Oxford County

*Growing stronger together*

# 100% Renewable Energy Plan

June 2018

Committed to

*100% RE | Zero Waste | Zero Poverty*

Advancing the

# FutureOxford

Community Sustainability Plan

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# Preface

On June 22, 2016 Oxford County Council received its first draft 100% Renewable Energy Plan in support of its commitment to achieving 100% Renewable Energy in Oxford County. Working with the Smart Energy Oxford Action Committee, as part of the Future Oxford Partnership, much has been done to understand Oxford's energy consumption, our efficiency opportunities and many actions have been undertaken to demonstrate the potential and begin to advance Oxford County towards a 100% Renewable Energy future.

Our 100 % Renewable Energy Plan continues to be developed as both a policy and reporting document modeled from the 100 RE Building Blocks plan structure. Like the Kassel Criteria before it, the 100 RE Building Blocks process is fully applicable to the development of any long term strategic initiative and when properly utilized can provide guidance for policy makers, governments and community champions to develop their own initiative roadmap. The goal is to create a living document that can serve as an interactive tool box for stakeholder implementation and monitoring.

## CHAPTER 1

# Activate Local Resource Potential

### Overview

The 100% RE vision must first understand the particularities of their *municipality*, the potential of their unique region and distinguishing features of their unique community. The local resource potential (meaning not only local natural resources, but also social, economic, educational, etc.) should be mobilized and gathered from the very beginning of any action plan. The 100% RE target, and its related policy framework needs to be tailored to this particularity, as this will ensure effective and rapid policy and project implementation. This chapter will explore ways to mobilize local resources and take stock of existing community groups.

It is important that local governments start exploring existing options available at different scales (i.e. different levels of government) with the potential to support a successful 100% RE transition. These will range from capacity building programs to funding schemes that can be tailored to focus on renewable energy implementation and energy efficiency investments.

This Chapter will assess the renewable energy potential of Oxford County and ensure that the regional natural strengths are fully captured. Define the geographical boundaries of the area transitioning to 100% RE. Analyse energy consumption, evaluate the current energy performance by sector and evaluate GHG emissions.

### Key points

- Perform Preliminary Assessments
- Mobilize Local Resources
- Identify Programs for Support and Assistance

### Background

**Implementation Status and Outcomes** The local resource potential (meaning not only local natural resources, but also social, economic, educational, etc.) should be mobilized and gathered from the very beginning of any action plan. The 100% RE target and its related policy framework needs to be tailored to this particularity, as this will ensure effective and rapid policy and project implementation.

Oxford County's **100% Renewable Energy** goal will be fully achieved when the annual renewable energy generated within equals 100% of the annual energy consumed within Oxford.

It should be noted this does not imply we intend to de-couple from any of the existing energy networks (electricity or natural gas for example). In fact, we intend to improve the utilization of these networks through the advancement of a bi-directional flow of energy.

Given that our goal is 100% renewable energy, this section establishes a means of identifying baselines, milestone dates and accomplishments towards this goal by separating existing and forecast energy consumption by source, use, and sector.

This section of the plan will include a series of pie charts illustrating energy use in 2015 (Baseline) and 2050 (Targets) to achieve 100% Renewable Energy.

## 1.1 Mobilize Local Resources

Oxford County is fortunate to encompass a breadth of community groups that support the transition to 100% renewable energy. This section refers to any person, group or business that may be affected by, or participate in the process of a transition to 100% renewable energy.

Stakeholders are referenced in several sections of this plan; however this chapter is designed to identify any and all parties who may have a stake in the process and outcomes of our transition.

### 1.1.1 Municipalities within Oxford

Oxford County comprises of 8 municipalities within its boundaries. The County is represented by eight Mayors, and two additional County Councillors from the City of Woodstock. The Warden is the Head of County Council, and is elected by and from within County Council.

The eight municipalities of Oxford County include five rural townships, primarily agriculture based economies (Blandford-Blenheim, East Zorra-Tavistock, Norwich, South-West Oxford, and Zorra) along with three urban centres (Town of Tillsonburg, Town of Ingersoll and City of Woodstock).

### 1.1.2. Municipalities outside of Oxford

The Counties of Middlesex, Norfolk, Perth, Elgin and Brant, along with Waterloo Region, share a common border with Oxford County. However, all municipalities across Ontario are considered stakeholders and partners, in whatever manner they are inclined to participate in the quest for a sustainable energy future.

A growing list of Canadian municipalities is joining in the journey to 100% Renewable Energy by 2050, all of whom are important partners with Oxford County as we learn together.

### 1.1.3 Oxford Residents and Businesses

The active engagement of Oxford's residents and businesses will play an important role in the implementation of our 100% Renewable Energy Plan.

### 1.1.4 Chambers of Commerce, Business Improvement Areas and Economic Development Offices

Oxford County has the good fortune of having a very vibrant and engaged business community comprised of urban and rural economic development offices and multiple Chambers of Commerce and Business Improvement Area organizations. We will continue to work closely with the business community and we appreciate the important role they play.

Business and industry is a critical part of Oxford's economic success and their successful transition to sustainable energy will be an important part of our collective success.

### 1.1.5 Not-for-Profit and Social Service Organizations

Not-for-profit groups, such as religious and community organizations, service clubs, and a variety of social agencies, partners and professionals all play an important role in our transition. In many cases, they represent marginalized members of the community. Oxford's quest for an all-inclusive community and broad community well-being resonates with our social, community and non-profit agencies. All are important partners in this goal and we appreciate the role they play.

In 2017, Oxford County council adopted a goal of Zero Poverty and established a community driven committee to oversee the development of an implementation plan. The Zero Poverty Plan is now under development and is based on the same 10 Building Blocks as used to develop the 100%RE and Zero Waste plans.

### 1.1.6. Educational Institutions

Academic institutions (public and private, elementary, secondary, and post-secondary) play a critical role in our public engagement and knowledge generation criterion. We will establish an ongoing partnership with these agencies and hope to create meaningful and effective learning forums and educational opportunities around Oxford.

### 1.1.7 Agricultural Groups

Oxford County is a significant agricultural hub. We have among the most fertile lands in Ontario and enjoy recognition as the Dairy Capital of Canada. Oxford County is also home to the internationally-recognized *Canada's Outdoor Farm Show*. We appreciate the spirit of innovation inherent in the farming community – specifically, in how this creative group will contribute to our successful energy outcomes.

### 1.1.8 Builder's Associations

The building sector is an invaluable partner as we transition our building systems to that of net zero and other highly efficient building practices. We will not accomplish a goal of 100% RE and low carbon emitting buildings without the support and participation of this group.

Oxford County is a leader in the development of high-performance new and retrofit building infrastructure. The builder/developer community continues to be engaged through education forums and within the social housing strategy as we encourage the construction of PassiveHouse standard social housing in Oxford County.

### 1.1.9 Arts and Culture

Engaging, educating and inspiring our community to succeed will require innovative approaches. The highly active arts and culture sector of Oxford can play a vital role on our journey.

Community engagement through the Arts can be demonstrated through the Art of Sustainable Energy and Uncertain Bearings exhibits, conducted in partnership with the Woodstock Art Gallery.

### 1.1.10 First Nations

First Nations groups are an important part of our national identity and play an increasingly important role in the development of sustainable energy practices. Although Oxford does not have the benefit of a formal First Nation presence, we will reach out to these groups in the hope they will share our journey, one that is in tune with their past and present in terms of a more environmentally connected spirit.

### 1.1.11 Local Distribution and Natural Gas Companies

Oxford County is served by three electric utilities and two natural gas utilities.

Tillsonburg Hydro, ERTH Corporation and Hydro One supply electricity and Union Gas is the primary supplier of natural gas. All three LDC’s and one natural gas utility (Union Gas) are active members of Smart Energy Oxford.

## 1.2 Identify Programs for Support

Existing programs are available for all sectors with the potential to support a successful 100% RE transition.

These may range from capacity building programs to funding efforts that can be tailored to focus on renewable energy implementation and energy efficiency investments. Programs, funds, and support mechanisms - from local to international –across departments that could potentially support the transition to 100% RE.

Several opportunities exist that provide consumers with access to audit and retrofit funding and often the most accessible programs can be found through engagement and participation with energy efficiency programs offered by local natural gas and utility companies.

### 1.2.1 Federal

The Federal Government has a number of funding opportunities for businesses, communities and individuals, looking for ways to incorporated energy efficiency and renewable energy technologies.

a) Clean Energy Innovation Program
b) Green infrastructure Program – Community Capacity building, promote research and development, Electric Vehicle (EV) charging development, Smart Grid integration, Energy Efficiency (EE) in buildings.
c) Infrastructure Canada Smart Cities Challenge

### 1.2.2 Provincial

Ontario is a leading a province in providing access to incentives and funding programs to its, communities, residents and businesses who are looking to make sustainable choices. The province in partnership with the Independent Electric System Operator (IESO) provides a number of funding options that support energy efficiency retrofits, and renewable energy generation:

a) EVCO: Electric Vehicle charge Program
b) Green Ontario Fund
c) Save On Energy
d) Home Assistance Program
e) FIT & MicroFIT programs
f) Net Metering and Virtual Net Metering

### 1.2.3 Local Funding Schemes

In partnership with Future Oxford, Oxford County will offer community development funds, aimed at providing seed funding to businesses and organizations developing sustainable community projects.

Alternative capital loans programs will also be explored for residents wanting to install in Solar PV systems on their roofs.

### 1.2.4 International

There are many international organizations that provide policy and program support for communities that are making the transition to a clean economy.

a) The World Future Council
Located in Germany, works with governments, business and organizations in implementing sustainable policy practices.

b) Local Governments for Sustainability
Global network for more than 1500 communities, providing practical strategies and methodologies in achieving a low carbon economy.

c) Go 100% RE
The first global platform advocating for a 100% RE future. The is organization helps in creating a dialogue around what a 100% RE future looks, and explores success stories, best practices and policies from around the globe.

# 1.3 Perform Preliminary Assessments

## 1.3.1 Local RE Potential

### Solar (Photovoltaic (PV) and Thermal)

As of 2015, total solar PV generation in Oxford stood at less than 1%, and solar thermal a fraction of that. While this may seem miniscule, proponents of technology growth and the implications of exponential vs linear growth in particular, tell another story. In 2017, Ontario had over 16,4001 MW of renewable energy generation capacity installed. Solar energy had 14% of that capacity. However, this number doesn't represent the actual energy generated for use from the grid, only 1%2 of energy sourced from the grid comes from solar energy generation. The imbalance of numbers provides evidence to the solar energy generation potential the province has. The solar energy generation potential in Oxford County would provide very similar results.

The growth in Ontario's large solar energy generation is a product of its Feed-In-Tariff program, which has triggered significant investment in Oxford and continues to play a modest role in renewable energy growth, however we expect the real driver will be the significant cost decline in renewable technologies, steady improvement in generation output and a pent up demand for energy independence from Oxford residents.

#### A. Wind

In Oxford currently, wind energy supports close to a third of electricity requirements in the Tillsonburg region (albeit from sources outside of Oxford). The newest wind installation in Oxford, Gunn's Hill Wind generates about 15% of the energy used in Woodstock alone.

Although wind is an abundant and proven resource, it carries with it the issue of public acceptance. In some regions, wind energy has divided communities and it is believed the root cause of this is the disparity in benefit. A sense of resentment forms among those in a community who feel hostage to the change in landscape, but receive

[1] https://www.ontarioenergyreport.ca/pdfs/COMPLETE%20FINAL_MOE%20Ontario%20Market%20Assessment_July%2020,%202017.pdf

[2] http://www.ieso.ca/learn/ontario-supply-mix/ontario-energy-capacity

no benefit from the electricity generated by the project.

This reality is something the community of Oxford will need to resolve, possibly through greater community wide benefit and community driven cooperatives, or through some other means of revenue sharing in recognition of the right to access the benefits of wind in the region.

## B. Biomass

Being a largely agricultural community, abundant and diverse sources of biomass are available, yet largely untapped. This resource will be one to analyze in coming months for future growth opportunities. Renewable biomass energy products can include solid or gas fuels.

## C. Renewable Natural Gas and Synthetic Natural Gas

Renewable Natural Gas (RNG), also known as Biogas, is the result of anaerobic digestion or other means of converting biomass into a burnable source of fuel. Being geographically situated in close proximity to agriculture and farming land, many opportunities exist around Oxford in the creation of RNG. This renewable form of energy can be utilized as a source fuel or injected into existing natural gas infrastructure. The by-product of the RNG polishing process is carbon dioxide (CO2). Renewable synthetic natural gas can be manufactured using the residual CO2 combined with hydrogen.

Oxford is establishing partnerships with academic and private sector business owners to further develop this resource.

Several new biogas generation sites are active throughout Oxford County, including a small-scale 20 KW biodigester connected to the local electricity distribution system as a combined net meter/microfit installation.

## D. Solar Thermal

The heating of water from the sun is an age old approach to harnessing renewable energy. Oxford has several solar thermal installations that cover residential through agricultural applications. As an example of the flexibility of solar thermal, Oxford Gardens in Woodstock heats water and also cools space using chiller equipment, all powered by the sun.

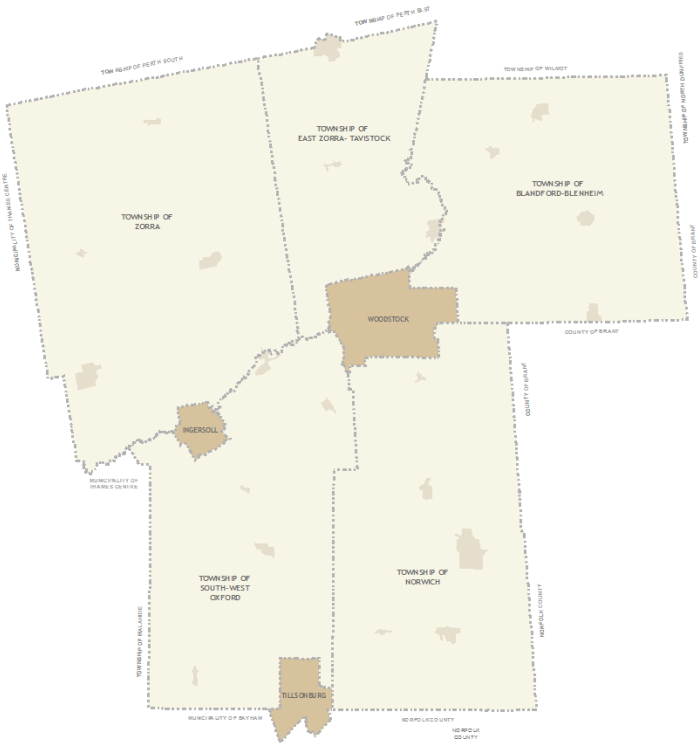
Solar thermal is significantly under-utilized in Oxford and presents significant opportunity for water and space heating applications.

