



New Official Plan

Energy

City of Ottawa
Planning, Infrastructure, and Economic Development
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Energy Discussion Paper

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1. Introduction of the Energy Theme

a. Ottawa Next: Beyond 2036

In December 2016, Ottawa City Council directed staff to undertake a planning study to “...identify trends in housing, employment, and identify opportunities to create complete communities which, together with current Official Plan policies create an affordable and sustainable city beyond 2036...”. The result was the approval of Ottawa Next: Beyond 2036 on February 27, 2019. The goal of the Ottawa Next: Beyond 2036 study was to identify the forces that will shape Ottawa over the next century to help position the City to build both resiliency and adaptability into the next Official Plan. In order to carry out this goal and to address the high level of uncertainty about influences and drivers of change that will influence how cities continue to evolve and grow into the future, Ottawa Next: Beyond 2036 was undertaken as a scenario-based planning study to:

- Identify trends and disruptors that will influence the city beyond the current 20-year planning horizon;
- Identify possible future scenarios, which extend beyond the normal planning time-frame and arise from the identified drivers and disruptors; and
- Identify planning considerations that will allow the City to create complete communities and be resilient and adaptable to future change

The scenarios and planning considerations identified in the report will help to inform the setting of priorities within the next Official Plan. One driver of change identified, and to be the focus of this discussion paper, is:

“Increased Pressure to Conserve Energy, Reduce Greenhouse Gas Emissions and Design for a Low Carbon Future”.

In 2016, Ottawa City Council approved a GHG emission reduction target for Ottawa of 80% below 2012 baseline levels by 2050.

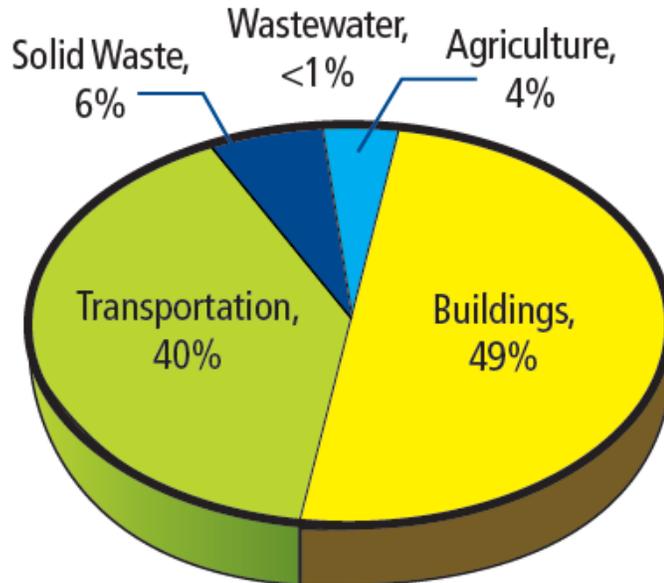
To meet this target, the City will be required to pursue relatively aggressive changes to support a sustained transition away from fossil fuels towards a low carbon economy. The cornerstone for this outcome will be conservation in buildings and transportation. Most buildings will need to be designed or retrofitted to require a fifth to a tenth of the thermal (heating) energy requirements of the current city building average. On transportation, a shift to public and active/green transportation, reduced distance travelled as well as a shift to electric motive power will be required. Along with these changes a shift to renewable thermal end electricity sources will be required. New thermal sources will include renewable natural gas, heat pumps and low carbon district systems. Electricity will include local renewable electrical generation and possibly some imports of renewable electricity.¹

¹ City of Ottawa. (2019). [Ottawa Next Beyond 2036](#), Draft Final Report, Scenarios, Change Drivers, and Planning Considerations.

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This approach will require significant infrastructure investments (transit levels of service, electric vehicle charging, and low carbon thermal energy) as well as a focus on more compact complete communities.²

Figure 1: Percentage CO₂ Emissions by End Use, Ottawa 2012



Source: *Ottawa Next Beyond 2036*³

b. Overview of what will be explored in this discussion paper

Energy systems are integrated into and are an integral part of nearly every aspect of our daily lives; including everything from heating and cooling our homes, bringing light to our streets and parks at night, or supplying fuel for our vehicles and transit systems to support mobility. The need for access to reliable (on-demand) and affordable energy services is strongly linked with and integral to our current quality of life.

Up until about 150 years ago, human activity did not produce many greenhouse gases. This changed as a result of industrial innovations and the widespread use of electricity and motor vehicles, which has transformed the way we live. Over time, the energy from the burning of fossil fuels has led to releases of carbon dioxide and other greenhouse gases into the atmosphere, resulting in changes to our climate that pose many serious and damaging effects that imperil our future.

Ottawa as a municipal government plays a critical role in guiding the city's transition to renewable energy and energy conservation. In 2015, City Council adopted, as a term of council priority, the development and implementation of a

² City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evol_phase1_en.pdf.

³ City of Ottawa. (2019). *Ottawa Next Beyond 2036*, Draft Final Report, Scenarios, Change Drivers, and Planning Considerations.

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renewable energy transition strategy, called Energy Evolution. Energy Evolution, Ottawa's Community Energy Transition Strategy is a renewable energy strategy designed to optimize energy consumption, promote the use of renewable energy and advance local economic development opportunities in Ottawa. There are eight specific goals in Energy Evolution:

1. Help meet or exceed locally established energy reduction targets
2. Develop local renewable energy generation opportunities
3. Improve energy security
4. Greater opportunities for residents to own or invest in local energy systems or businesses
5. Reduce environmental impact
6. Complement long term municipal land use, transportation and infrastructure master plans
7. Advance economic development objectives
8. Bring groups together to facilitate info sharing and development of joint solutions⁴

The purpose of this discussion paper is to generate discussions regarding energy considerations for growth and intensification, to consider how to meet Municipal GHG Emission Targets through Shifting to Renewable Energy Sources; Buildings; Transportation; and Public/Private/Philanthropic Collaboration to Achieve Goals.

The following, are the relevant Planning considerations, as derived from Ottawa Next: Beyond 2036.

i. Meeting municipal GHG emission reduction targets.

Canada and the world are now at a critical point in their efforts to combat climate change. Urban areas produce roughly half of Canada's emissions, which makes them critical players in fulfilling climate commitments. Some Canadian municipalities have been at the forefront of energy and emissions planning for as long as 20 years, attempting to inventory local sources of emissions and set reduction targets in some cases well before their provincial or federal counterparts.

In 2016, Ottawa City Council approved a GHG emission reduction target for Ottawa of 80% below 2012 baseline levels by 2050. To meet this target, the City will be required to continue to work with key stakeholders and community partners and pursue relatively aggressive changes to support a sustained transition away from fossil fuels towards a low carbon economy. The Official Plan will be one of the primary tools for the city to realize many of these changes, such as greater density, to increase the use of active transportation and to decrease vehicle kilometers travelled, building thermal energy requirements, increase zero-emission mass transit, support of renewable district energy,

⁴ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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diversion of organic waste to generate renewable natural gas and supporting of renewable electricity generation.⁵

Energy Planning and Reducing GHG emissions are interrelated and discussing either one typically implicates the other.

ii. Shift to Renewable Energy Sources

As noted above the energy from the burning of fossil fuels cannot continue indefinitely, yet we need access to reliable and affordable energy services. There is a need to transition away from fossil fuels and to increase the supply of renewable energy by promoting local and regional production; and to prioritize the procurement of clean, renewable energy by home owners, industry and the city.

