation and transit b) Increase electrification of local transportation c) Increase use of clean fuels	a) Raise energy literacy within the community regarding the need to evolve how we locally manage our energy. b) Proactively integrate energy considerations into ongoing land development and local infrastructure planning processes. c) Build on Waterloo Region's competitive advantage and capacity for delivering research, innovation, technology and support services for the energy sector as well as economic sectors with high energy demands.

Legend for Recommended Actions:

Timing of implementation:
short - term = by year 2020; medium - term = by 2027; long - term = by 2041;

Potential financial and staff resource requirements:
$ or 🧍 = nominal, $$ or 🧍🧍 = moderate, $$$ or 🧍🧍🧍 = significant

Goal 1 - Significantly Improve the Energy Performance of Buildings

Recommended Actions	Expected Timing	Potential Resource Requirement $ dollars staff time	Energy Opportunities Supported
A. Area Municipalities to solicit interest from public and/or private partners in undertaking a local Net Zero neighbourhood or mixed use complex pilot project.	Short to Medium – term	$$ 1	- Net-zero new building construction
B. Area Municipalities coordinate with local electricity and natural gas utilities to update existing processes to better integrate energy considerations into the review and approval process for development applications.	Short - term	1	- Enhanced energy performance of new commercial, institutional and industrial buildings and new residential construction
C. Area Municipalities coordinate efforts to investigate, evaluate and recommend tools for increasing the energy performance and self-sufficiency of new developments as well as the use of on-site renewable energy.	Short to Medium – term	1	- Enhanced energy performance of new commercial, institutional and industrial (ICI) buildings and new residential construction - Net-zero and/or Solar PV for new building construction
D. Area Municipalities to provide information about existing energy incentives to building permit applicants.	Short – term	1	- High energy performance new construction - Retrofits to existing homes and in ICI buildings
E. Local electricity and natural gas utilities, in collaboration with community partners, Region of Waterloo and the Area Municipalities, to establish a “one-window service” for improving energy conservation and efficiency in homes by enabling access to all applicable incentives and delivering residential education and behavioural campaigns.	Short - term,	$$ 2	- Retrofit existing homes and multi-unit residential buildings
F. Region of Waterloo, in collaboration with Area Municipalities, and other community partners to explore the use of Passive House Standard as a means to establish highly energy efficient affordable housing options.	Short to Medium – term	$$ 2	- Passive House standard for new multi-unit residential and commercial buildings
G. Region of Waterloo coordinate with local electricity and natural gas utilities, with cooperation from the Area Municipalities, to identify options that provide households who are most challenged with paying their electricity and gas bills with improved access to energy incentives.	Short to Medium – term	2	- Retrofit existing homes and multi-unit residential buildings

Goal 2 - Enhance Local Energy Generation and Security

Recommended Actions	Expected Timing	Potential Resource Requirement $ dollars staff time	Energy Opportunities Supported
H. Energy+, Kitchener-Wilmot Hydro, and Waterloo North Hydro to promote Grand River Energy Corporation (GRE) with local Economic Development community regarding potential investments in local energy projects where appropriate as asset managers in collaboration with implementation partners	Short - term	1	- Combined heat and power, - Ground mounted solar PV, - Energy storage, - Expanded local EV charging network - Solar PV for net metering
I. Region of Waterloo, in coordination with Area Municipalities, and the local electricity and natural gas utilities, to establish criteria for identifying specific sites across Waterloo Region that are appropriate for implementing micro grids, district energy systems, or other distributed generation options and, to seek external funding for a feasibility study to refine and apply the criteria locally.	Short - term	$ 2	- Combined heat and power, - District energy systems
J. Region of Waterloo, in collaboration with interested local utilities and other stakeholders, to re-evaluate energy-from-waste options and viable uses of output energy.	Short to Medium – term	$ 1	- Combined heat and power, - District energy systems - Biofuels for transportation, - RNG injection into pipelines
K. Energy + and City of Cambridge support Grand River Conservation Authority to develop the Park Hill Dam hydro generation project.	Short– term	1	- Local hydro electric power plant

Goal 3 - Transition to a Low-Carbon Local Transportation Network

Recommended Actions	Expected Timing	Potential Resource Requirement $ dollars staff time	Energy Opportunities Supported
L. GRE Corporation to work with engaged stakeholders to develop an expanded local EV Charging Network to support an accelerated consumer adoption of electric vehicles.	Short - term	$$$ 👤 👤	- Expanded local EV charging network
M. Region of Waterloo and the Area Municipalities continue to support the implementation of action plans and strategies of the impending Regional Transportation Master Plan and local municipalities' active transportation plans.	Short to Medium - term	(in accordance with Regionally and Municipally approved plans and budgets) 👤 👤	- Active transportation: increasing mode share for walking, cycling and transit ridership (supports lowering fuel use and emissions from transportation sector)
N. Area Municipalities, the Region of Waterloo and the local electricity and natural gas utilities show leadership in transitioning their fleets to electric power or other alternative fuels such as hydrogen or biofuels.	Medium to Long - term	$$$ 👤	- Incrementally converting local transit buses to electric vehicles as part of the normal bus replacement life-cycle - Systematically assessing suitability of public sector fleets for switching to EVs in alignment with fleet replacement schedules

Goal 4 - **Cultivate a Supportive and Innovative Environment for Energy Investments -** an overarching goal that supports all Energy Opportunities.