## E. Hydro

The simple mix of water and gravity formed the first electricity generation source in Ontario and continues to provide 23[3]% (2017) of our electricity mix in Ontario. While limited resources for hydroelectric generation exist in Oxford, every small opportunity taken can add up. As an example, the Pittock Conservation authority located in Woodstock plays host to a small dam used to control water level at Pittock. It is estimate this small dam could provide up to 1000 kW of hydro power generation.

[3] http://www.ieso.ca/learn/ontario-supply-mix/ontario-energy-capacity

Assuming even half of that capacity could be generated for 6 months of the year, enough electricity could be generated to supply about 300 homes in Woodstock, or roughly 2% of the homes in Woodstock. At present, all of that water simply cascades over the dam, unharnessed and providing no electrical energy to Woodstock.




## 1.3.2. Define Boundaries

The 100% RE target will be specific to Oxford County. Oxford County is a two-tier municipality that is the aggregate of eight urban and rural municipalities. As such, the success of the many will determine the success of the whole. The eight municipalities that are a part of the 100% RE target are:

1. Blandford-Blenheim
2. East Zorra Tavistock
3. Ingersoll
4. Norwich
5. SWOX
6. Tillsonburg
7. Woodstock
8. Zorra

## 1.3.3. Analyze energy Consumption Data

### A. Electricity

Monthly electrical consumption data from 2011 to 2014 was provided by Woodstock Hydro at the postal code level broke down by account type. The following account data was included:

- Residential
- GS less than 50 kW
- GS 50-999 kW
- GS greater than 1000 kW
- Scattered Load
- Streetlights

Annual electrical consumption data from 2013 to 2015 was provided by Hydro One Networks Inc. at the postal code level and it was categorized into the following four sectors: agricultural, commercial, industrial and residential.

The electrical consumption data provided by Woodstock Hydro (2014) was categorized as residential or nonresidential (remaining account types) and summarized to provide annual consumption data. This annual summary is provided in Table 1.

The electrical consumption data provided by Hydro One Networks Inc. (2014) was already categorized into sectors (not account type). An annual consumption data summary of the four sectors are provided in Table2[4] .

| **Table 1: Annual Electrical consumption data provided by Woodstock 2014** | | |
|---|---|---|
| Elec. Consumption (kWh) | Residential | Non-Residential |
| | 110,718,170 | 261,550,485 |

| **Table 2: Annual electrical consumption data provided by Hydro One by sectors for 2014** | | | | |
|---|---|---|---|---|
| Elec. Consumption (kWh) | Residential | Commercial | Industrial | Agriculture |
| | 152,520,050 | 158,388,057 | 85,148,230 | 190,628,329 |

## B. Heating and Cooling

## C. Transport

An estimate analysis of energy consumption for transportation was performed by WalterFedy, an in depth report of the 100% RE and GHG Reduction report is available here: http://www.oxfordcounty.ca/Portals/15/Documents/SpeakUpOxford/2018/Smart%20Cities/5_SEO_100RE_GHG_Report_2016.pdf The total annual estimated energy consumption due to gasoline usage in Oxford County is 7,474,149 GJ. A summary of the analysis can be found in Table 3.[5]

| **Table 3: Summary of energy consumption in the transportation sector** | |
|---|---|
| **Activity** | **Annual Energy Consumption (GJ)** |
| Work Commute (outflow) | 1,317,000 |
| Work Commute (inflow) | 868,000 |
| Commute within Municipality | 1,266,000 |
| Leisure Commute | 239,147 |
| Commercial Transport | 3,784,002 |
| **Total** | **7,474,149** |

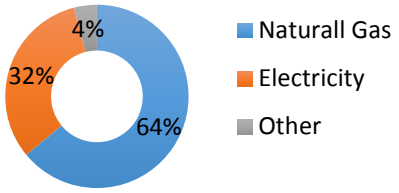
[4] SEO, page 5
[5] SEO, page 12

## 1.3.4. Identify Energy shares by Source

The current local energy mix by sector in

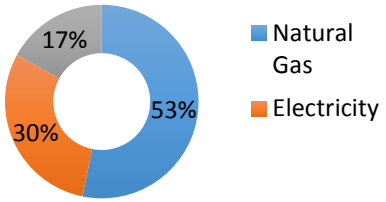
2105 for Oxford County is mostly sourced by natural gas. The residential energy source follows: Natural Gas 64%, Electricity 32%, and Other 4%

Residential Energy Mix 2015




The Non-Residential energy mix in 2015 had 50% Natural Gas: 28%, Electricity and 16% Other.

Non-Residential Energy Mix 2015




The Transportation sector's main energy source is Gasoline at 73%, Diesel 26% and Other 1%[6]

The total annual energy consumption in 2015 for Oxford County was 22,404 GJ, out of that 1,243 GJ of RE was purchased from grid, and 21,161 GJ of non-Re energy (6%). Table 4 provides a summary of the energy mix for the County.

Transportation Energy Mix 2015

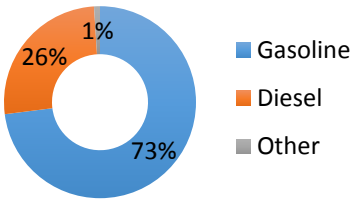



**Table 4[7]: Oxford County Current Energy Consumption Categorized**

| Energy Type | Annual (2015) Energy Source (GJ) |
|---|---|
| Non- Re consumption | 21161 |
| RE purchased from Grid | 1243 |
| RE Generation | |
| Total | 22404 |

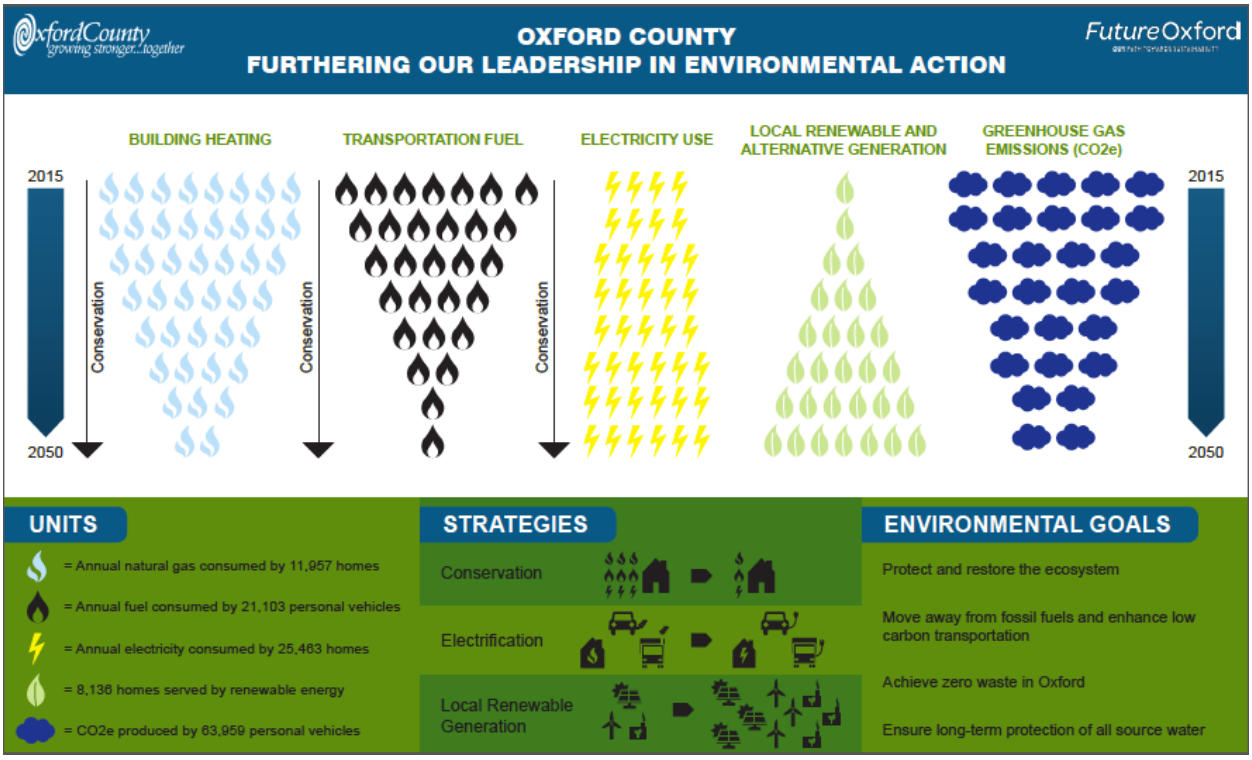
[6] SEO, page 15
[7] SEO, page 18

## 1.3.5 Identify GHG Emissions by Sector

The total GHG emissions in Oxford County in 2015 was 1,176,841 tonnes of CO2, with a large portion of that coming from the transportation sector (44%), 38% from the non-residential sector, and 18% from the residential sector.

Figure 4 provides a visual on how Oxford County will strategize in reducing GHG emission to 367, 942 tonnes of CO2, a reduction in 69% of GHG emissions by 2050.

Figure 4: Oxford County GHG Emissions Strategy




## 1.3.6. Measure Current energy Costs

Estimate average annual per capita costs for electricity, heating/cooling and transport.

## 1.3.7. Measure and Quantify Externalities

The current energy system is costing our communities much more than just monetary loses. Human health, climate change and environmental impacts are all externalities associated with the current energy system.

## A. Health effects of energy sources

The combustion of fossil fuels results in the release of pollutants that have a significant impact on the health and well-being of society. Air pollution is associated with elevated mortality rates for adults and infants, and other respiratory illnesses. Health Canada estimates 14,400 mortalities per year caused by air pollution[8]. Reducing the use of energy sources that cause air pollution can help reduce this number.

## B. Climate-change impacts

Humans have been emitting greenhouse gases such as CO2 into the atmosphere since the Industrial Revolution. The main concern is the continued rise of global temperatures and its consequences on the planet. As the impacts of climate change worsen, we will experience sever winter storm, droughts, and increase in rain fall and extreme heat. Ontario has experienced some unusual weather in the past years, including two extreme freezing rain events.

## C. Economic effects

The Clean-tech industry employs 274,000 Canadians that hold an average salary of $92,000[9]. By not leveraging this economic opportunity, Oxford County and surrounding communities are at risk of missing out on the job growth potential that clean energy brings. Investing more into clean energy and clean tech jobs will help to bring good paying jobs to local communities, while accelerating the transition to a clean economy.

[8] http://publications.gc.ca/collections/collection_2018/sc-hc/H144-51-2017-eng.pdf
[9] https://workandclimatechangereport.org/2017/12/19/clean-technology-employment-in-canada-new-data-from-two-statistics-canada-releases/

## CHAPTER 2

# Develop the 100% Renewable Energy Blueprint

### Overview

Chapter 2 gathers the key features of the 100% RE target (timeline and scope, energy sectors, covered, degree of political obligation and commitment. Baseline data for existing load and supply mix will be continually compared to milestone targets leading up to our 100% renewable by 2050 goal.

The 100% RE blueprint will be based on local potential and will be as inclusive as possible to ensure that all parts of society are involved and engaged. Oxford's 100% RE goal will be fully achieved when the amount of renewable energy generated within, or imported equals or exceeds the annual energy consumed.

In parallel with defining the 100% Renewable Energy target local government will engage with local research centres to develop a credible energy scenario using computational modelling tools. The results of the energy scenario will be summarized in a structured and easily communicated manner that guides stakeholders in developing specific policy interventions. The energy scenario creates a credible base that will help build support and understanding of how the 100% RE scenario would look like in practice, especially in terms of technologies and infrastructural changes involved.

The results of the energy scenario can also help develop an estimation of the potential economic, environmental and social benefits that such an energy transition would entail. These variables will include job creation, energy savings, opportunities for local industries, positive effect on human health, and climate change mitigation potential and resilience.

### Key points

- Define the 100%RE target
- Model 100% Renewable Energy Scenario
- Estimate the Potential Economic, Environmental and Social Benefits
- Oxford County's **100% Renewable Energy** goal will be fully achieved when the annual renewable energy generated within equals 100% of the annual energy consumed within Oxford.
- Oxford does not intend to de-couple from any of the existing energy networks (electricity or natural gas for example). In fact, we intend to improve the utilization of these networks through the advancement of a bi-directional flow of energy.
- To foster the formulation and implementation of a 100% RE target, Oxford has a long-term mission statement (100% RE by 2050), and will develop short and mid-term targets and milestones.

# 2.1 DEFINE THE 100% RE TARGET

## 2.1.1 Sectors included in the target

Oxford County's **100% Renewable Energy** goal will be fully achieved when the annual renewable energy generated within, equals 100% of the annual energy consumed within Oxford.

Oxford does not intend to de-couple from any of the existing energy networks (electricity or natural gas for example). In fact, we intend to improve the utilization of these networks through the advancement of a bi-directional flow of energy.

To foster the formulation and implementation of a 100% RE target, Oxford has a long-term mission statement (100% RE by 2050), and will develop short and mid-term targets and milestones.

The Oxford County goal of 100% RE by 2050 is a community-wide goal, meaning all energy generated and consumed across every sector is considered. Each consumer sector of residential, commercial, institutional, industrial and agricultural will be tracked as a measure of GJ and MW.

a. Residential
b. Industrial
c. Commercial
d. Institutional
e. Agricultural

The total energy consumption within Oxford County will be categorized into three sectors:

1. Residential
2. Non-Residential
3. Transportation

Based on limitations of data collection, it is not possible to distinguish between commercial, agricultural and industrial sectors, these sectors are combined into one, under 'non-residential'. [10] Figure 1 provides a breakdown of Oxford County's current (2015) energy consumption by each sector and energy source.