Shifting of source electricity generation and distribution systems to the promotion of local renewable power generation (Solar, Water, Wind); biogas derived from organic materials; heat pumps for buildings; district energy systems using energy capture from waste heat sources; and electrification of transportation for fleets and private vehicles, are examples of strategies for consideration.⁶

iii. Buildings

Greenhouse Gas (GHG) emissions from buildings represents almost half of the total of GHG emissions released from Ottawa. In order to meet GHG reduction targets, consideration for buildings is of paramount importance. For consideration, discussions are required in regards to establishing ultra-low thermal requirements and increasing energy efficiency in the construction of new buildings and remodelling of existing buildings.

iv. Transportation

GHG emissions from transportation represent 40% of the total of GHG emissions released from Ottawa. To reduce emissions from transportation, consideration should be given to determining ways to reduce, and work toward eliminating our collective reliance on fossil-fuel-burning motorized transportation and to improve the technologies for various transportation modes. The City requires a strategy involving a significant reduction in car ownership and use, the design of zero emission public transit that is attractive and convenient, and for all active transportation options and networks to be well connected and safe. The City's goal of achieving electrified public transit over the next ten years will be accomplished by converting regional and main line service from operating with diesel buses to operating with electric trains. A very large fraction of all customer trips will be made, in whole or in part, on electric light rail vehicles on Stage 1 and Stage 2 of the O-Train Line 1, the Confederation Line. Future investment decisions on transit improvement and on transit electrification will determine the

⁵ City of Ottawa. (2019). [Ottawa Next Beyond 2036](#), Draft Final Report, Scenarios, Change Drivers, and Planning Considerations.

⁶ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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direction to either extend electric light rail service or pursue the infrastructure and capital costs required for electrically powered buses. Lastly, the strategic approach to city-building that starts with the creation or strengthening of complete communities where residents can access everything on foot, and the need to travel longer distances is minimized, is also a central consideration.

v. Support for public/private/philanthropic collaboration to achieve goals

The City plays a key role in bringing community stakeholders together to facilitate discussions and foster collaboration in planning and strategizing integrated approaches to achieve long term energy sustainability goals. Through education and civic engagement, the City has a responsibility to communicate the basis for and the pathways to take towards a long term sustainable energy future.⁷

2. Global Context

a. Drivers, Disrupters and Challenges identified through Ottawa Next: Beyond 2036.

The drivers, disrupters and challenges for energy demand identified in Ottawa Next: Beyond 2036 are from climate change; pressures from population growth and urban expansion; and from accelerating demands for improved and more integrated mobility.⁸

Managing the uninterrupted availability of energy sources at an affordable price is fundamental to ensuring sustainable development, as well as protecting the well-being of residents and the bottom line for businesses. However, with a steadily increasing population and high energy demands, the challenge becomes how to manage that upward pressure while providing residents the same uninterrupted level of service.⁹

b. How Ottawa is positioned relative to Global Context.

i. Meeting Municipal GHG Emission Reduction Targets

Energy Planning and Reducing GHG emissions are interrelated and discussing either one typically implicates the other.

At the 21st Conference of Parties (COP 21), parties to the UN Framework Convention on Climate Change (UNFCCC) reached a landmark agreement to combat climate change and to accelerate and intensify the actions and investments needed for a sustainable low carbon future. The result was the Paris Climate Agreement.

The Paris Agreement entered into force on November 4, 2016, and was ratified by 55 countries. Since that time, more countries have ratified and continue to

⁷ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

⁸ City of Ottawa. (2019). [Ottawa Next Beyond 2036](#), Draft Final Report, Scenarios, Change Drivers, and Planning Considerations.

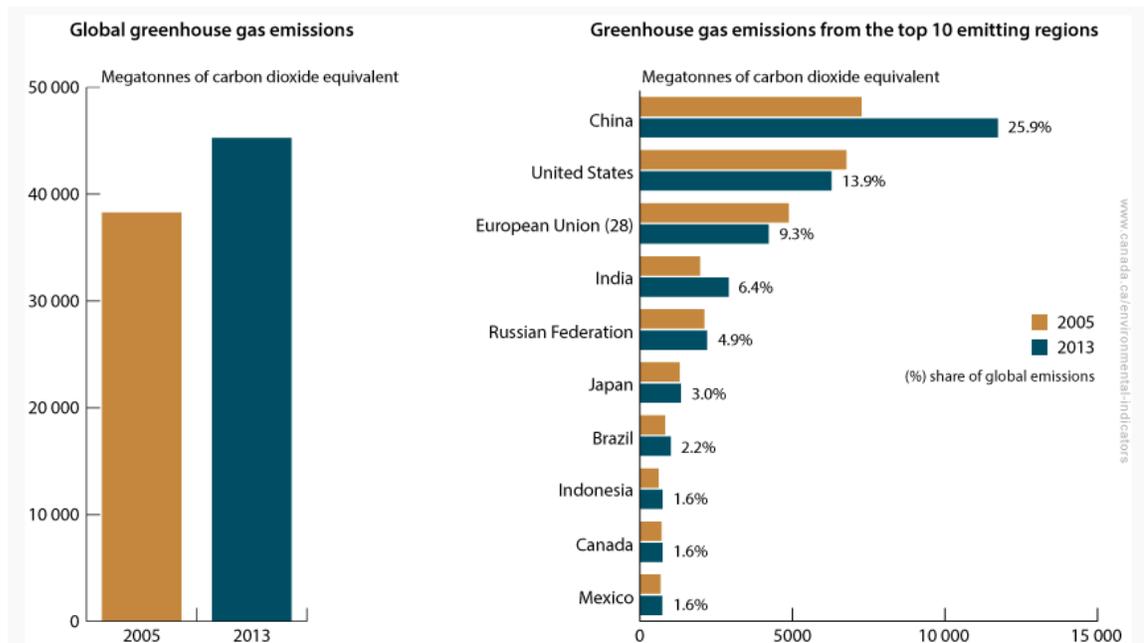
⁹ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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ratify the Agreement, reaching a total of 184 Parties as of December 2018. Canada is one of those parties.¹⁰

Canada ranks 9th in the world's top GHG emitting countries, contributing 1.6 % of the total emissions in 2013. For the world, GHG emissions overall continued to increase, with an increase of 18.3 % between 2005 and 2013. Canada's GHG's increased 4.2 % during that period of time, but represented a smaller share of total GHG's, with a decrease from 1.9 % to 1.6 % of the total world share of GHG emissions.¹¹

Figure 2: Greenhouse Gas Emissions for the Top 10 Emitting Countries and Regions – 2005 and 2013



Source: Government of Canada¹²

More recent figures indicate that for 2017 that Global energy-related GHG emissions grew by 1.4%, reaching a historic high of 32.5 gigatonnes, a resumption of growth after three years of global emissions remaining flat and contrasts with the sharp reduction needed to meet the goals of the Paris Agreement.