Recommended Actions	Expected Timing	Potential Resource Requirement $ dollars staff time	Energy Opportunities Supported
O. Region of Waterloo to ensure Regional Official Plan policies and infrastructure master planning processes specifically address the new requirements under the 2017 Growth Plan for the Greater Golder Horseshoe, to influence development and transportation patterns regarding energy conservation, climate change mitigation and adaptation.	Short - term	👤👤	These actions link to the municipal land use policy, regional energy planning and economic development frameworks and address the administrative capacity necessary to support CEIS implementation.
P. Area Municipalities to ensure local Official Plans conform to the 2017 Growth Plan policies on energy conservation and, based on amendments made to the Regional Official Plan, climate change.	Medium - term	👤	
Q. Region of Waterloo, Area Municipalities, Kitchener-Wilmot Hydro, Waterloo North Hydro, Energy+, Kitchener Utilities, and **Union Gas** to appoint a senior staff person to sit on an ongoing governance committee to oversee implementation of the CEIS, with the first order of business to identify the means to establish a dedicated resource for leading the administration and management of the CEIS, targeting a report back to Councils/Boards of Directors by June 2018.	Short - term	$$ 👤	
R. Region of Waterloo, in collaboration with local electricity and natural gas utilities, with cooperation from the Area Municipalities, to develop an energy literacy campaign for municipal, commercial and institutional decision-makers to raise their awareness of available incentives and the process to determine the best ways to lower their energy costs.	Short - term	$$ 👤👤	
S. The Region of Waterloo, in collaboration with local electricity and natural gas utilities as well as Area Municipalities to work closely with the IESO to strengthen communication and dialogue (e.g. information sharing, coordination of planning activities, assessing the impact of EV charging) as part of the next round of Integrated Regional Resources Planning for this area via on-going meetings or by establishing a formal Local Advisory Committee using the Terms of Reference created by the Ministry of Energy.	Short to Medium - term	👤	
T. Region of Waterloo, in collaboration with the Waterloo Institute for Sustainable Energy, Waterloo Economic Development Corporation, local incubator programs and other economic development professionals to help market this region as an area for advancing cleantech investments as this emerging sector continues to expand and evolve globally.	Medium to Long - term	👤	

Endnotes

[i] QUEST. (2017). What is a Community Energy Plan? Retrieved from http://gettingtoimplementation.ca/faq1/

[ii] QUEST impact report. http://www.questcanada.org/files/download/93659833062faf0

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[iv] 2017 Canadian Clean Technology Industry Report – Synopsis. http://analytica-advisors.com/sites/default/files/2017%20Canadian%20Clean%20Technology%20Industry%20Report%20Synopsis%20FINAL.pdf

[v] QUEST. (2012). BUILDING SMART ENERGY COMMUNITIES: IMPLEMENTING INTEGRATED COMMUNITY ENERGY SOLUTIONS. ICES Literary Series. Retrieved from http://www.questcanada.org/downloads/Building%20Smart%20Energy%20Communities%20-%20Implementing%20ICES.pdf

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[vii] See http://www.mto.gov.on.ca/english/vehicles/electric/charging-electric-vehicle.shtml#Resources and http://caa.ca/car_costs/embed/ev_calculator

[viii] QUEST. (2011). Integrated Community Energy Solutions Municipal Policy Toolkit. Retrieved from http://www.questcanada.org/rh/aa539c1b53703fb55223c353998566be.pdf

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[xv] Ontario Ministry of Energy. (2017). Municipal Energy Plan Program. Retrieved from http://www.energy.gov.on.ca/en/municipal-energy/

[xvi] consistent with Ontario's Growth Plan for the Greater Golden Horseshoe, 2017

[xvii] See the following website for more details: www.ClimateActionWR.ca

[xviii] QUEST. (2016). Community Energy Planning in Ontario: A Competitive Advantage for Municipalities. Primer. Retrieved from http://www.questcanada.org/files/download/ff5cd870c543cdd

[xix] One Petajoule (PJ) equals One million Gigajoules (GJ).

[xx] Source: Statistics Canada. Table 326-0020 - Consumer Price Index (CPI), monthly (2002=100)

[xxi] http://www.energy.gov.on.ca/en/ltep/

[xxii] http://www.climateactionwr.ca/

[xxiii] Residential natural gas consumption increased by approximately 10% during 2010 – 2015 which is primarily reflective of weather variations as it relates to space heating needs.

[xxiv] http://www.climateactionwr.ca/

[xxv] See Localized Climate Projections for Waterloo Region, University of Waterloo, October 2015, https://uwaterloo.ca/environment/sites/ca.environment/files/uploads/files/waterloo_region_climate_projections_final_revised30oct2015.pdf

[xxvi] More details of these projections are included in two separate supplementary documents: a) Baseline Analysis and Business-As-Usual Forecast of Energy Use in Waterloo Region as well as b) a background section within the supplement that describes the Strategic Energy Opportunities for this region.

[xxvii] QUEST is a non-profit organization that conducts research, engagement, and advocacy to advance Smart Energy Communities in Canada by working with government, utilities, the energy industry, the real-estate sector, economic regulators, and the product and professional service sector. http://www.questcanada.org/

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If you would like additional information on the Community Energy Investment Strategy

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Region of Waterloo

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