## 2.1.2. Calculation of RE Shares

The following baseline data, targets and figures have all been modeled by engineering firm, WalterFedy. The Energy Plan will offer a summary of RE targets, a more comprehensive look at

Oxford County's 100% RE modeling is available in the SEO Report done by WalterFedy.

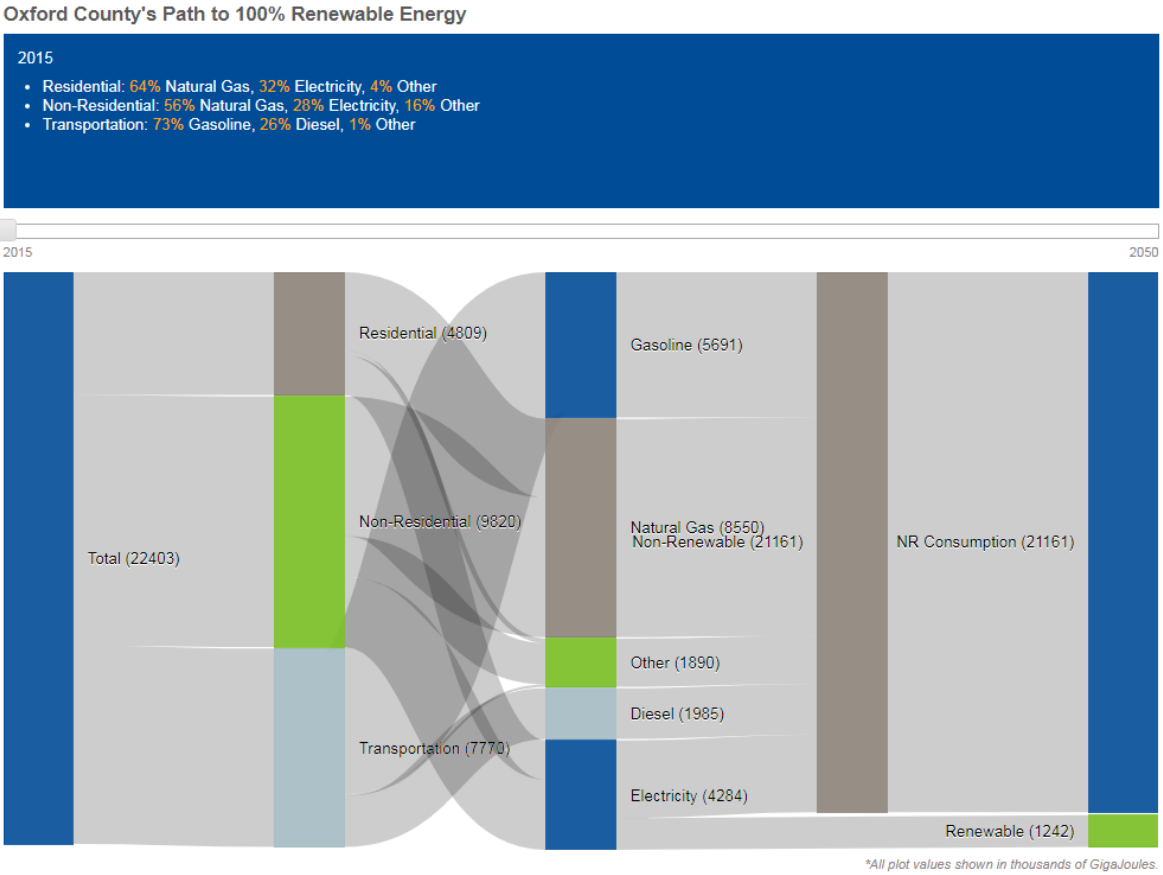
Percentage share of various renewable energy technologies will improve over time as we gather verifiable data. Our present assessment of renewable energy relies on IESO provincial renewable energy data and assumptions of distributed renewable energy share based on provincial averages.

[10] SEO Report page 14

Short term improvements to our RE share data include recent reporting from the Gunn's Hill Wind project. In addition, Renewable energy generation data from the IESO and LDC sectors, will be gathered through ongoing collaboration with these entities.

In 2015, Oxford County consumed approximately 22.4 million GJ of energy from electricity, natural gas, gasoline and diesel. Of this, over 94% of total energy consumed was produced using
Non-renewable sources; only 6% of energy consumed comes from renewable energy sources from electricity generation by hydro and wind. [11]

**Figure 1: Oxford County's Energy generation and consumption by sector and energy source.**




[11] SEO Report page 14.

## 2.1.3 Targets

In order to achieve 100% RE by 2050 Oxford County will aim to make the following adjustments:

- Increase Renewable generation capacity
- Fuel switch from natural gas to electricity for space heating in residential and non-residential sector.
- Switch from gasoline and diesel vehicles to electric vehicles and compressed natural gas.
- Increase energy conservation in residential, non-residential and transportation sectors.[12]
- Develop high-performance building portfolio in 2018/2019 to demonstrate improvement in occupant health, cost of energy reduction and building affordability improvement. Project will illustrate adoption of high-performance buildings will enable cost effectiveness of renewable energy and energy storage.

The current total energy consumption for residential, non-residential and transportation sectors is 22,404,000 GJ, the target for 2050 is to reduce this to 10,221,000 GJ. Figure 2 provides detailed energy targets by sector for 2030 (mid-term), Figure 3 provides energy targets by sector for 2040 (long-term), and Figure 4, provides the end goal of energy targets by sector for 2050 (end-goal). A more detailed report on baseline and targets is available in the SEO Report.

Table 1 illustrates the current and predicted energy consumption patterns if no drastic measures are taken to reduce energy consumption or switch to renewable energy sources. In this model, by 2050 Oxford County would transition from 6% renewable energy to 21% by 2050.

### Table 1: Oxford County Current and Predicted Consumption Patterns

| Energy Type | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Non- RE consumption | 21161 | 20673 | 20185 | 19697 | 19209 | 18721 | 18234 | **17746** |
| RE purchased from Grid | 1243 | 1345 | 1447 | 1548 | 1650 | 1751 | 1853 | **1955** |
| RE Generation | | 315 | 631 | 946 | 1261 | 1577 | 1892 | **2208** |
| **Total** | **22404** | **22018** | **21632** | **21245** | **20859** | **20472** | **20087** | **19701** |

All data is measured in thousands of Gigajoules.

Oxford County's targets for 100% RE by 2050 includes a decrease in total energy consumption of 12,182,000 GJ (48%), an increase of 776,000 GJ RE purchased from the grid and an increase of 8,211,000 GJ of RE generation.

Table 2 provides a detailed summary of Oxford County's energy consumption and generation targets by 2050.

[12] SEO Report pg. 16

## Table 2: Oxford County Energy Consumption and Generation targets for 100% RE by 2050[13]

| Energy Type | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| Non- RE Consumption | 21161 | 20673 | 16248 | 12997 | 9746 | 6494 | 3243 | - |
| RE purchased from grid | 1,243 | 1,344 | 1,456 | 1,569 | 1,681 | 1,793 | 1,906 | **2,018** |
| RE Generation | - | 1,173 | 2,346 | 3,519 | 4,692 | 5,865 | 7,038 | **8,211** |
| **Total** | **22404** | **22017** | **20,050** | **18,085** | **16,118** | **14,152** | **12,186** | **10,221** |

To offset energy consumption with RE generation, Oxford County will need to implement Solar PV's on land and existing and new rooftops, implement new wind farms, increase biofuel generation and continue to develop other renewable energy technologies. Improving Public transportation will also assist in decreasing energy consumption in the transportation sector.

Table 3 outlines the intermediate goals that Oxford County will need to set in order to achieve 100% by 2050

## Table 3: Oxford County Energy Source Targets[14]

| Changes to Achieve Ultimate Goal | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| Re-Generation (MW) | 120 | 240 | 360 | 480 | 600 | 720 | **840** |
| Natural Gas to Electric heating- Nonresidential % | 5 | 15 | 25 | 35 | 45 | 55 | **65** |
| Natural Gas to Electric heating- Residential % | 2 | 10 | 18 | 26 | 34 | 42 | **50** |
| Vehicle switch from gasoline to electric % | 10 | 20 | 30 | 41 | 51 | 61 | **71** |
| Vehicle switch from Diesel to Electric % | 5 | 26 | 27 | 38 | 49 | 60 | **71** |
| Energy Conservation- Residential Sector % | 2 | 8 | 13 | 19 | 24 | 30 | **35** |
| Energy Conservation- Transportation Sector % | 2 | 10 | 18 | 26 | 34 | 42 | **50** |
| Energy Conservation- Nonresidential Sector % | 2 | 10 | 18 | 26 | 34 | 42 | **50** |
| Renewable Energy Generation (thousand GJ) | 1173 | 2346 | 3519 | 4693 | 5866 | 7039 | **8212** |

To reach the goal of 100%, Oxford will need to switch space heating from natural gas (non-renewable), to electrical heating (renewable) which will be purchased from the grid. As well, Oxford will target to generate 71% of its energy needs from renewable energy sources. Table 4 provides a detailed overview of electricity consumption targets for Oxford County. A visual of the electricity targets for 2050 are presented in Figure 4.

[13] SEO Report page 19
[14] SEO Report page 19

## Table 4: Oxford Country Electricity Targets

| Type of Energy | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|
| RE Purchased from Grid | 1.242 | 1.345 | 1.456 | 1.569 | 1.681 | 1.793 | 1.906 | **2.018** |
| Non-Re Consumption | 3.043 | 2.521 | 2.169 | 1.817 | 1.264 | 712 | 460 | |
| RE Generation | | 771 | 1.398 | 2.025 | 2.853 | 3.680 | 4.207 | **4.942** |
| Total Electricity Consumption | 4.286 | 4.637 | 5.023 | 5.411 | 5.798 | 6.185 | 6.573 | **6.960** |

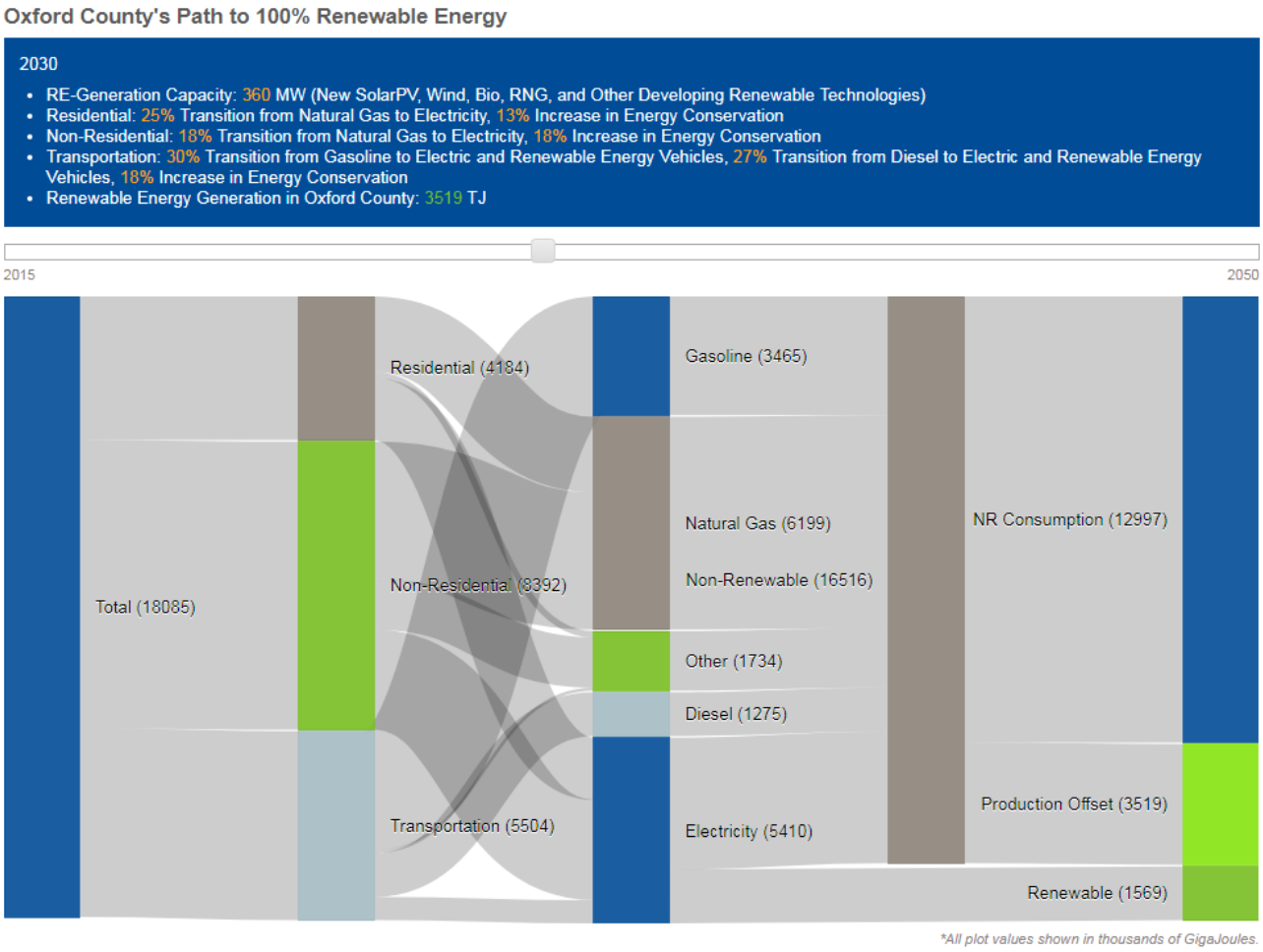
All Data is in thousands of Gigajoules.[15]

In order for Oxford to reach its goal of 100% by 2050, the annual amount of electricity consumed by Oxford County in 2050 will need to be 2,018,000 GJ of renewable energy purchased from the grid and 4,942,000 GJ of renewable energy generated within

Oxford County to offset the nonrenewable consumption.[16]