The increase in carbon emissions (equivalent to the emissions of 170 million additional cars) was the result of robust global economic growth of 3.7%, lower

¹⁰ United Nations Framework Convention on Climate Change. (2018). Paris Agreement – Status of Ratification. Accessed electronically on December 9, 2018 from <https://unfccc.int/process/the-paris-agreement/status-of-ratification>.

¹¹ Government of Canada. 2018. Environmental Indicators. Accessed electronically on December 10, 2018 from <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/global-greenhouse-gas-emissions.html>

¹² Government of Canada. 2018. Environmental Indicators. Accessed electronically on December 10, 2018 from <https://www.canada.ca/en/environment-climate-change/services/environmental-indicators/global-greenhouse-gas-emissions.html>

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fossil-fuel prices and weaker energy efficiency efforts. These three factors contributed to pushing up global energy demand by 2.1% in 2017.

The trend of growing emissions, however, was not universal. While most major economies saw a rise in carbon emissions, some others experienced declines, such as the United States, the United Kingdom, Mexico and Japan. Factors towards reducing GHG emissions were:

- Improvements in Energy Efficiency
- Moving from coal to natural gas
- Decline in oil use
- Higher renewables-based electricity generation
- Decline in gas used in some areas
- Decline in electricity demand in some areas

The growth in energy-related carbon dioxide emissions in 2017 is a strong warning for global efforts to combat climate change and demonstrates that current efforts are insufficient to meet the objectives of the Paris Agreement.¹³

Climate Transparency, a coalition of international climate organizations, released its fourth annual review of the climate policies of G20 members in November 2018. Combined, the G20 members represent about 70 per cent of the world's economy and population. As a group, they are also responsible for more than 80 per cent of the world's annual GHG emissions. The report pointed out that none of the G20 members has a plan in place that would actually meet the goals of the Paris Agreement.

Canada is the 38th country in the world by population, boasts the 11th largest economy and is the seventh biggest emitter. The Climate Transparency analysis said, on average, each Canadian produces 22 tonnes of GHG per year, which is the highest among all G20 members and nearly three times the G20 average of eight tonnes per person. Oil and gas and transportation are the two largest and fastest growing sources of emissions in the country. On a positive note, Canada has 65% share of renewables in power generation, compared to the G20 average of 24%.¹⁴

In 2016, Ottawa City Council approved a community wide GHG emission reduction target for Ottawa of 80% below 2012 baseline levels by 2050.

ii. Shift to Renewable Energy Sources

According to the International Renewable Energy Agency, the global renewable energy sector employed 9.8 million people in 2016. The number of people employed in solar power alone is estimated at 3.1 million—more than double the

¹³ International Energy Agency. 2018. Global Energy & CO2 Status Report. Accessed electronically on December 10, 2018 from <https://www.iea.org/geco/emissions/>.

¹⁴ Climate Transparency. 2018. G20 Brown to Green Report 2018. Accessed electronically on December 11, 2018 from <https://www.climate-transparency.org/g20-climate-performance/g20report2018>.

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number of jobs attributable to large hydropower. In Canada, there were an estimated 10,500 jobs related to wind power and 8,100 jobs associated with solar power in 2015.¹⁵

Hydro Ottawa is the third largest municipally-owned electric utility in Ontario and the largest municipally-owned producer of green energy. Energy Ottawa (EO) is a subsidiary that generates electricity from a number of “green” sources. The most significant is Chaudière Falls. Hydro Ottawa also owns the capacity of the landfill gas-to-electricity plant at the Trail Road Landfill.

In Ottawa, solar capacity has grown significantly, but still meets only a small proportion of electrical demand at 400 terajoules in 2015¹⁶. It comes from very small-scale generation by hundreds of residential providers, as well more significant contributions from a smaller number of commercial/institutional and agricultural installations.

Ottawa’s solar potential is in the top 15% among the hundreds of municipalities in Ontario. But taking this potential into account, the actual amount of electricity that is generated annually from installed solar capacity in Ottawa is still a very small proportion of energy demand.¹⁷

An example of the City of Ottawa competing globally in the energy field is with the City’s Building Engineering and Energy Management Section whose core work involves energy conservation retrofits and expanding and improving building automation. With regards to building automation, the City has one of North America’s largest web-based building control systems. This tool has been indispensable for conservation initiatives and has allowed facility staff to address building issues without trips to a particular site, thereby saving time, staff call-ins and vehicular travel.¹⁸

iii. Buildings

GHG emissions from buildings represents almost half of the total of GHG emissions released from Ottawa. Many options exist to reduce building energy demand, especially in new construction.

Ottawa has a number of existing commercial buildings environmentally certified through the Building Owners and Managers Association (BOMA). More recently, the first home in Canada certified to the very demanding Passive House standard

¹⁵ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

¹⁶ Leidos. (2017). Pathway Study on Solar Power in Ottawa. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_pathways_en.pdf.

¹⁷ Ottawa Community Foundation. 2018. Ottawa Insights. Accessed electronically on December 11, 2018 from <https://www.ottawainsights.ca/themes/environment-and-sustainability/energy-climate-change/>.

¹⁸ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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was in Ottawa, as well as the world’s first Passive-House certified multi-unit affordable housing project in a northern climate.¹⁹

iv. Transportation

GHG emissions from transportation represent 40% of the total of GHG emissions released from Ottawa.

Based on 2016 census data, 29% of Ottawa commuters used public transportation, walked or cycled to work.²⁰ The opening of the O-Train’s Line 1 in 2019 and the construction of Line 2 will allow the City to strengthen its position in sustainable transportation leadership. It is estimated that the first stage of the O-Train Line 1 project will reduce Ottawa’s GHG emissions by approximately 94,000 tonnes per year by 2031 and once Line 2 is completed, at least 204,000 tonnes annually by 2048. For context, 204,000 tonnes represents approximately 4 % of all GHG emissions that were produced by Ottawans in 2015 through their energy consumption.²¹

Figure 3: Percentage of Population using sustainable transportation by city, 2016



Source: Ottawa Community Foundation ²²

¹⁹ Ottawa Community Foundation.2018. Ottawa Insights. Accessed electronically on December 11, 2018 from <https://www.ottawainsights.ca/themes/environment-and-sustainability/energy-climate-change/>.

²⁰ Ottawa Community Foundation.2018. Ottawa Insights. Accessed electronically on December 11, 2018 from <https://www.ottawainsights.ca/themes/environment-and-sustainability/energy-climate-change/>.