[15] SEO Report page 28
[16] SEO Report page 28

## Figure 2: Mid-Term Energy Goal 2030



## Figure 3: Long Term Energy Goal 2040

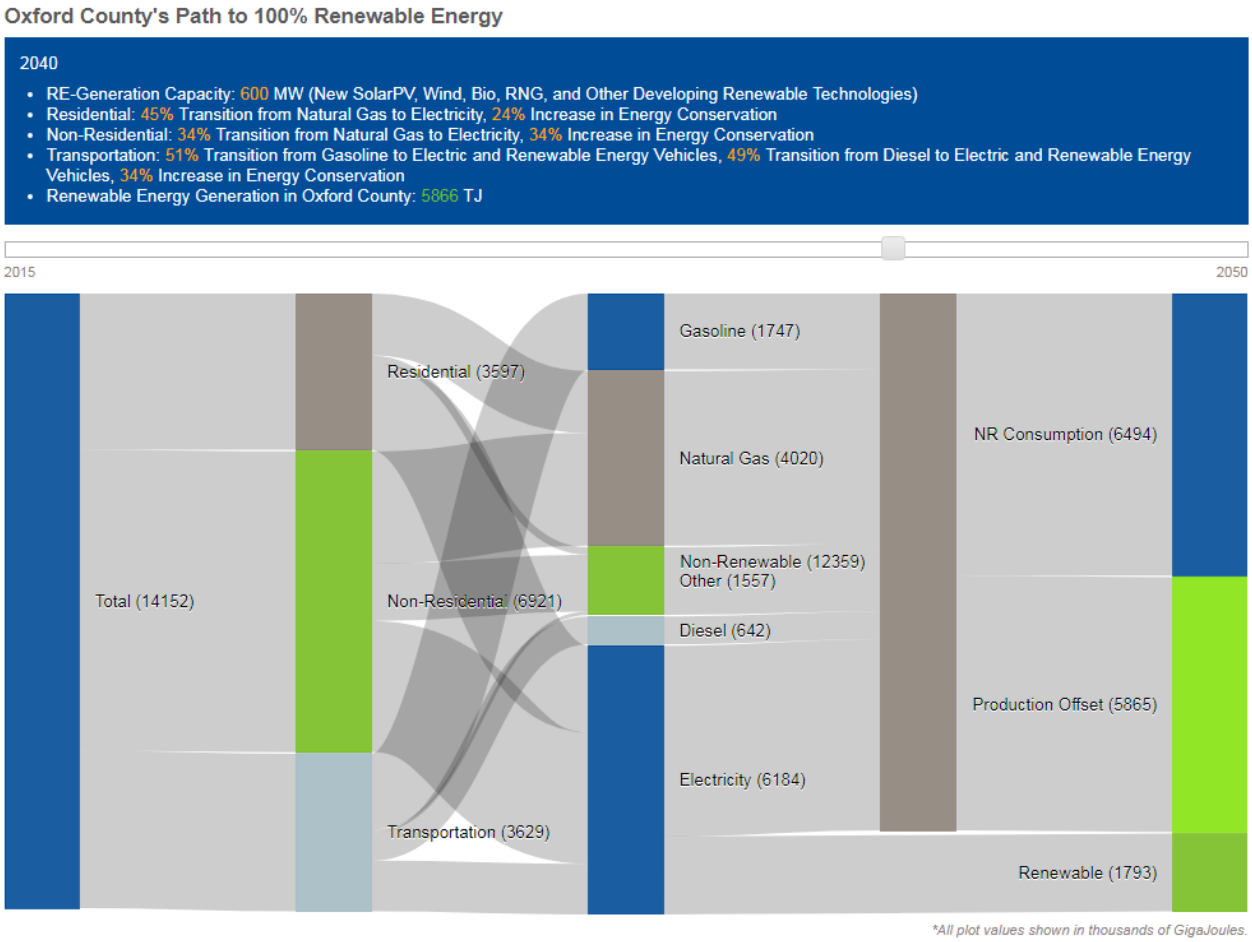
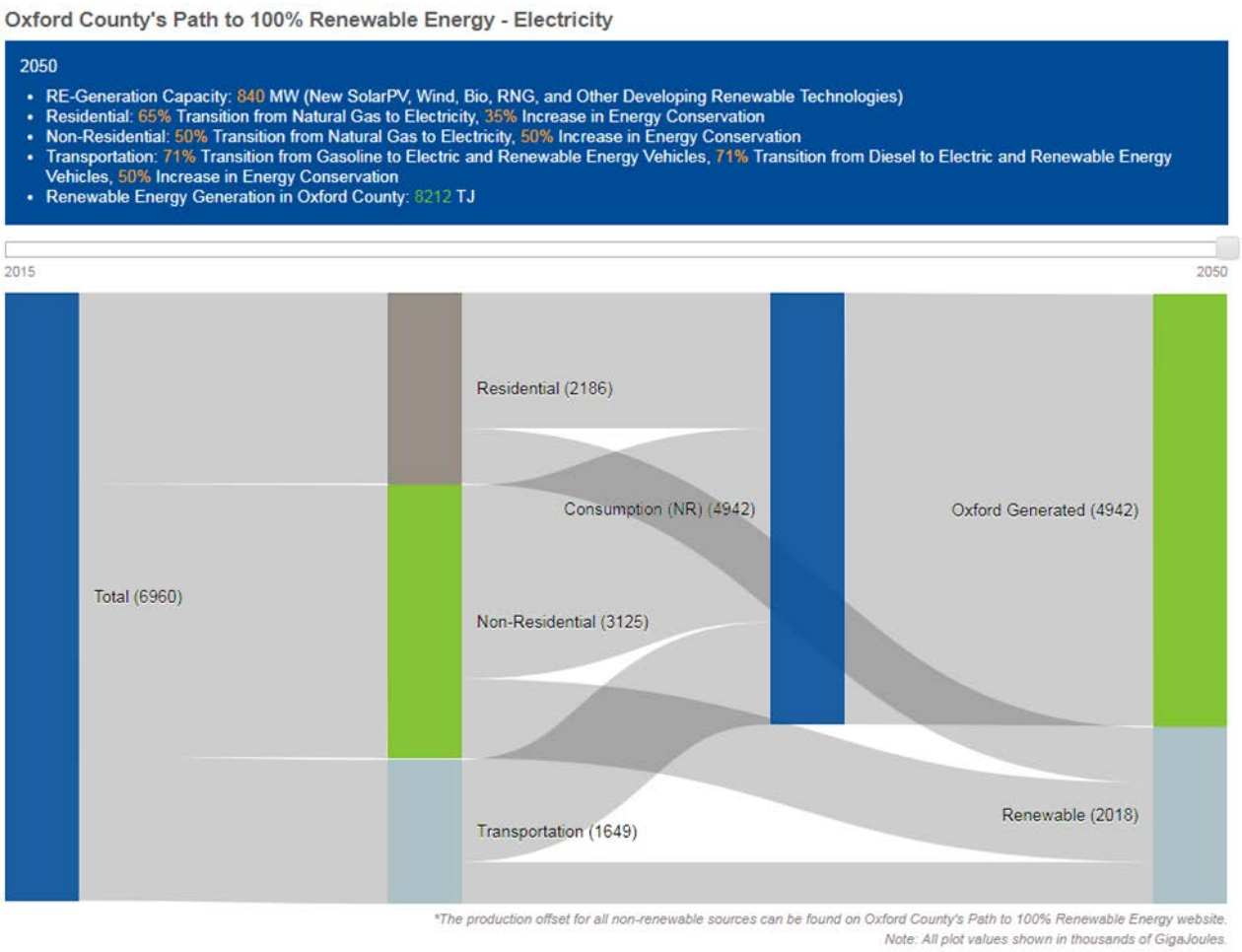


**Figure 4: Electricity consumption target 2050**




## 2.1.4 The 100% RE Scope of Target

The scope of Oxford County's 100%RE plan is community wide. In other words, all activities, including energy use related to buildings, transportation and electricity, across all sectors, is included. The Energy, Electricity and GHG baseline data is based on community wide statistics.

While our overall goal is 100% renewable energy within the County of Oxford as a whole, we may choose to establish milestones and targets for each of the partner area municipalities that comprise Oxford County:

1. Blandford-Blenheim
2. East Zorra Tavistock
3. Ingersoll
4. Norwich
5. SWOX
6. Tillsonburg
7. Woodstock
8. Zorra

## 2.1.5. The Role of the Community

The role of the County is to lead by example; to inspire; to remove doubt and to existing barriers surrounding RE. However, the real change will begin only when individual people, groups and business owners engage and lead on their own terms.

Oxford County municipalities are working together, and individually to gather baseline energy data and to begin the process of first identifying ways to better utilize their supplies of energy, while mapping out a path to transition to renewable energy.

### A) Municipal energy committees

Energy committees are typically a mix of municipal, private and business participants and bring an important mix of perspectives and expertise to the table.

South-West Oxford is a good example of the small municipality involved in energy committee work. Established in 2007, their committee includes private and public representatives to assess energy topics ranging from municipal asset improvements to building code advancements, such as Net Zero and Passive House concepts.

### B) Future Oxford Partnership

www.futureoxford.ca

Note that this includes consultation with all sub-committees of Future Oxford (Zero Poverty, Zero Waste, Smart Energy Oxford, Reforest Oxford, Economy Oxford, Community Oxford).

### C) Smart Energy Oxford (SEO)

The cornerstone committee of our 100% renewable energy transition, SEO was established under the environmental pillar of our Future Oxford Sustainability plan. SEO is comprised of rough a dozen community energy experts with diverse backgrounds.

Smart Energy Oxford (SEO) is comprised of private, municipal and utility stakeholders. Their primary mandate is the development and implementation of this plan through meeting and discussion, public outreach through their respective personal and professional circles and facilitating or championing a variety of projects and initiatives.

Tillsonburg Hydro: Local LDC serving Town of Tillsonburg. Active in Smart Grid development and supporting member of SEO.

Erie Thames Power (ERTH Corp): Local LDC based in Ingersoll and serves multiple communities throughout Oxford County. Active in market operations and renewable energy development, including net and virtual net metering applications.

Union Gas: Supporting member of SEO and advocate for compressed natural gas solutions.

### C) York University: Sustainable Energy Initiative

By partnering with Dr. Jose Etcheverry, Oxford has been connected to the worldwide renewable energy movement. Organizations such as the World Future Council and Renewable Cities have welcomed us with open arms and supportive venues like Kassel

International Dialogue on 100% Renewable Energy. We look forward to continuing to build, benefit and contribute to these relationships.

### D) Ryerson University: Future and Smart Cities

Oxford County continues to develop smart city strategies through the Ryerson Future and Smart Cities initiatives, to which Oxford County representatives serve in an advisory capacity.

# 2.2 The 100% RE Model Scenario

## 2.2.1 Potential Partners

Research and innovation will form an important part of our 100%RE transition. We are fortunate to have established working relationships with respected Universities such as York and Ryerson, and agencies such as the CUTRIC. These partnerships have helped lead us to this opportunity and they will continue to help guide us to success.

### A. University of Western Ontario (UWO):

- Partnering with UWO building research scientists on a Living Lab Building project. Installation of sensors and energy monitoring will drive data harvest for building performance-monitoring project.

### B. Ryerson University: Future and Smart Cities

- Partnering with Oxford County on Living Lab Building project.
- Assisting with solar rooftop generation project

### C. York University – International Renewable Energy Academy (IREA)

- Collaborate with York SEI to create combined in-class and field experience
- Host international students in RetScreen and renewable energy field project review

### D. Private Partners

WalterFedy, a Kitchener, Ontario based architecture engineering and construction firm, continues to assist in developing a web platform that illustrates the County's targets through Sankey diagrams, as well as a detailed 100% RE Baseline, Targeting and Dashboard Development Report.

The Canadian Urban Transit Research & Innovation Consortium (CUTRIC), a Toronto based research hub that supports next generation mobility and transportation solutions in Canada.

## 2.2.2 Infrastructural Changes

The 100% RE energy transition will impact the infrastructure in our buildings, transportation and electrical systems.

### A. Buildings

As an example of the importance we place on the built environment, high performance buildings form the foundation of our 2018 Smart Cities Canada Challenge application, forming the basis of our Challenge statement:

***Healthy, energy efficient, affordable buildings - where we live, work and play - are fundamental to community well-being. Through enhancement of data and technology, Oxford County's Building Transformation project will demonstrate a minimum 10%***

***improvement in occupant health, a 50% reduction in energy consumption, and an overall affordability improvement of 10%.***

Significant progress is being made in building design and retrofit. In 2017, several high-performance building projects that incorporate PassiveHouse/EnerPhit Standards and Green Building Council Zero energy building standards were started and will become demonstration project that include a consortium of partners. These projects will be monitored for post-occupancy performance to ensure outcomes meet modelled expectations; results will be shared locally and across Canada.

### B. Transportation

The transpiration sector will go through a major transformation. Oxford County will create Electric Vehicle Charger feasibility study in order to establish need and projected development of EV charging infrastructure across all sectors. Expand public transit into a Zero Emissions Urban Transit system and create additional bike lanes, which will impact the way traffic moves in the region

### C. Electricity

The County will continue to harvest information related to renewable energy generation across all sectors and include all generation supply mix. Establish 'bridge' technology road maps that include CNG and RNG, and establish projection of renewable energy transition across all sectors based on application of building and transportation conversions.

## 2.2.3 Opportunities to Fund 100% RE

Provincial and Federal grant programs will be used to fund Oxford County's 100% RE transition. Oxford County will ensure that it is successfully leveraging all funding opportunities by:

1. Identifying government programs, such as Green ONFund and IESO's Save On Energy Program.
2. Continuously apply for funding opportunities through Ontario's Cap and Trade program
3. Confirm County funding sources
4. Establish list and track all activity (both failed and successful) related to funding program applications. For example, Oxford invested time and resources on 9 projects to the MOECC GHG reduction challenge. None were selected, but this activity should be tracked and reported, regardless of outcome to ensure efficiency in the future.

## 2.2.4 100% RE and Meeting the Sustainability Plan

In 2015, the Future Oxford Community Sustainability Plan was approved by County Council and endorsed by all eight Area Municipal Councils. The Future Oxford Community Sustainability Plan provides a means of identifying and implementing sustainability practices, including the transition to 100% RE.

The Future Oxford Partnership has been established as a community based entity responsible for the leadership, guidance, co-ordination to, and monitoring of the plan's implementation.

Three implementation sub-committees (representing the three pillars of environment, economy and community) will be responsible for coordinating with the many community groups who are contributing to the implementation of the plan. All committees will provide input and comment as the 100% RE plan is implemented.

### A. Sustainability Plan

Details of the Future Oxford Community Sustainability Plan can be viewed at www.FutureOxford.ca

### B. Zero Waste Plan

The 100% RE Plan works in harmony with Oxford's Zero Waste Plan by allowing the County to create a closed loop system through maximizing the use of raw materials through biofuel generation, diverting waste from landfills, and reducing carbon emissions by creating a more sustainable community.

# 2.3 Estimate the Potential Economic, Environmental and Social Benefits

## Potential Economic Savings

Based on the existing energy infrastructure, we have become resigned to the fact that our after-tax energy dollars must be sent outside of the County. Virtually all money paid for energy use is sent outside of the County to distant generators. This does not need to be the case and other jurisdictions, such as Rhein-Hunsruck in Germany, are gradually reversing this flow back to their communities, where it is re-invested within the community to further advance renewable energy development.

The economic saving potential for generating renewable energy within the local community is vast. In the case of Rhein-Hunsruck, a small German town of a 103,000 citizens, 290 million euros could be saved annually by eliminating the import of energy into the community.

Similar savings are projected for Oxford County.

## Environmental Benefits

Fossil fuel is something we should treasure, not burn. Our gradual decline is the direct result of squandering a natural resource that in actual fact, should be valued beyond that of gold, yet is dealt at a price liken to dirt. If we are to reduce carbon emissions and avoid the continued acceleration of global warming resulting from copious carbon emissions, we need to stop burning fossil fuels. The road to 100% RE will reduce CO2 emissions by 47% for Oxford County. Table 5 provides the reduction in CO2 emissions by milestone years for Oxford's 100% target. Detailed targets for each year can be viewed in the SEO report.

**Table 5: CO2 Emissions reduction targets**

| | 2015 | 2025 | 2035 | 2050 |
|---|---|---|---|---|
| GHG Emissions | 1,139,705 | 1,011,078 | 753,824 | 397,942 |
| % Change | | 11% | 25% | 47% |

## 2.3.3. Social Benefits

### A. Socioeconomic Value Creation: Private Ownership vs Public/Corporate Investment

A major consideration as we develop our 100%RE plan is the concept of leaving no-one behind. Access to renewable energy should not be limited only to those who can afford it. A challenge for, and indeed an obligation of each municipality is to ensure everyone in our community has access to the benefits of a renewable energy future. Community driven cooperatives and other creative means of providing capital will need to be developed.

### B. Local jobs created

Renewable energy creates an incredible opportunity for any community with the courage to implement and seek out industry and service companies willing to shift into this new energy paradigm. An important element of economic benefit in Oxford will include the attraction and development of renewable energy production and service agencies.

These new systems need to be designed, manufactured and serviced somewhere, and where better than in a community that lives with renewable energy technologies on a daily basis.

Oxford County has a robust manufacturing sector in place and can easily ramp up to support renewable energy technologies. In turn, these new industries and service companies will generate new job growth in the County – jobs that will rely on unlimited renewable energy resources as opposed to short term and limited non-renewable resources.

### C. Avoided health care costs

As we transition to a renewable energy system, we should expect a reduction in the amount of air pollution. While this measurement will be very subjective, given the fact we have no control over the 400 series highways passing through our region, it is still important to measure the benefits of this transition. Various metrics will need to be developed in order to make reasonable health care assessments, however it is understood that a reduction in carbon emissions, especially those from the transportation sector, will have a net benefit on the air quality of Oxford County.

### D. More Active Community

The 100% RE plan will foster a more active and engaged community. By transforming the transportation infrastructure to accommodate more bike lanes and encourage walking, will naturally get the residents of Oxford County moving more actively. The plan also fosters an open door environment where residents are encouraged to participate in, and provide their input on decision-making processes. The 100% RE plan will help in creating a more sustainable, active and engaged community in Oxford, and surrounding areas.

# CHAPTER 3

# Formalize Aims and Functions

### Overview

Formalization of the transition to 100% RE requires official, binding targets that need to be set, policies and legislation that needs to be binding, and specific institutions that are needed to supervise and drive the transition forward must be established.

Setting an ambitious, long-term renewable energy target demonstrates political commitment and provides investors, businesses, and residents alike, with a clear long-term vision for the region, along with better understanding of how their roles within it.

The establishment of stable, formal legal and regulatory frameworks that support the 100% RE targets need to be institutionalized. Specific regulations will need to come into force to ensure that all the other recommendations listed in the building blocks are indeed implemented.

Policies will be supportive of renewable energy investments; favour clean technologies over carbon-intensive alternatives; internalization of fossil fuel and nuclear externalities, and stimulation of energy cooperatives and other participatory and decentralized processes of renewable energy development.

The establishment of formal bodies and organizations that will be responsible for designing, implementing and monitoring the transition towards achieving the target: multi-level governance, cross-sectorial collaboration and peer-to-peer cooperation between regions, cities and local governments will take place.

### Key points

- Fix Binding Targets
- Define Comprehensive Legal and Regulatory Frameworks
- Establish Relevant Institutionalized Bodies
- Establish binding commitment to 100%RE goal
- Focus is on program planning with each municipality at a high level.

### Background

## Fix Binding Targets

## 3.1.1 Map existing policies for RE

Existing standards, plans and bylaws have been established over a long period of time and should be useful guides to help structure change. As an example, planning and building code rules have evolved to ensure a fair and equitable process is in place (as much as possible). Buildings have been identified as a significant carbon and energy reduction opportunity; however a wholesale change of land use and building codes without seeking guidance from existing policy would be a mistake.

As barriers are identified within existing regulations, existing processes should be viewed as a starting place to begin making the changes that are needed to allow the 100% RE process to move forward**.**

All municipalities in Oxford need to take a pro-active role in our collective transition to 100% RE. Leading by example is the essence of the province's Green Energy and Economy Act and is a natural part of this initiative.

### A. Define Social Risk and Opportunity

The transition to 100%RE must be transparent and inclusive and will require extra effort to ensure that no person is left behind. As an example, our social housing transition to high-performance buildings will significantly reduce the energy requirement of our social housing stock. This reduction will in turn enable a cost effective replacement of non-renewable sources of energy. By reducing the amount of energy required overall and by replacing what energy we do need with renewable sources of energy, affordability will improve.

Oxford County Human Services is focusing on PassiveHouse and Net Zero building concepts to enable the reduction of energy usage, while improving affordability, health and wellbeing to occupants.

### B. Future Oxford Community Sustainability Plan

In 2015, the Future Oxford Community Sustainability Plan was approved by County Council and endorsed by all eight Area Municipal Councils. The Future Oxford Community Sustainability Plan provides a means of identifying and implementing sustainability practices, including the transition to 100% RE.

The Future Oxford Partnership has been established as a community based entity responsible for the leadership, guidance, co-ordination to, and monitoring of, the plan's implementation. Three implementation sub-committees (representing the three pillars of environment, economy and community) will be responsible for coordinating with the many community groups who are contributing to the implementation of the plan. All committees will provide input and comment as the 100% RE plan is implemented.

### C. City of Woodstock Municipal Energy Plan (MEP)

The City of Woodstock MEP is the first formal community energy plan within Oxford borders and provides a valuable yet different comparison as we develop the Oxford 100% RE plan.

### D. Ontario's Long Term Energy Plan

Released in 2017, Ontario's Long Term Energy Plan seeks to enable access to renewable energy by allowing the virtual transfer of electricity across geographical and non-contiguous LDC territories. In 2017, Oxford County presented a Virtual Net

Metering proposal to Ministry of Energy, which was used in part to help shape a demonstration process that will be launched in 2018.

The Plan also aims to focus on modernizing the grid, investing in electrifying the transpiration system, expanding energy storage and enhancing the Smart Grid Fund.

### E. Climate Change Action Plan

The Climate Change Action Plan is a five-year plan that will help Ontario fight climate change by establishing innovative funding mechanisms that enhance the adaptation of clean energy technologies, while promoting energy efficiency in homes and businesses, developing clean transportation and making public transit more accessible. The plan aims to integrate The Cap and Trade system and allow businesses and industry to make sustainable investments, while ensuring efficient and sustainable land use practices. [17]

### F. Ontario Cap and Trade

Ontario Cap and Trade program aims to lower GHG emissions by putting a price on carbon. The cap limits the amount of GHG emissions a polluter can emit, staying within their allowance for that given year. While allowing polluter the ability to trade (purchase or sell) allowances based on their GHG emissions for that year. The program is projected to generate $1.9 billion per year, which will be reinvested into reducing GHG emissions generated by transit, homes, and funding social housing retrofits[18].

## 3.1.2 Partnerships with other levels of government

### A. Municipalities

For our 100% RE goal, we have the unique advantage of solidarity in Oxford through a motion of council. We are in the early and fragile stages of our transition, making planning and orientation a critical path. Oxford County has a strong relationship with all eight municipalities that unanimously passed the motion to commit to 100% RE. This positive relationship allows for the development of RE in the area to be more fluid and acceptable.

We continue to support our municipal partners from across Canada by sharing our experience to date and by engaging and learning from our cohorts.

### B. Provincial Partnership & Outreach

The County is aggressively seeking sustainable partnerships with all relevant Provincial Ministries. This outreach includes ministerial delegation, planning and arranging onsite meetings to discuss specific topics when necessary.

**Key Ontario Ministries include:**

- Ministry of Energy
- Ministry of Environment and Climate Change
- Ministry of Transportation
- Ministry of Agriculture, Food and Rural Affairs
- Ministry of Municipal Affairs and Housing
- Ministry of Economic Development, Employment and Infrastructure

[17] Climate Change Action Plan, pg. 8

### C. Federal Partnership

While less active than provincial, the new Federal government appears to align more closely with provincial and national ambitions. Participation at the federal level will occur generally in cooperation with our various provincial partners.

**Key Federal Ministries include:**

- Ministry of Energy
- Ministry of Environment and Climate Change
- Ministry of Transport
- Ministry of Infrastructure and Communities (Smart Cities Canada Challenge)

## 3.1.3. Legislative Gaps and Barriers

A longer term and relatively aggressive plan such as 100% RE must be able to weather the storm of political change. With a change of political leadership possibly occurring every 4 years, effective communication and planning with all levels of staff must be managed properly.

Energy is fundamental to all aspects of our economy and community and political leadership and policy at all three levels of government will impact the transition to renewable energy.

### A. Strategic cooperation between Oxford municipalities

Once the value of renewable energy in our communities, economy and environment is apparent, the likelihood of new leadership eliminating or significantly reducing the goal of 100% RE should be diminished.

In the spirit of the County tagline “Growing Stronger, Together”, a conscious effort is be made to avoid duplication of effort, while tapping into the strengths of each individual partner. As an example, the City of Woodstock took the lead in the development of a Municipal Energy Plan, providing a template for other municipalities to follow. A number of years ago, Southwest Oxford created a Municipal Energy Committee and has been sharing their experiences with their neighbours.

Outreach and educational forums will take place at council meetings and public venues within each municipality, and a ‘coming together’ under the auspice of Oxford County will take place as appropriate.

### B. Strategic cooperation with contiguous municipalities outside Oxford

Planning for a 100% RE target will eventually need to expand to other regions, including bordering counties. Oxford may need the unique characteristics of neighbouring counties for renewable expansion or service sharing, and vice versa.

Ultimately, a goal of 100% RE will become a Provincial mandate. We hope to start in Oxford and spread out as we begin to work more closely together as a Province seeking a common goal.

Each municipality is unique and brings a different perspective and skillset to the conversation. As an example, Perth County (Stratford) is quickly developing the foundations for a Smart City, including autonomous vehicle testing and large scale energy storage. We hope to learn from their experience and in turn, share our own experiences in a way that will provide mutual benefit.

#### C. Funding

Support of the 100%RE transition will continue to be a blend of municipal investment and where possible, funding support through programs such as Cap and Trade and other government programming designed to accelerate the transition to a low carbon economy.

To date, the majority of funding for our programming is through council approved municipal budget.

### 3.1.4 Political Mandate of Energy Policy in Oxford County

Oxford County's 100% Renewable Energy Plan is consistent with and is supported by the recently released Ontario Climate Change Action Plan. An ongoing relationship with the Province is considered a crucial aspect of our plan, since Oxford's sustainability plan essentially aligns with the Provincial goals attributed to energy, waste and other challenges. Our alignment with provincial government policy and direction cannot be wasted.

## 3.2 Define Comprehensive Legal and Regulatory Frameworks

### 3.2.1 Legislative Gaps

Identify gaps in the existing legislative framework to define potential additional laws and regulations to be implemented.

Map which stakeholders are addressed by the existing laws and policies

### 3.2.2 Amendment of Regulations

Identify laws and regulations that should be amended

## 3.3 Relevant Institutionalized Bodies

### 3.3.1 Institutional Bodies Responsible for 100% RE

Institutional processes take time to evolve and time to change. Changes to policy and standards requires significant effort and human resources and it will be important that a process is created that allows for a time-effective means of making adjustments as required.

#### A. Oxford County

All municipalities in Oxford need to take a pro-active role in our collective transition to 100% RE. Leading by example is the essence of the province's Green Energy and Economy Act and is a natural part of this initiative.

This will take significant planning and orientation among all municipalities and departments and must be monitored.

Municipal Departments

The County hosts a wealth of information and skills across all its municipal partners. The people in these organizations are knowledgeable and well educated in their respective vocations and will be invaluable partners as we transition to 100% RE.

#### B. Environment Oxford

Environment Oxford combines the three committees of Zero Waste, Reforest and 100%RE committees and includes additional stakeholders. This committee meets on an as-needed basis to review progress of the three aforementioned committees and to gauge progress from an overall environmental perspective.

#### C. Smart Energy Oxford

Smart Energy Oxford (SEO) is comprised of private, municipal and utility stakeholders. Their primary mandate is the development and implementation of this plan through meeting and discussion, public outreach through their respective personal and professional circles and facilitating or championing a variety of projects and initiatives.

#### D. Zero Waste Oxford

Zero Waste Oxford (ZWO) is comprised of private, municipal and industry stakeholders. Their primary mandate is the development and implementation of a plan to achieve zero waste in Oxford County through meeting and discussion, public outreach, through their respective personal and professional circles and facilitating or championing a variety of projects and initiatives. There are significant synergies between Oxford's 100% RE and Zero Waste goals.