²¹ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

²² Ottawa Community Foundation.2019. Ottawa Insights. Accessed electronically on February 4, 2019 from <https://www.ottawainsights.ca/explore/transportation/>.

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v. Support for Public/Private/Philanthropic Collaboration to Achieve Goals

Current climate policies will not achieve the aims of the Paris agreements on keeping global temperature rise to well below two degrees celsius and achieving net zero emissions in the second half of the century. However, the Paris agreement contains provisions to ramp up ambitions over time, through what is known as the “ratchet mechanism”. This is one of the many ongoing processes established within the UN climate deal, which commits each country to submitting targets on a five-year cyclical basis, each of which must be progressively more ambitious than the last.²³

To achieve these targets the Canadian Federal Government requires municipalities to be instrumental in reducing emissions of GHGs. For example, the Federation of Canadian Municipalities, funded by the Government of Canada, in 2016, created the Municipalities for Climate Innovation Program (MCIP), which is a five-year, \$75-million program that helps municipalities prepare for, and adapt to, climate change, and to reduce emissions of GHGs and is available to all municipalities and their partners.²⁴

Many Canadian cities, including Ottawa, partner with The Global Covenant of Mayors for Climate & Energy, which is an international alliance of cities and local governments with a shared long-term vision of promoting and supporting voluntary action to combat climate change and move to a low emission, resilient society.²⁵ Additionally, Ottawa had an exchange with Hanover, Germany, a city which requires building to the Passive House standard.²⁶ Ottawa is also now participating in an exchange with Malmö, Sweden; the exchange includes Energy as a topic of interest.

3. Specific Challenges and Opportunities for Ottawa

The City has a key role to play in ensuring energy security through land-use planning and policy development that identify local priorities, reduce energy demand, and ensure energy resources are available. Identifying local energy resource opportunities can help to ensure local energy security, increase diversity of energy sources, promote economic competitiveness, and improve reliability of energy systems and resiliency to extreme weather events.²⁷

²³ Carbon Brief. (2018). Timeline: the Paris agreements ‘ratchet mechanism’ Accessed Electronically on December 19, 2018 from <https://www.carbonbrief.org/timeline-the-paris-agreements-ratchet-mechanism>.

²⁴ Federation of Canadian Municipalities. (2018). Accessed Electronically on December 19, 2018 from <https://fcm.ca/home/programs/municipalities-for-climate-innovation-program/about-municipalities-for-climate-innovation-program.htm>.

²⁵ <https://www.globalcovenantofmayors.org/about/>

²⁶ The Smart Citizen. (2015). German Municipalities Lead the Way in Passive Housing: A world Habitat Day Special. Retrieved from <https://thesmartcitizen.org/technology-enablement/german-passive-housing/>.

²⁷ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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a. Challenges

i. Limited Financial Resources

At all levels of government, achieving energy and emissions targets requires significant resources and investments. Senior levels of government rely on cities to help achieve many of their energy and emissions commitments, whereas municipalities typically do not have the necessary revenues to sufficiently fund local climate action and rely on funding from senior levels of government.²⁸

ii. Demand and Supply of Energy

Managing the uninterrupted availability of energy sources at an affordable price is fundamental to ensuring sustainable development, as well as protecting the well-being of residents and the bottom line for businesses. However, with a steadily increasing population and high energy demands, the challenge becomes how to manage that upward pressure while providing residents the same uninterrupted level of service.²⁹

For Energy Evolution Phase 1, a baseline analysis was performed. In 2015, Ottawa residents consumed approximately 114,000 terajoules (TJ) of energy at a total cost of \$3.0 billion, or roughly \$3,200 per person. Natural gas was the most consumed type of energy in the city (39%) followed by electricity (28%) and gasoline (26%). Together, these three energy types accounted for roughly 93% of the total energy used in Ottawa.³⁰

The following diagram shows energy sources and uses in 2015 for Ottawa.

²⁸ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evol_phase1_en.pdf.

²⁹ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evol_phase1_en.pdf.

³⁰ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evol_phase1_en.pdf.

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Figure 4: Flow of Energy by Supply into Usage (2015)

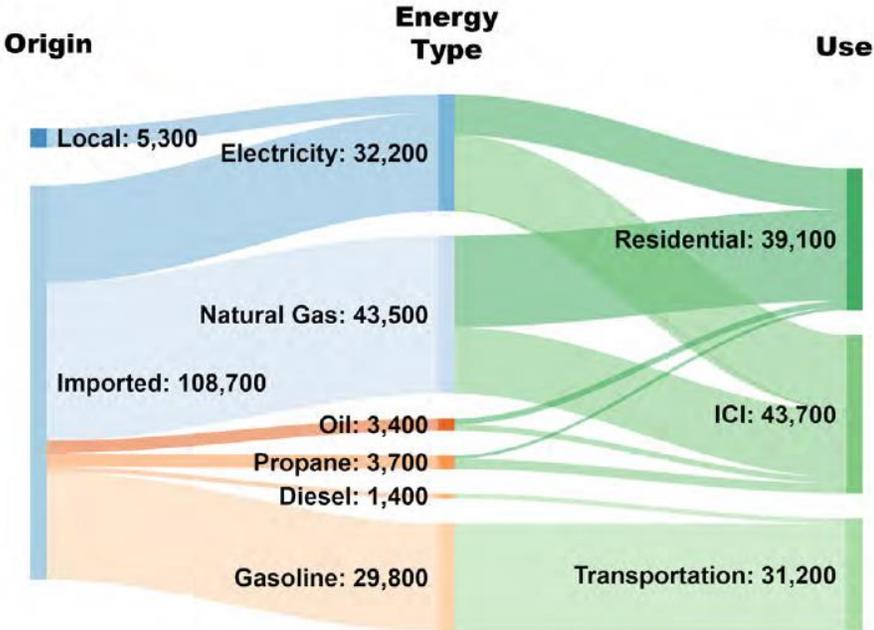


Figure 5: A Sankey diagram showing the flow of energy by supply into usage. Values are in TJ. Diagram created using SankeyMATIC.