### E. Reforest Oxford

Reforest Oxford is comprised of a number of private and municipal stakeholders interested in restoring naturalized areas within Oxford (tree cover and meadowlands).

### F. Community Oxford

Community Oxford was initiated as a means to conduct a Community Index of Wellbeing survey in Oxford, committee membership includes social and charity organizations, staff and private citizens.

A shift to renewable energy will not be without social challenges, however we believe the long-term result will be a more democratic and independent energy result for citizens.

This committee will be tasked with the role of monitoring and recommending course of actions during transition to ensure “no person is left behind.”

### G. Economy Oxford

The transition to 100% renewable energy will create both opportunity and challenges from an economic perspective. This committee is driven by business people and community leaders and will be tasked with the goal of monitoring the economic climate in Oxford as the plan evolves.

As with social outcomes, a properly implemented transition to 100% RE will have a net positive impact to the county and region as we become more energy independent and capitalize on the opportunities that renewable energy technology and services will ultimately bring.

## 3.3.2 Other Exemplary Bodies

### A. Canada- Vancouver

In 2015, Vancouver City’s Council set out an ambitious goal to shift the city to 100% RE by 2050. Currently, Vancouver is the only other jurisdiction in Canada that has set this ambitious target. The City’s Renewable City Strategy highlights its goals, targets and strategic approach on how the City will transition to a low carbon economy. Vancouver’s 100% RE strategy will act as a guiding tool for best practices and assist in developing Oxford’s own 100% RE plan.

## B. U.S Beaverton, Oregon

Beaverton, Oregon has targets to move to 100% RE for all public buildings, streetlights and water supply. The town has taken an alternative approach to 100% RE; rather than generating renewable energy generation, it is investing in renewable energy that is generated elsewhere which will help offset the consumed energy in the town. Investing in RE provides a monetary value to the environmental benefits of RE generation. The town also has a commitment to lower carbon levels by 80% by 2050[19].

## C. Europe - Rhein-Hunsruck, Germany

A district located in the West of Germany that used to spend 290 million euros on energy imports annually. By setting a climate protection plan in 2011, the district began generating

100% of its electricity needs through RE generation. By 2014, the district was able to export its excess electricity to neighbouring regions and supply its local transportation system[20].

Rhein-Hunsruck is a great example of a district that has robust grid connection to neighbouring regions, providing an avenue to export excess electricity generation without having to invest in local storage facilities, demand response, and system balancing. Oxford County also shares similar interconnections with its neighbouring regions, allowing it to benefit from the same positive economic, environmental social and energy secure benefits as Rhein-Hunsruck has.

[19] http://www.go100re.net/properties/beaverton-oregon/
[20] http://www.idaea.csic.es/sites/default/files/How-to-achieve-100-percent-renewable-energy.pdf

# CHAPTER 4

# Promote Energy Conservation and Efficiency

## Overview

Chapter 4 evaluates the scope of measures implemented to improve performance in energy efficiency and energy savings with respect to energy generation and utility activities in achieving 100% RE.

A large decrease in energy consumption can come from non-technical measures that support a cultural focus on energy savings that lead to behavior change. This can be done by promoting a culture of sustainability within the community, which is based not only on raising the level of awareness among citizens (through education and awareness campaigns) but also on increasing their level of engagement within their community.

Considerable amounts of energy and carbon emissions can be saved by aggressively retrofitting existing buildings. By upgrading infrastructure, energy conservation can be achieved. Technologies that enhance energy efficiency and save energy through improvements in infrastructure and efficient technologies will be deployed.

## Key points

- Change Human Behaviour
- Retrofit Existing Built-Environments
- Upgrade Infrastructure and Support new Technologies
- Energy efficiency gains will reduce the amount of renewable energy required to meet the same needs
- Effective energy efficiency planning must align with renewable energy needs assessment

## Background

Energy efficiency and energy savings are always the first step when planning a shift to renewable energy. The amount of renewable energy required to displace non-renewable energy resources is directly proportional to the amount of energy required; the less we consume to create the same services, the less we require in capital investment for our renewable energy system.

Most of us use far more energy than is required to achieve the same outcomes. With energy costs historically low and supplies plentiful, as a society we fail to appreciate the true value of energy resources, whether considering non-renewable or renewable sources. This lack of appreciation has placed us among the most inefficient users with among the highest per-capita energy users in the world. But we can change this. As we navigate toward a 100%RE society in Oxford, efficiency and conservation will become second nature. Several opportunities exist that provide consumers with access to audit and retrofit funding and often the most accessible programs can be found through engagement and participation with energy efficiency programs offered by local natural gas and electric utilities.

# 4.1 Change Human Behaviour

- Engage your community in local decision making processes related to energy consumption and production.
- Define projects and platforms to foster community engagement and education particularly on energy.
- Map existing policy initiatives that target change of behavior within a community.

Leaving fossil fuels in the ground will not be easy. As with any process that develops over time, our dependence on fossil fuel has inertia. Our work and play infrastructure and virtually everything that helps define us, is in some way tied to fossil fuel. The very atoms that comprise our body mass are composed not of carbon created during our lifetimes, but rather, carbon from eons past, mined and pumped from deep within the earth's surface.

Fossil fuels are so deeply embedded in the fabric of society and the transition from a fossil fuel existence to that of one driven by renewable forms of energy is possible, but it will take a leap of faith and significant adaptation to a different type of existence.

## Creating a Culture of Conservation

Finding ways to engage the public at their respective level of understanding will take time, and consumers will need to adapt at their own pace and in ways that are meaningful to them.

We are entering a time where a culture of conservation must again manifest itself, as there are economic, environmental and social benefits to practicing conservation. Changing human behavior may be one of the bigger obstacles that we may face and may take longer to shift societal norms. Oxford County is committed to assisting its residents in making that transition easier by being a leader and offering programs for support to its community.

### A. The Negawatt

The concept of a Negawatt is a simple one: the best unit of energy you use is the unit of energy you don't need. Coined by Amory Lovins of the Rocky Mountain Institute, the concept of incenting people to use less energy through conservation and efficiency efforts creates a 'virtual' measurement of energy not used.

In a system where the true value of energy is not considered, the cost has little to no impact on the ability of the user to consume, creating an unsustainable situation. Homes and Businesses are predominantly heated with non-renewable, carbon emitting fossil fuel, yet these energy sources are priced at levels that fail to appreciate the true value of those limited natural resources.

Using energy is necessary to conduct commerce and to sustain our very existence; however using energy that contributes nothing to our livelihood is unnecessary and will make a transition to renewable energy very difficult if not impossible.

### 4.1.3 Empowering Public Engagement in Decision Making

Oxford County took the lead in Ontario by bravely committing to a renewable energy future; however our success will be built on the leadership and commitment of the public. The role of the County is to lead by example; to inspire; to remove doubt and to remove barriers

Real change will begin only when individual people, groups and business owners engage and lead on their own terms. Continuous efforts into ensuring the citizens of Oxford County are engaged in decision making process will be critical.

*"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has." – Margret Mead*

### 4.1.4 Energy 101

It is important to engage the public in language that is relatable to avoid 'tune-out'. If we aim to rally people to understand and adopt renewable energy into their lives and businesses, we must succeed at reaching people on their own terms.

Part of our 100%RE strategy will involve the development of a meaningful and measurable public education campaign. People need not become energy professionals to make a difference, but they do need a basic understanding of energy.

### 4.1.5 Establishing training opportunities

Oxford County is a big place with relatively few people. At 2000 sq. km's and a population of 115,000, the number of people we need to reach is relatively small, but the distances are great. There is a tendency to focus public meetings and engagement sessions within the urban regions of the County. This is the path of least resistance when organizing events and at the same time unfair to those living in rural areas of the County.

An important element of our Future Oxford Community Sustainability Plan is that of an accessible Oxford, and for good reason. People essentially rely on personal vehicles to get around, yet not everyone has the same access. Establishing training centers in the peripheries of the County is becoming part of our education strategy through the Future Oxford Speakers Series and leveraging the County Library resource network to host public events.

### 4.1.6 Leveraging existing tools to monitor and manage energy use

There are many devices on the market that can help people learn about their energy use and acquire the basic skills and understanding to reduce energy consumption, but none is so under-appreciated and under-used as that of the Smart Meter.

With the exception of a few difficult-to-reach regions around the Province, virtually all residential and small commercial customers have access to their hourly electricity consumption in relation to time-of-use prices. Customers have the opportunity to shift their activities to times when

electricity is less expensive to reduce cost and reduce load on the grid during peak times. The Province has rolled out Ontario's Green Button Initiative that allows customers to view their energy use through a mobile app and web base to help Ontarians make better decisions on how to lower their electricity bills.

An early strategy to combine education and awareness should involve a training series on the various technologies available to customers on reducing their utility bills and grid load.

### 4.1.7 Education and Public Outreach platforms

Similar to our Knowledge Generation approach, we will involve continuous brainstorming to develop the most time, and cost effective programs and venues.

#### A. Education through Art

Through our partnership with the Woodstock Art Gallery (WAG), an ongoing series of public events and exhibits provides the opportunity of sharing the conservation method through the medium of Art.

Public and student training sessions provide a wide demographic of education and awareness training by using Art as means of connecting people to energy related technologies.

http://www.woodstockartgallery.ca/index.php/2011-12-15-19-29-58/current-exhibition/uncertain-bearings

#### B. Internet & Social media

The Strategic Communications and Engagement Team at Oxford County manages the interface between County initiatives and the public. They do a great job of assisting each department with a vision, while managing a consistent and professional image. Social media and Internet development is essential to reach the most number of people. It will also help us establish a two-way communication link with customers to gauge success while driving adjustment to our approach.

#### C. Guest Speaker series

A common message can be strengthened by introducing a variety of different perspectives. There are many professionals or those with significant life experience willing to share their story, and each speaker will resonate with a different crowd. Throughout 2017, several Speakers Series events were hosted around Oxford County, primarily through the Library system and will continue throughout 2018.

#### D. Regular workshops and Public Events around Oxford

This section will be used to manage and monitor planned workshops and events hosted around Oxford County. Unlike public events, these workshops will target specific topics based on the brainstorming sessions and public feedback.

Public events can be a combination of several initiatives, such as workshops and guest speakers. An example of public events is the OSEA's Green Energy Doors Open event, where a host comes forward to share their experience with sustainable energy during a

short duration event. The Expo series has hosted a diverse set of professionals sharing who shared their story, and each brings with them a different personality and experience.

## E. Local Competitions

Almost everyone loves a fun competition. As an example of a successful, local competition, the City of Woodstock's Environment committee created the Voluntary Blackout Day in 2005. This event was initially launched a challenge to residents to take some time during the anniversary of the 2003 eastern seaboard blackout, by shutting things off and getting together with neighbours. The event had a two-fold objective: recognize the importance of electricity in our lives and to value the resource by using it as effectively and efficiently as possible. This competition evolved to become a Provincial challenge when then-mayor Michael Harding challenged his counterparts in other regions. Eventually, the Mayors Blackout day challenge evolved into the provincial "County Me In" program and included the provincial IESO and other agencies as supporting resources. The IESO created measured electricity reduction outcomes during the event and rated each participating municipality.

It was fun, it was creative and it put Woodstock and Oxford on the map as a community willing to lead in conservation initiatives. Our goal as a community will be to raise the bar on this initiative. We will gather people and their ideas from the around the County for the purpose of creating a fun challenge that can inspire people within and outside of our community.

## F. Solar Oxford Challenge

Building on the concept of friendly competition, the Solar Oxford Challenge will reinforce through education the combined benefits of conservation efficiency and renewable energy toward the goal of Net Zero electricity.

## G. Student Smart Meter Challenge

Create programs with schools to introduce students to their Smart meter and Kilowatt meter (available through the local library system). This program will foster an understanding of energy at the early stages of learning.

**Program overview:**

- Teach student about Smart meter and how to create an account and access their smart meter data via the Internet
- Introduce students to the kilowatt meter, a plug-in device that will assist with a home electricity audit
- Establish a 'contract' with parents that identify existing monthly cost and kWh consumption based on parents' existing account. Student leads the home through an audit and smart metering data.
- Parent agrees to pay the same amount for one year based on historical energy and costs.
- Any savings that result from the student's leadership for home energy reduction is paid to the student by the parent

# 4.2 Retrofit existing built- environment

## 4.2.1 GHG Emissions from Buildings

### A. Residential

In 2015, the residential sector emitted 211,868 tonnes of CO2 emissions, this includes the use of: 64% natural gas, 32% electricity and 4% other.

By 2050, this number is set to decrease to 105,965 tonnes of CO2 emissions, a decrease of 50%. 65% of this will come from the transition from natural gas to electricity, and a 35% increase in energy conservation.

### B. Non-Residential

i. Municipal
ii. Other

In 2015, the non-residential sector emitted 443,192 tonnes of CO2 emissions, this includes the use of: 56% natural gas, 28% electricity and 16% other.

By 2050, this number is set to decrease to 211,217 tonnes of CO2 emissions, a decrease of 52%. 50% of this will come from the transition from natural gas to electricity, and a 50% increase in energy conservation.

## 4.2.2 Energy Efficiency Improvements in Buildings

The transition of building energy efficiency is critical to our 100% RE plan. Building construction must evolve to Net Zero energy performance well before 2015. The County will look to incorporate a holistic approach to energy efficiency measures and develop new policies that support new energy efficiency benchmarks in buildings. Refer to Appendix 1 to view additional policies.

### A. Raising the Bar – going beyond Ontario Building Code requirements

The Ontario Building Code (OBC) should be considered a minimum standard, yet OBC is in most applications, the maximum level of quality and efficiency being constructed in Ontario today. At the time of writing, Oxford has only one builder working beyond OBC level, building to Energy Star standard.

### B. Creating voluntary standards (i.e. Net Zero, Passive House)

While OBC is a de-facto standard, Oxford can do much better. Several recognized and tested building standards exist globally that result in significant energy efficiency outcomes. Although the upfront cost of adopting enhanced building standards is often higher than minimum OBC requirements, the longer-term cost and energy footprint requirement needs to be accounted for. In many cases, building to a higher level of building integrity can result in a net zero or even net positive energy result, with the building generating more energy over the course of a year than what it requires to operate. This can include all energy inputs

from electricity, heating, hot water and even the support of electric vehicle charging.

The following Home Rating systems (courtesy of http://www.ecohome.net) provide a sample of existing building standards now in use in Ontario and around the world.