Source: Energy Evolution – Phase 1³¹

iii. Knowledge

There is a need for capacity building, including staff with knowledge and expertise in this domain. Traditional routes to planning certification/education still do not focus on energy planning, so often there is a need for municipalities to directly seek out this expertise.

iv. Locally Generated Renewable Energy Sources & Energy Security

Only 5% of the city’s total energy consumption is currently generated or supplied from local, renewable sources. The remaining 95% of energy is imported from outside the City which means Ottawa is heavily reliant on, and vulnerable to, decisions made in domestic and international energy markets.³²

b. Opportunities

i. Government Funding and Support

As a large Canadian city with an established GHG reduction target to 2050, Ottawa has an opportunity to apply for a significant amount of funding from the Provincial and Federal governments. Examples are grant funding opportunities that have come / continue to come from:

³¹ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

³² City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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- Federation of Canadian Municipalities
- Natural Resources Canada
- Environment and Climate Change Canada
- Ontario Ministry of Energy³³

The Federal government is committed to requiring a price on carbon in all Canadian provinces and territories beginning in 2018.³⁴

ii. Collaboration

Low Carbon Cities Canada (LC3) is a proposed Pan-Canadian network of major urban climate centres (Halifax, Montreal, Ottawa, Toronto, Edmonton, and Vancouver). Low Carbon Innovation Centres (LCICs) are proposed for each of the six urban climate centres. The LCICs are proposed to be modelled after The Atmospheric Fund (TAF) which has been advancing low-carbon solutions in Toronto since 1991. TAF operates independently and is self-financed thanks to a \$40 million endowment from the City of Toronto (1991) and Province of Ontario (2016). Its work has contributed to a 25 per cent decrease in Toronto's carbon emissions since its founding.³⁵

There are many local Environmental Non-governmental Organizations (ENGOS) that run programs and initiatives that are complementary to the City's energy planning objectives. Examples include Ecology Ottawa, EnviroCentre, Sustainable Eastern Ontario, and Ottawa Community Foundation. These organizations provide valuable expertise on a range of energy issues and have demonstrated a strong desire to collaborate with the City on local energy issues.

In addition, there are many private organizations that have renewable goals as part of their corporate sustainability strategy, that the City can learn from, share information with, and possibly provide incentives. Examples of organizations participating in corporate sustainability are:

- TD Bank – The first bank in North America to achieve carbon neutral status.³⁶
- Enbridge Gas Distribution - has a plan to green the pipes that seeks to increase the percentage of renewable natural gas that makes up the content of their gas delivered to local customers.³⁷
- IKEA - The IKEA Group Sustainability Strategy for 2020, including striving towards energy independence through being a leader in renewable

³³ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

³⁴ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

³⁵ Low Carbon Cities Canada. (2018). Accessed Electronically on December 19, 2018 from <http://lc3.ca/>.

³⁶ TD Bank. (2018). Corporate Responsibility. Retrieved from <https://www.td.com/corporate-responsibility/environment/eco-efficiency.jsp>.

³⁷ Enbridge. (2017). Sustainability Report. Retrieved from <http://www.enbridge.com/sustainability-reports/sustainability-report/priority-areas/renewable-and-low-carbon-energy/renewable-energy>.

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energy, and becoming more energy efficient throughout their operations and supply chain.³⁸

- University of Ottawa – Sunlab is an advanced solar research group at the University investigating photovoltaic technologies and systems.³⁹

iii. Locally Generated Renewable Energy Sources & Energy Security

Only 5% of the city's total energy consumption is currently generated or supplied from local, renewable sources. There are opportunities to increase local renewable energy sources from solar power, heat pumps, biogas, district energy, electrification of transportation, water power, and wind power. Energy Evolution – Phase I projects that renewable energy technologies have the potential to offset nearly half (43%) of Ottawa's current energy consumption under an aggressive uptake scenario.

Renewable energy technologies play an increasingly important role in energy security. By diversifying local renewable energy sources, Ottawa decreases its reliance on the unpredictability of energy supply from outside the city boundary while boosting local economic growth.

Ottawa has the good fortune to be the primary share-holder in Hydro Ottawa including Energy Ottawa Inc. Energy Ottawa is the largest municipally owned producer of green power in Ontario. It owns and operates six hydroelectric generation plants at Chaudière Falls and more elsewhere. Energy Ottawa also holds interests in landfill gas-to-energy joint ventures that convert millions of tonnes of previously flared-off methane gas into renewable energy at the Trail Road landfill site and elsewhere.⁴⁰

iv. Knowledge Based Sector

How Ottawa will continue to build on key knowledge based industry sectors, where the City has the potential to become global leaders, is an area requiring further discussion. Renewable energy, energy conservation and finding efficiencies in energy use are areas where the City has the opportunity to become a global leader.⁴¹

Ottawa hosts a significant concentration of clean energy researchers and companies. Renewable energy is one of the key sub-sectors, along with energy management and green buildings.⁴²

³⁸ IKEA (2014). People & Planet Positive IKEA Group Sustainability Strategy for 2020. Retrieved from https://www.ikea.com/ms/en_US/pdf/reports-downloads/sustainability-strategy-people-and-planet-positive.pdf.

³⁹ Sunlab. (2018). Accessed Electronically on December 19, 2018 from <http://sunlab.eecs.uottawa.ca/about/overview/>.

⁴⁰ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

⁴¹ City of Ottawa. (2019). [Ottawa Next Beyond 2036](#), Draft Final Report, Scenarios, Change Drivers, and Planning Considerations.

⁴² Ottawa Community Foundation. 2018. Ottawa Insights. Accessed electronically on December 11, 2018 from <https://www.ottawainsights.ca/themes/environment-and-sustainability/energy-climate-change/>.

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Ottawa has post-secondary institutions focused on different aspects of renewable energy. These range from renewable energy engineering degrees and energy management certificates, to chemical and biological engineering research related to bioethanol and biodiesel production that are creating new industrial partnerships.

Ottawa has more engineers, scientists and PhD's per capita than any other city in Canada which can contribute significantly to energy innovation and green jobs.

As a G7 Capital, Ottawa has a large concentration of federal research agencies and laboratories focused on clean energy and addressing climate change that spin off complimentary industry. These include:

- The National Research Council (NRC), Canada's biggest research facility
- The National Sciences and Engineering Research Council (NSERC)
- Agriculture and Agri-food Canada, supporting research, development and demonstration and the adoption of clean technology in Canada's natural resources sectors
- Natural Resources Canada, working to support the acceleration and advancement of energy efficiencies. The CanmetENERGY facility is Canada's leading clean energy research and technology organization.⁴³

v. Economic Development Opportunities and Job Creation

Markets can play a key role in responding to global challenges such as climate change. Negotiation of the Paris Climate Agreement and its subsequent entering into force in November 2016 is a powerful market signal. While there is still much to be determined about the scope and speed of international emission reduction efforts, the agreement, now ratified by 184 countries, points unequivocally to a carbon-constrained future.

Supporting Ottawa's local businesses in the transition towards a low-carbon economy will not only help these companies reduce their costs; it also represents an opportunity to create good local jobs, attract investment and to keep a greater share of energy dollars (expenditures) within the local economy.

Reducing energy consumption and promoting the use of renewable energy is already credited with the creation of new green jobs in manufacturing, construction and trades.

The job creation potential associated with energy efficiency is equally well established. Retrofitting existing homes and buildings increases the demand for various low-carbon and renewable energy technologies while also generating a demand for workers who can perform building upgrades, such as adding insulation, installing building automation systems, or replacing old and inefficient furnaces.

⁴³ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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By examining the supply and the cost of energy consumed locally, there is an opportunity to keep millions of energy dollars circulating within the local economy, with benefits ranging from business retention and attraction to housing affordability.⁴⁴

4. Moving Forward

The Official Plan integrates renewable energy considerations into the broader context of building a sustainable and resilient city and improving the quality of life of citizens. Energy considerations affect many city building priorities, including the supply of streets and sewers, housing and the conservation and protection of the natural environment. The risk of rising energy costs are one of the key considerations in moving towards more sustainable forms of housing and transportation. Ottawa can meet the demands of the 21st Century by planning sustainable, livable and resilient communities which are cleaner and greener and consume less energy for travel and housing. Energy which is supplied from green, renewable sources will help to further this goal.