### C. LEED Canada (Leadership in Energy and Environmental Design)

Administered in Canada by the Canada Green Building Council (CaGBC), LEED is the most comprehensive and versatile home rating system, and consequently the most recognized. LEED promotes sustainable building practices through material selection, responsible site management and design. LEED homes generally have reduced ecological footprints, healthier indoor environments and offer 30 to 70% in energy savings over homes built to provincial code. Because it is the most well-recognized certification program, LEED homes can have access to reduced mortgage rates, reduced home insurance rates and often municipal tax relief. At times of resale they command on average an 8% higher price, and consistently sell faster. For more information see our LEED pages.

The County will encourage the development of LEED Certified Homes …

Municipal buildings will transition to LEED certified.

### D. ENERGY STAR for New Homes

ENERGY STAR promotes guidelines for energy efficiency in new homes resulting in homes that are at least 20% more efficient than homes built to provincial building codes alone. ENERGY STAR is most commonly known for its evaluation of energy efficient appliances, fixtures, windows and doors. Any product carrying the ENERGY STAR label are certified to be a high efficiency option. Other rating systems like LEED for example, will recognize ENERGY STAR certified products, and award points for incorporating them into buildings.

### E. Passive House

Modeled after the German Passivhaus standard, this certification program deals specifically with home design for passive solar gain, and reducing energy consumption. A certified Passive House is significantly more energy efficient than a conventionally built home. This rating system is pretty much limited to energy performance, so many categories of sustainability and health are not addressed.

There may not be many financial incentives that come with this certification, but certainly economic savings when heating or cooling a house. Typically a certified Passive House would be expected to operate approximately 75%[21] more efficiently than a house built to code. That is pretty close to a ‘net-zero ready’ house; often a modest photovoltaic solar system is all it takes to achieve the elusive $0 utility bill.

Passive House Standards in practice: Currently under construction, Blossom Park, a multi-residential social housing building owned and operated by Indwell Community Homes. The building is being developed in Woodstock, comprising of 34 individual units, and is funded through municipal and provincial awards.

[21] https://www.cagbc.org/cagbcdocs/Passive%20House%20in%20cold%20climates.pdf

Oxford County will also host PassiveHouse workshops so residents can understand PassiveHouse standards and learn to incorporate them into their homes and businesses.

### F. R-2000

This rating system was created in the early 1980's by the Canadian Home Builders' Association and Natural Resources Canada (NRCan). R-2000 is a government-run program that encourages energy efficient building techniques, with an energy performance of 50% better than code. Certified homes can only be built by licensed R-2000 builders. Like many of the earlier programs, R-2000 focused solely on the building envelope and performance until very recently. Following the lead of non-government rating systems, R-2000 is now starting to incorporate other sustainability issues into their rating system such as indoor air quality and sustainable material sourcing.

### G. The Living Building Challenge

By far the hardest certification to achieve, the Living Building Challenge (LBC) is for the ambitious green builder. This rating system comprises of seven performance areas: Place, Water, Energy, Health, Materials, Equity, and Beauty. A 'living building' earns that title by generating all of its own energy and capturing and treating all of its waste water. Certification under the Living Building Challenge can only be achieved after a full year of occupancy to determine actual operational consumption rather than projected.

Studies show that although Living Buildings are cost effective, there aren't as many financial incentives as with other programs. However, a home/building owner can pursue LEED certification simultaneously while have having access to some of the financial benefits that come with brand recognition. If a home/building owner achieves LBC certification they will easily qualify for LEED certification, in addition to a serious competitive edge.

### H. EnerGuide

Run by the Canadian government, EnerGuide is an energy consumption index that evaluates appliances, heating / cooling equipment, and new and existing homes. Many other rating systems reference EnerGuide to grade homes. It's based on a 0 to 100 point scale, zero being the least energy efficient performance and 100 being the best. Energy auditors collect data on a home's building envelope (windows, doors, insulation) as well as appliances and energy systems. With this information and a blower door test to determine how airtight a building envelope is, information is fed into energy analysis software called HOT2000 which compares the building with a similar building.

## 4.2.3 Economic Savings

Modelling of efficiency gains and cost savings is an important first step, however validation of outcomes is critical to identify success and failure of change. As an example, high performance construction techniques such as PassiveHouse promise to significantly reduce heating and cooling costs based on energy models. In 2018, Oxford County and partners will establish a series of monitoring routines with the goal of quantifying modelled vs actual cost savings.

### 4.2.4 Availability of Measures

Energy Efficiency measures requires upfront costs and capital, something that may not be available for all residents of Oxford County. To foster a community where no one is left behind, the 100% RE Plan will align its targets with its Zero Poverty Plan and aim to include all residents in practicing energy efficiency measures.

Additional incentive opportunities offered by the Province for low-income homes include:

**A. Ontario Electricity Support Program (OESP)**
The OESP provides low-income consumers with monthly credits on monthly electricity bills.

**B. Low-income Energy Assistance Program (LEAP)**
LEAP provides emergency assistance to those facing financial difficulties paying their utility bills.

**C. Save On Energy Program**
The Save on Energy Program offers various incentives for upgrading home appliances and lighting to energy efficient ones.

**D. Home Assistance Program**
The **Home Assistance Program** offers qualifying homeowners with access to LED light bulbs, water saving equipment, energy efficient refrigerators and other home appliances.

**E. Zero Poverty Plan**
Our Zero Poverty Plan will ensure that no resident is left behind in the transition to 100% RE. We will aim to make all energy efficiency measure available to all residents of Oxford.

## 4.3 Upgrade Infrastructures and Support Efficient Technologies

### 4.3.1 Energy Efficiency

Energy efficiency and energy savings are always the first step when planning a shift to renewable energy. The amount of renewable energy required to displace non-renewable energy resources is directly proportional to the amount of energy consumed; the less we consume to create the same services, the less we will require in capital investment for our renewable energy systems. Effective energy efficiency planning must align with renewable energy needs assessment, in order to achieve 100% RE. Energy efficiency gains will reduce the amount of renewable energy required.

With energy costs historically low and supplies plentiful, as a country we fail to appreciate the true value of energy resources, whether considering non-renewable or renewable sources. This lack of appreciation has placed us among the most inefficient users with among the highest per-capita energy users in the world. Canadians ranked number 7 in energy usage per capita in 2014[22]. But we can change this. As we navigate toward a 100%RE society in Oxford, efficiency and conservation will become second nature. Several opportunities exist that provide consumers with access to audit and retrofit funding and often the most accessible programs can be found through engagement and participation with energy efficiency programs offered by local natural gas and electric utilities

### 4.3.2 Economics of Conservation & Efficiency

In simple terms, the less energy one requires to produce a product or complete a task such as space heating, the less cost will be incurred. Conservation and efficiency are essential in the development of a 100%RE lifestyle, and the second benefit to the user is the reduced cost (either in capital or energy used) to complete the same function.

According to the Ontario government, for every $1 invested in conservation and efficiency measures, is equivalent to $2- 3 of net savings[23]. These avoided costs include the extraction or generation of energy that is not needed in the first place, and refurbishing or expanding generation and distribution assets that do not need to be expanded. Through a culture of conservation and efficiency, these savings have the potential to accelerate the transition to a clean economy and further develop efficient technology applications.

### 4.3.3 Conservation First

Ontario is known internationally for its progressive conservation policy. By leveraging resources through utilities and energy agencies such as IESO, Ontario continues to improve CDM outcomes. A history of elaborate and complex conservation programs has evolved to the simple and effective program known as Conservation First.

The framework aims at reducing 8.7 TWh of Ontario's electricity consumption by 2020[24].

For Oxford's challenge of a 100% renewable energy society, we must emphasize Conservation First.

### 4.3.4 Community Scale Generation Opportunities

Germany and other jurisdictions have found that municipal scale and cooperative initiatives have helped to move their 100RE transition forward. In the case of community cooperatives, the

[22] The Global Economy, (2018). https://www.theglobaleconomy.com/rankings/Energy_use_per_capita/
[23] https://www.ontario.ca/document/2010-long-term-energy-plan/conservation
[24] http://www.ieso.ca/sector-participants/conservation-delivery-and-tools/conservation-first-framework

entire community invests in and benefits from the benefits of renewable energy systems. In many cases, the municipality is a partner and leader during the formation of cooperatives.

Municipal scale generation programs provide a means for everyone in the community to benefit from the investment, not just a few. Oxford and municipal partners will work together and in their respective communities to explore cooperative and municipally led renewable initiatives.

### 4.3.5 Oxford County Waste Management Facility at Salford

Landfills often have the dubious reputation of being a negative to its community. Our societal needs for landfills and what we put in them must be dramatically transformed and there is no doubt that the capacity of Oxford's landfill must be meticulously managed as a finite asset. Oxford County's commitment to Zero Waste is a demonstration of our recognition of this important issue.

With our goal of Zero Waste comes the expectation of both a dramatic reduction in the waste we produce along with a dramatic increase in our recovery of the wealth of potential resources that currently enter our landfill gates. From the historical waste landfilled comes the potential of methane recovery or raw material mining. Diverting all resource opportunities from landfill will play a key role in our energy plans as well. Whether from reduced energy demands by recovering metals, recycling or reuse of plastics or the recovery of organics, all resource recovery will have a direct impact on our 100% renewable energy outcomes.

As technology solutions develop, we expect additional safe and effective energy extraction opportunities will present themselves. As part of the environment pillar of Future Oxford, Zero Waste Oxford will play a pivotal role in the evolution of our waste reduction and energy and resource recovery goals.

Landfills also present unique re-use of the area. In the case of Rhien-Hunsruck in Germany, a capped landfill site serves as host to a large scale PV installation. In Oxford County, the Biosolids building roof is the site of a current 250 kW solar installation under Ontario's FIT program. In addition, Oxford has a pending 500 kW ground mount installation within the Salford site's buffer lands awaiting approval under Ontario's FIT program.

### 4.3.6 Waste Water Treatment Plants (WWTP)

Human waste presents both challenges and opportunities to a municipality. In the case of Oxford County, anaerobic digesters are used in the treatment process at four WWTPs, producing renewable natural gas that is currently repurposed for digester heating applications at the treatment facility, while excess is flared.

In 2018, action will be taken to harness excess methane to create electricity or renewable natural gas that can be repurposed on or off-site.

The Woodstock WWTP location in particular is rapidly evolving toward a 100% renewable energy outcome. In 2018, a 500 KW solar PV installation will be connected under a net metering agreement with Hydro One. Based on projections, this installation will offset up to 25% of existing electricity consumption.

### 4.3.7 Brownfields

Land used for industrial and other purposes often leaves the land contaminated and unable to be restored to its original state in a cost effective way. However, this same land can play host to a variety of renewable energy technologies, making the space an ideal location to contribute to our renewable energy mix in Oxford.

An example can be found adjacent to the Woodstock WWTP located on Tecumseh Street, where a large scale ground-mount solar PV system will be installed that was formerly utilized for manufacturing over the past century.

### 4.3.8 Hydro

The simple mix of water and gravity formed the first electricity generation source in Ontario and continues to provide close to 20% of our electricity mix in Ontario.

While limited resources for hydroelectric generation exist in Oxford, every small opportunity taken can add up. As an example, the Pittock Conservation authority located in Woodstock plays host to a small dam used to control water level at Pittock. It is estimated this small dam could provide up to 1000 kW of renewable generation. Similar dams in the area include the Shand Dam in Fergus, Ontario, which produces 600 kW of renewable energy.

Assuming even half of that capacity could be generated for 6 months of the year; enough electricity could be generated to supply about 300 homes in Woodstock, or roughly 2% of the homes in Woodstock. At present, all of that water simply cascades over the dam, unharnessed and providing no electrical energy to Woodstock.

### 4.3.9 Industrial

Industry in many cases is leading the charge with energy efficiency retrofits, thanks in part to the Ontario Green Energy Act and conservation first strategies. Industry consumes roughly one-third of all energy requirements in urban centers, making it a potential leader in the overall reduction of energy requirements in Oxford.

Municipalities in Oxford can play a leadership role by leading by example and creating education and venues to help raise awareness of conservation opportunities in conjunction with the local natural gas and electric utilities.

In most cases, industry is located on large parcels of land and in some cases, carries acres of rooftop space. This same space is largely untapped in Oxford County, yet presents incredible opportunity to play host to renewable energy resources, such as solar PV or solar thermal.

### 4.3.10 Waste heat recovery

An incredible amount of energy is exhausted to atmosphere or simply dumped following hot water use applications. In addition, many industrial and commercial processes create heat that could be re-used for other applications that now require the use of non-renewable resources.

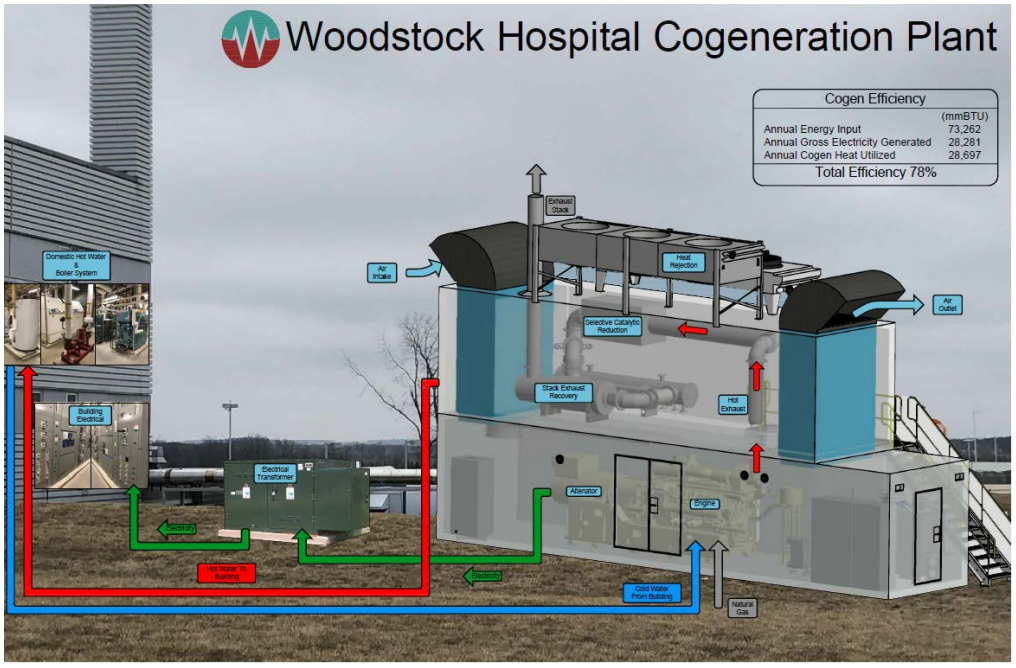
Our 100% RE strategy will seek to identify existing waste heat recovery applications now in use around Oxford and develop education and awareness campaigns to promote more adoption of this largely untapped resource.