Complete and compact communities offer the greatest potential for high efficiency energy systems. They have attractive transportation options, including good and frequent transit service, well connected streets, good public realm and open spaces and offer a mix of housing with convenient access to services and the workplace. Energy use decreases in this form of development because less energy is required per occupant to heat and cool smaller dwellings, and trip distances and travel times are reduced with viable alternatives to the automobile. Although the topic is touched on in this discussion paper, the discussion for complete and compact communities will be explored more in depth in the discussion papers for Healthy Ottawa and Mobility, since complete and compact communities provide many benefits in addition to reducing energy demand.

Energy planning also enhances the quality of the natural environment by reducing energy consumption, improving air quality and minimizing the demand for land and resources. Support for energy efficient and green design measures help to reduce the impact of the built environment. This is achieved in the review of new development such as subdivisions by taking into account building orientation for solar exposure, protecting sensitive environmental features in the design of stormwater management areas and giving consideration to alternative energy systems.

Energy is strongly linked to each of the Beyond 2036 themes which touch on various aspects of city planning. The next Official Plan, in addressing the more traditional elements of land use, urban form and mobility, will need to be more strategically informed to uphold the City's climate commitments.

⁴⁴ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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a. Needs to address challenges and opportunities

The approach in developing the new Official Plan should be to add a strong energy lens through which all growth and development activities across the city are considered. This will send a signal, not only to the local economy, but also to businesses in Canada and beyond, that the City is committed to pursuing a transition to clean, renewable energy (and to supporting the related opportunities for economic development and innovation).

Policies and planning approaches should be developed that are in alignment with the energy transition vision and goals outlined in the City's Energy Evolution Strategy, including reducing energy use through efficiency and conservation, increasing the supply of renewable energy through local and regional production, and prioritizing the procurement of clean, renewable energy.

New policies have to recognize the switch to renewable forms of energy and allow for flexibility in their use while making them more available. Having more choice increases the resiliency and adaptability of the city and its residents to respond to change as it occurs - such as with temperature fluctuations and extremes.

b. Possible strategic directions

i. Pursue Government Funding

Ottawa has an opportunity to apply for a significant amount of funding from the Provincial and Federal governments. Examples are grant funding opportunities that have come / continue to come from:

- Federation of Canadian Municipalities
- Natural Resources Canada
- Environment and Climate Change Canada
- Ontario Ministry of Energy

Ottawa can continue to apply for various funding programs, however would need to continue to do what is required to be eligible. Initiatives such as Energy Evolution are essential to enabling the City to apply and gain access to funding that would otherwise be unavailable⁴⁵

ii. Energy Evolution

In 2015, City Council adopted, as a term of council priority, the development and implementation of a renewable energy transition strategy, called Energy Evolution. Energy Evolution is a renewable energy strategy designed to optimize energy consumption, promote the use of renewable energy and advance local economic development opportunities in Ottawa. Energy Evolution is a Multi- Year Strategy.

⁴⁵ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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Phase I of Energy Evolution represents a baseline and analysis of current energy consumption, pathway studies and a short term, 3 year action plan to 2020, primarily focused on the delivery of renewable energy projects and enabling policy changes. The following energy types currently used within Ottawa were investigated with the intent to reduce the city's dependence on fossil fuels:

- Solar Power – Large Scale, Commercial Rooftop and Residential
- Water Power
- Wind Power
- Heat Pumps – Air and Ground Source
- Biogas
- District Energy
- Electrification of transportation – Cars and Light Trucks

The approach adopted by the strategy is to transition away from fossil fuels: to reduce energy use through conservation and efficiency; increase the supply of renewable energy through local and regional production; and to prioritize the procurement of clean, renewable energy.

Aggregation of nine renewable energy pathway studies developed for Phase I suggests that these technologies have the potential to displace or reduce roughly half of the energy currently consumed in Ottawa under an aggressive uptake scenario. Increasing renewable energy generation and energy conservation and efficiency efforts will inevitably have the net effect of reducing GHG emissions.

Phase 2 of Energy Evolution has not yet begun, but will provide medium (2031) and long term (2050) deliverables to align with the City of Ottawa's Official Plan current time horizon (2031) and the City's long term target to reduce community GHG emissions by 80% below 2012 levels by 2050. Phase 1 of Energy Evolution does articulate the overall vision and approach of the strategy. As noted above, Phase I suggests that renewable energy sources have the potential to displace or reduce roughly half of the energy currently consumed in Ottawa. Therefore, meeting the City's 2050 GHG reduction target may also require seeking equally large reductions through energy conservation and efficiency in the buildings and transportation sectors.

Although Phase 1 actions focus primarily on renewable energy generation opportunities, some actions are also included for the promotion of energy efficiency and conservation in buildings and for transportation. With this discussion paper, we will begin discussions regarding buildings, however more enhanced discussions will be undertaken in our next series of discussion papers, after Energy Evolutions short-term actions are implemented and as new opportunities and trends within the renewable energy sector emerge.⁴⁶ The pathway papers for Phase II of Energy Evolution have undergone successful

⁴⁶ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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reviews at a series of technical workshops. Results from these workshops will be part of the final report.

Energy Evolution – Phase I projects that renewable energy technologies have the potential to offset approximately nearly half (43%) of Ottawa’s current energy consumption under an aggressive uptake scenario.⁴⁷

iii. Promote Energy as a Knowledge Based Sector in Ottawa

Energy Evolution can directly support efforts to promote innovation, entrepreneurship and technology development in Ottawa; key objectives of the City’s updated Economic Development Strategy and recent Innovation Pilot Program. One direct connection is the contribution of energy efficiency and renewable energy technologies towards the development of Ottawa’s clean technology sector. Ottawa is home to an estimated 240 clean technology companies, and the sector is one of six high-growth “Knowledge-Based Industries” local economic development organization Invest Ottawa is currently working to support.⁴⁸

iv. Build on Collaborative Initiatives

Achieving Ottawa’s long-term GHG reduction target and the vision of the Energy Evolution: Ottawa’s Community Energy Transition Strategy will require ongoing coordination, and collaboration between the City and its community partners. Three examples of partnerships, that can be furthered strengthened are with:

Natural Resources Canada. As a G7 Capital, Ottawa has a large concentration of federal research agencies and laboratories focused on clean energy and addressing climate change that spin off complimentary industry, including Natural Resources Canada. Natural Resources Canada is working to support the acceleration and advancement of energy efficiencies. The CanmetENERGY facility is Canada’s leading clean energy research and technology organization.

Low Carbon Cities Canada (LC3) / Ottawa Community Foundation. Ottawa to continue to work with community partners to establish a Low Carbon Innovation Centre for Ottawa as part of the LC3 initiative. Not only will this establish a focused location to move low carbon initiatives forward, but also make Provincial and Federal funding such as the Low Carbon Economy Fund available to the City and its partners

Ottawa Community Housing (OCH) is striving to achieve the highest financially feasible energy performance in new developments by taking inspiration from leading energy certifications like Passive House. As the second largest housing provider in Ontario and the largest social and affordable property managers in

⁴⁷ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

⁴⁸ City of Ottawa. (2017). Energy Evolution Ottawa’s Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

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the city, OCH are making significant contributions in implementing energy efficient strategies.⁴⁹ A continued partnership with OCH will not only reduce energy costs for the City but will also advance the use of new technologies in energy performance.

v. Low Carbon Innovation Centre

Low Carbon Cities Canada (LC3) is a proposed Pan-Canadian network of major urban climate centres (Halifax, Montreal, Ottawa, Toronto, Edmonton, and Vancouver). Low Carbon Innovation Centres (LCICs) are proposed for each of the six urban climate centres. The LCICs are proposed to be modelled after The Atmospheric Fund (TAF) which has been advancing low-carbon solutions in Toronto since 1991. TAF operates independently and is self-financed thanks to a \$40 million endowment from the City of Toronto (1991) and Province of Ontario (2016). Its work has contributed to a 25 per cent decrease in Toronto's carbon emissions since its founding.

In Ottawa, the LCIC is to be located with the "Ottawa Community Foundation", which was founded in 1987 and is a public, non-profit organization created by and for the people of Ottawa.⁵⁰

A LCIC is an organization that helps accelerate multiple stages of the innovation process, whether those are technological, financial, policy, behavior change or combinations thereof. The intention is that LCIC's invest in demonstrating, de-risking, and unsticking relevant, local solutions. In other words, a dedicated capacity to support cities to create, refine and/or develop, eliminate barriers to and scale up solutions that can achieve significant GHG reductions and the multiple benefits associated with a low carbon urban economy. The Centre would complement but not duplicate or compete with existing local initiatives to advance clean energy and reduce emissions. It will also target significant co-benefits, including economic development, health, inclusion (e.g., reduced energy poverty), and energy resilience. Ottawa's LCIC will be networked with other local centres to boost knowledge-sharing and accelerate innovation.

Ottawa is one of six participating jurisdictions (including TAF) to submit a proposal to the federal Low-Carbon Economy Fund in 2018. If the proposal is accepted, each centre would receive a substantial endowment, likely in the order of \$15 to \$30 million. Via both investments (loans) and grants, the funds would directly support key, strategic opportunities in the local community, and leverage additional resources from an array of other sources, including the province, private impact investors, private donors, and other foundations. The Ottawa Community Foundation is working with a group of about 20 contributors with

⁴⁹ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evolution_phase1_en.pdf.

⁵⁰ <http://lc3.ca/>

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relevant expertise and connections to develop the proposal, in collaboration with TAF and the other proponents.⁵¹

⁵¹ City of Ottawa. (2017). Energy Evolution Ottawa's Community Energy Transition Strategy – Phase 1. Retrieved from https://documents.ottawa.ca/sites/default/files/energy_evol_phase1_en.pdf.

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c. Relationship to other themes

Energy considerations are linked to the other topics found in each of the Official Plan Discussion Papers. The connections are summarized below.

Theme	Planning Considerations	Relationship to Energy as a theme
The Economy	<ul style="list-style-type: none"> • Defining and building on key knowledge-based industry sectors where the City has the potential to become global leaders. • Retaining and attracting a critical mass of human talent and providing advanced training, including further development of, and addition to, the city's post secondary institutions • Importance of business linkages and relationships with Toronto and Montréal (within the mega-region) and other global cities • Waste an energy source and circular economic development opportunity 	<p>Energy technology is a key knowledge-based industry sector where the city has the potential to become a global leader.</p> <p>In addition, business linkages with Toronto and Montreal and other global cities will aid in the advancement of energy technology and the economic benefits that come with that technology.</p>
Healthy Ottawa	<ul style="list-style-type: none"> • Requirements for complete communities, including adaptive design, local services and amenities, infrastructure, mobility options, employment, mix of housing, density, parks, urban forest and tree canopy • Improved community design to promote healthy outcomes; promotion of daily physical activity • Transforming existing communities into more complete communities with supporting mobility planning • Ensure that transit services meet evolving travel pattern needs • Responding to life cycle changes of a community • Monitoring and surveillance of the health impacts of climate change 	<p>Promotion of complete communities supports energy conservation and the reduction of energy demand in several ways, including:</p> <ul style="list-style-type: none"> • Reducing the need for vehicular travel • Reducing demand for energy with appropriately sized building construction. • Reducing demand for energy by diversifying, protecting and enhancing greenspaces.
Climate Change	<ul style="list-style-type: none"> • Meeting municipal GHG emissions reduction targets 	<p>Energy conservation and a shift to renewable energy sources is directly</p>

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	<ul style="list-style-type: none"> • Infrastructure design standards to meet new climate conditions • Waste an energy source and circular economic development opportunity • Role of Not-for Profit, social enterprise and opportunities for partnership 	linked to Climate Change and the need to reduce GHG emissions. Both papers address: the need for reduced consumption of fossil fuels; promotion of local renewable energy generation; review of existing service infrastructure for water and waste; and opportunities to design with clean energy supplies.
Housing	<ul style="list-style-type: none"> • Building technologies for new and remodelling of older buildings and development approaches that maximize energy efficiencies and reduce emissions • Ice, wind and flood-resistant design for buildings • Coordination with the City of Gatineau and other adjacent municipalities regarding regional mobility networks and the movement of people seeking lower housing prices • Striking the right balance in the policy, regulatory and financial framework to allow for the evolution of existing areas that receive a transit station to become full-service, walkable, mixed-use neighbourhood 	Energy conservation and a shift to renewable energy sources is linked to opportunities to encourage green building construction as part of new developments and infill, and particularly for housing.
Mobility	<ul style="list-style-type: none"> • Integration of active transportation network into urban design • Transforming existing suburbs into more complete communities with supporting mobility planning • Establishing closer links between urban planning and transit route planning for all transit modes (rail and bus) • Striking the right balance in the policy, regulatory and financial framework to allow for the evolution of existing areas that receive a transit station to become full-service, walkable, mixed-use neighbourhoods • Ensure that transit services meet evolving travel pattern needs • Mobility options for rural communities 	Energy conservation and a shift to renewable energy sources is directly linked to mobility options. Co-benefits will be realized with investments in light rail; improvements to the level of public transit service in new and built up areas; plans for shifts toward electrification of vehicles (i.e. infrastructure needs); examining opportunities for fleet transition to low carbon fuels; and advancing opportunities to improve mobility in rural and suburban areas

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	<ul style="list-style-type: none"> • Coordination with the City of Gatineau and other adjacent municipalities regarding regional mobility networks and the movement of people seeking lower housing prices • Network integration (all forms of transport) • Impacts of high speed rail links to Toronto and Montréal, corridor protection and station location(s) 	
Infrastructure	<ul style="list-style-type: none"> • Shifting of source electricity generation and distribution systems; promotion of individual generation and renewables, biogas from solid waste • Opportunities for energy capture through various sources, including waste digestion • Policy and cost implications of intensification or expansion • Sustainable infrastructure operation and maintenance in light of increasing need and cost • Ice, wind and flood-resistant design for energy distribution networks • Integration of innovation in all aspects of city life and management • Waste an energy source and circular economic development opportunity 	Promotion of energy conservation and the use and generation of renewable energy sources can be significantly advanced with new infrastructure requirements utilizing appropriate forms of energy and building resilience for the operation and maintenance of that infrastructure.
Natural Ottawa	<ul style="list-style-type: none"> • Diversification, protection, and enhancement of natural systems • Environmental planning built into healthy community development • Retention of existing tree canopy into both urban infill and suburban development • Retention and maintenance of urban forest • Mitigation of heat island effect 	Ottawa's Natural Systems help to mitigate the need for energy. By diversifying, protecting and enhancing Ottawa's natural systems, the demand for energy is reduced than would otherwise be.
Rural Ottawa	<ul style="list-style-type: none"> • Communication and coordination between the urban core, suburban communities, and rural communities. 	Energy demand by rural Ottawa and ways to conserve energy and introduce

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	<ul style="list-style-type: none">• Allocation of appropriate density and mix of uses• Network integration (all forms of transport)• Integration of active transportation network into urban design• Mobility options for rural communities• Waste an energy source and circular economic development opportunity	renewable energy sources, to support residents and businesses, is contemplated in both papers.
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Appendices

Appendix 1 – Ottawa Next Energy Drivers and Policy Considerations

In Ottawa Next: Beyond 2036, Ottawa looked at the possible challenges and opportunities that it might face in becoming North America’s most liveable mid-sized city. It focuses on four critical, interrelated themes: Economic Development, Social-Cultural and Quality of Life, Environment, and Urban Form and Mobility. The table below illustrates how energy influences these areas of city life, sustainability and prosperity.

Drivers of Change	Planning Considerations
Environment	
Greater Pressures on Ottawa’s Natural Environment from Urban Development	<ul style="list-style-type: none"> • Retention of existing tree canopy into both urban infill and suburban development • Diversification, protection, and enhancement of natural systems • Environmental planning built into healthy community development • Mitigation of heat island effect
Rising Temperature	<ul style="list-style-type: none"> • Sustainable infrastructure operation and maintenance in light of increasing need and cost • Building technologies and development approaches that maximize energy efficiencies and reduce emissions • Retention and maintenance of urban forest
Increased Storm Events	<ul style="list-style-type: none"> • Ice, wind and flood-resistant design for buildings and energy distribution networks • Urban tree retention
Greater Pressure on Public Health and Emergency Response	<ul style="list-style-type: none"> • Urban design that supports public health, including greater access to tree-shaded public spaces and streets across the city • Monitoring and surveillance of the health impacts of climate change
Increased Pressure to Conserve Energy, Reduce Greenhouse Gas Emissions and Design for a Low Carbon Future	<ul style="list-style-type: none"> • Meeting municipal GHG emissions reduction targets • Shifting of source electricity generation and distribution systems; promotion of individual generation and renewables, biogas from solid waste • Increased energy efficiency through green building design and construction for new buildings and remodelling of older buildings • Comprehensive mobility strategy involving reduction in car use and the design of public transit and active transportation networks to be more convenient • Opportunities for energy capture through various sources, including waste digestion • Innovation in movement of people and goods in rural areas • Innovations in mass mobility considering urban and rural needs • Electrification of private and public fleet including expansion of the number of charging stations • Support for public/private/philanthropic collaboration to achieve goals

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<p>Increased Costs Associated with Drinking Water, Wastewater, and Solid Waste management</p>	<ul style="list-style-type: none"> Waste an energy source and circular economic development opportunity
<p>Urban Form and Mobility</p>	
<p>Evolving Urban/Rural Structure</p>	<ul style="list-style-type: none"> Transforming existing suburbs into more complete communities with supporting mobility planning Coordination with the City of Gatineau and other adjacent municipalities regarding regional mobility networks and the movement of people seeking lower housing prices Policy and cost implications of intensification or expansion Communication and coordination between the urban core, suburban communities, and rural communities.
<p>Pressure on Communities</p>	<ul style="list-style-type: none"> Requirements for complete communities (adaptive design, local services and amenities, infrastructure, mobility options, employment, mix of housing, density, parks, urban forest and tree canopy, etc.) Tailored response to needs of different communities to become more complete Responding to life cycle changes of a community
<p>Demand for Housing and Employment Close to Transit</p>	<ul style="list-style-type: none"> Striking the right balance in the policy, regulatory and financial framework to allow for the evolution of existing areas that receive a transit station to become full-service, walkable, mixed-use neighbourhoods Allocation of appropriate density and mix of uses Ensure that transit services meet evolving travel pattern needs Establishing closer links between urban planning and transit route planning for all transit modes (rail and bus)
<p>Increased Demand for Integrated Mobility and Goods Movement</p>	<ul style="list-style-type: none"> Network integration (all forms of transport) Integration of active transportation network into urban design Mobility options for rural communities
<p>Economic Development</p>	
<p>Growing Importance of Diversification of Knowledge-Based Economy</p>	<ul style="list-style-type: none"> Understanding how technology can be implemented to the benefit and in support of the City’s goals and objectives Integration of innovation in all aspects of city life and management Requirement for enhanced training at all levels Role of Not-for Profit, social enterprise and opportunities for partnership
<p>Increasing Importance of Knowledge-Based Sector</p>	<ul style="list-style-type: none"> Defining and building on key knowledge based industry sectors where the City has the potential to become global leaders Greater partnerships between post-secondary institutions and industry University attraction, development, diversification and retention
<p>Growing Demand for Quality Labour Supply</p>	<ul style="list-style-type: none"> Retention of local human capital Further development of, and addition to, the city’s roster of post-secondary education institutions

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Increasing “Spikiness” of Cities and Businesses	<ul style="list-style-type: none"> • Importance of business linkages and relationships with Toronto and Montréal (within the mega-region) and other global cities
Growing Importance of Inter-City and Global Connectivity	<ul style="list-style-type: none"> • Impacts of high speed rail links to Toronto and Montréal, corridor protection and station location(s)
Innovation Plays an Increasing Role in Competitiveness	<ul style="list-style-type: none"> • Attracting a critical mass of human talent and providing advanced training • Availability of venture capital • Promoting Ottawa’s emerging agricultural sector as a key sector of the economy
Social / Cultural and Quality of Life	
Increased Pressure on Community Health	<ul style="list-style-type: none"> • Improved community design to promote healthy outcomes; promotion of daily physical activity