## 4.3.12 District Heating

There are no district heating installations in Oxford County, however a small-scale community geothermal project is under review.

## 4.3.13 Combined Heat and Power Generation

Combined Heat and Power (CHP) is the use of a heat engine or power station to generate electricity and useful heat at the same time. One example of a local installation can be found at Woodstock General Hospital. Monitoring of the efficiency and outcomes of the WGH installation will serve as an example of innovative technology applications that can improve efficiency of existing sources of energy.




## 4.3.14 Virtual Net Metering

In 2017, Oxford County presented a demonstration project concept to Ministry of Energy that would see 900 KW of PV installed at the Oxford County waste management facility. Although this project was not able to proceed, it did contribute to the Provinces Long Term Energy Plan.

In 2018, the Independent Electricity System Operator will launch a Virtual Net metering demonstration program. Oxford County will consider participation alongside LDC and other stakeholder partners.

Details can be found at http://www.ieso.ca/en/sector-participants/engagement-initiatives/engagements/renewable-distributed-generation-integration-fund

## CHAPTER 5

# Increase and Integrate RE across Sectors

### Overview

To increasing RE energy generation Oxford will need to develop a sustainable energy system that is ready to meet current  local energy demand, which itself varies hourly, daily, and seasonally. A smart, integrated use of RE, energy efficiency, demand management and energy storage technologies is necessary. Variable RE resources such as solar and wind will play key roles for energy generation, as well as dispatchable renewables like bioenergy and hydropower.

The built environment improvements are key to achieving energy efficiency and savings in heating and cooling and electricity, and participation by private homeowners and business owners and employees will also be essential.

Developing efficient and sustainability mobility is very important for 100% RE to be effective.

The plan will encourage active mobility (walking and cycling), public transport, and mix-use developments. An evaluation of the community's public transport system and analyze citizen's mobility behavior including connection to surrounding regions/suburbs will take place.

Polices must support the integration of the technical and infrastructural changes needed to support an energy system fully powered by renewable energy sources. A policy framework will need to delineate clear actions to overcome the major technical hurdles specifically related to the flexible nature of RE and the necessary modernization of the energy grid.

### Key points

- Increase Renewable Electricity Generation
- Tackle the Built Environment Challenge (Heating/Cooling)
- Tackle the Mobility and Transport Challenges
- Modernize the Grid and Other infrastructure

# 5.1. Increase renewable electricity generation

## 5.1.1 Local Utility Company Generation

Local gas and electric utilities are major contributors to any 100% renewable energy plan. We rely on gas and electric utilities to manage our electricity distribution system. They are required to create asset management plans aimed at optimizing investment in infrastructure against existing and forecast load growth. If done right, they will ensure the right amount of maintenance and replacement of capital is invested – but not more than needed.

A largely untapped opportunity exists for gas and electric utilities by identifying use of renewable energy to provide much of the electricity required for their customers and simultaneously avoiding unnecessary investment in infrastructure by leveraging renewable energy resources locally.

In addition to renewable generation investment, gas and electric utilities can level out the volatility of renewable energy availability through enhanced energy storage and Smart grid (power matching between generation and load) implementation.

In general, gas and electric utilities have been slow in making the transition to upgrading infrastructure to meet the demands of current household needs. They risk being left behind from advancements in clean energy technologies and meeting customer expectations. They will compromise value to their customers and shareholders should they not quickly develop a better sense of the opportunities that await them through renewable energy and smart technology investments.

While most gas and electric utilities do host Supervisory Control and Data Acquisition systems, they are typically limited to the monitoring and harvesting of power, voltage and load current information. Some provide limited intelligent control for automated power restoration, but very few have the capacity to manage distributed generation and load matching.

Smart grid essentially refers to an intelligent grid that possesses the ability to harness renewable energy, energy storage and other sources of electrical energy and efficiently supply consumer load at the best time and when energy sources are at their optimum capacity[25]. Taking this concept a step further, the idea of a Smart home or business provides yet another layer of intelligence that could be matched with the Smart grid system of the electric utility.

By working together on both sides of the electricity meter there exists a huge opportunity to improve efficiency of generation, delivery, storage and end use of electrical energy. Ultimately, consumers will be “prosumers” of electricity and will demand access to the grid as both a source of energy and a consumer of energy.

[25] https://www.nrcan.gc.ca/energy/electricity-infrastructure/smart-grid/4565

### 5.1.2 Smart grid

The concepts of Smart grid, power matching and Smart home/business, combined with renewable energy and artificial intelligence will ultimately play a very large role in Oxfords transition to 100% renewable energy.

### 5.1.3 Solar

In 2018, Oxford County will connect an additional 620 KW of Net metered solar PV technology. Expansion of solar PV is expected to increase in coming years, largely led by net metering and virtual net metering installations.

### 5.1.4 Wind

### 5.1.5 Hydro

### 5.1.6 Biomass

### 5.1.7 Off-Grid

Solar PV and energy storage are rapidly becoming cost effective. In 2018, several new large scale agriculture projects are being connected, entirely off-grid.

### 5.1.8 Renewable Natural Gas (RNG) to Power

Bio-methane is now being generated from the waste of beef feedlots for the purpose of generating electricity and will eventually serve as a renewable natural gas (RNG) supply for injection into the existing natural gas distribution network, and by extension the Compressed Natural Gas (CNG) fueling station now operational in Oxford County. The outcome of this project will allow RNG generation and the fueling of vehicles utilizing RNG.

Additionally, methane has the potential to act as a storage medium for renewable energy. In cases where wind and solar technologies produce excess energy that cannot be fed into the grid, the surplus energy can be used to produce hydrogen from water. This hydrogen combined with carbon dioxide from the biogas plan can be converted into RNG[26]. Acting as a storage and generation source for energy.

[26] ***Viessmann Cicorob*** *Energy Power to Gas paper-* ***Method and components of biological methanation***

Oxford County will work with government, private sector and NGO groups to further develop power to gas and the repurposing of methane. This project is but one example of things to come on the bio methane and power-to-gas technology front.

> ***Viessmann Cicorob*** *Energy Power to Gas paper*
>
> ***Method and components of biological methanation***
>
> *The increasing expansion of wind and solar power are leading to growing quantities of surplus electricity during windy and sunny periods that cannot be fed into the power grid due to a lack of demand or sufficient capacity of the electrical grid. In this case, the surplus electricity can be used to produce hydrogen from water in an electrolyser developed and built by Schmack Carbotech, a wholly-owned subsidiary of Viessmann. Then the produced hydrogen, together with carbon dioxide from a biogas plant, is converted into natural gas or methane by microbiological means. The biological methanation method was developed by MicrobEnergy and the technology was designed and built in a first industrial scale project by Schmack Biogas, both Viessmann companies.*

### 5.1.9 Manufacturing Scale Micro GRID Demonstration

Oxford County continues to collaborate with private sector and LDC partners in the search for an appropriated microgrid demonstration.

### 5.1.10 Biodigester Pilot (Agriculture)

A 10-30 KW Biodigester Pilot project: OMAFRA has been working with a company from Belgium to test small-scale biodigesters for cattle/hog operations. The system arrives in a 20-foot container complete, with only the fermenting chamber requiring assembly. Within 3 days the system is generating power and heat.

In 2018, Oxford's first small-scale 20 KW biodigester was commissioned using 10 KW under a microfit contract and a 10 KW net metering connection. Performance monitoring of this facility may lead to additional installations around Oxford County through the many small-scale dairy operators.

### 5.1.11 Organics Energy Recovery Project (Zero Waste)

Energy and waste are emerging as two sides of a coin and can become enablers for one another. Organic waste is a proven resource for the generation of energy from a variety of methods; however anaerobic digestion appears to be the most favourable from an environmental perspective. Our Zero Waste and 100%RE goals will join under this project as we seek ways to lever organic waste for renewable energy generation and in the process, significantly reduce materials that would otherwise be sent to our landfill.

# 5.2. Tackle the Built Environment (Heating/Cooling)

## Energy Efficiency Retrofits

Buildings in Oxford County include an eclectic mix of agriculture, industrial, commercial and both urban and rural residential dwellings. While not unique, it does present a mosaic of almost every type of building structure that can be found anywhere in Ontario.

The Saskatchewan Conservation House is credited as being the catalyst behind the Canadian R-2000 program as well as the PassivHaus program that started in Germany and spread across the globe.

The apparent end of the global energy crisis ushered in the end of Canadian leadership on building energy efficiency, however other regions such as Germany, picked up the Canadian initiative and continued to build and develop the concept of advanced energy technologies.

Ontario's building sector is the third largest carbon emitter, contributing 17%[27] of total emissions. Existing building stock will need to undergo deep energy retrofit activity over the next several decades if we are to meet GHG reduction targets and will greatly reduce the net renewable energy required to displace heating/cooling energy requirements.

We have an opportunity in Oxford to establish a net zero energy and zero carbon footprint standard in new building construction by implementing leading edge building design and construction techniques. Successfully establishing such a standard will require significant cooperation among municipalities, developer/builders and the public to achieve these enhanced performance-building outcomes

### A. PassiveHouse

Efficiently designed PassiveHouse design has the potential of performing 75%[28] more efficiently than its counterpart. PassiveHouse uses an integrated design system that considers comfort, health, energy conservation, energy efficiency and renewable energy. A PassiveHouse design is not only for homes, but can also be used for multi-residential buildings, schools and community centers.

Oxford County is requiring the incorporation of PassiveHouse design techniques in the new social housing projects, including the Blossom Park multi-residential affordable housing building.

### B. Net Zero Buildings

In order to achieve 100% RE in the region, building performances must achieve net zero energy performances well before 2050.

Oxford County is home to one of the first Net-Zero Certified building in Canada hosting Oxford's Waste Management Office. A $1.8 million project that incorporates 120 KW of Solar energy, which will offset the majority of energy needs for the entire operation, including the new building facility.

[27] 2012- https://www.ontario.ca/page/ontarios-climate-change-update-2014
[28] https://www.cagbc.org/cagbcdocs/Passive%20House%20in%20cold%20climates.pdf

### 5.2.3 An Inclusive Oxford

Many people do not have the resources or knowledge required to complete building energy retrofits, or to plan for high performance new construction. To successfully transition to Net Zero and zero carbon buildings, we need to ensure all people have access to the resources and training that will enable this change – our plans and programs must be accessible to all in our community.

This will require frequent training and education programming and access to necessary incentive and performance monitoring technologies. There exist many incentive programs from IESO, Government and other agencies; however these incentive programs typically require a meaningful investment by the building owner.

Other creative means of establishing low interest loans will be considered, alongside a comprehensive retrofit campaign. The idea of municipalities investing back into their own communities will be considered.

### 5.2.4 Smart Cities Challenge

Smart Cities Challenge Building transformation project www.OxfordCounty.ca/SmartCities

A Government of Canada competition of prizes between $5 and 50 million that will fund four municipal projects that will achieve meaningful outcomes for residents through the use of data and connected technology. Oxford's submission will draw from its various community-driven initiatives over the past four years that stem from the Future Oxford Community Sustainability Plan.

Post Occupancy Performance is a key aspect of the project and includes critical partners such as University of Western Ontario (UWO), Zon engineering, Walter Fedy among others.

### 5.2.5 Energy Performance Measurement

Given the fact there are many potential sources of energy for buildings, it is necessary to establish a baseline energy reference as well as a simple and practical means of measuring energy use reduction. The following list provides a snapshot of existing ideas and technologies now available on the market.

#### A. Electricity

Smart meters are now in place for most residential and small commercial sector (however there remain pockets of customers who do not have access for a variety of reasons).

Implemented in 2010 across the Province, Smart metering provides an incredible tool for measuring electricity load information, often down to a 5 minute interval, but in all cases, at

least to 1 hour intervals. This electricity load data is gathered throughout the day and is posted to the

IESO (Independent Electricity System Operator) and subsequently made available to the consumer by 8:00 am the next day.

Customers have the ability to create an online account via their electricity provider, at no cost, where they can analyse their consumption habits based on a 24 hour day, monthly and annual basis.

#### B. Natural Gas

The Natural Gas industry in Ontario does not provide Smart metering data for most customers; however every customer does have access to their account information online.

In most cases, customers can read their natural gas meter consumption, daily, weekly or monthly.

Smart thermostats are capable of providing run-time information of the customer heating system and a prediction of natural gas and related carbon emissions is calculated through algorithms. It should be noted that this technology cannot accurately measure natural gas consumption, but a reasonable estimation of consumption is made based on run-time hours of the heating equipment.

### 5.2.6 Access to building audit resources

It is very difficult for a home or building owner to compare their building performance to like buildings without an energy audit. The auditing process steps through a structured list of building envelope and equipment items and assesses how each component of the building is performing against a known benchmarks.

When armed with the results of a comprehensive building energy audit, the building owner is able to establish a list of improvements and prioritize improvements to lower operating costs and ensure an optimal return on investment for retrofits.

The Ontario Energy Audit Funding incentive offered by IESO covers 50% of the cost of an energy audit. The Green Ontario Fund also has extensive resources to help consumers lower their utilities and reduce their carbon footprint.

### 5.2.7 Incorporating new technologies

As climate change adaptation and mitigation efforts ramp, monitoring, testing and implementing new technologies becomes increasingly important.

Relatively little has changed in recent decades in terms of significant energy and GHG reductions, in part due to the relatively low cost of heating fuels and electricity cost.

Continuous monitoring of new technologies is an important role of the Smart Energy Oxford committee.

## 5.3 Tackle the Mobility and Transport Challenge

a. Evaluate and assess your community's public transport system
b. Encourage active mobility (walking and cycling), public transport, and mix-use developments
c. Evaluate the community's public transport system and analyze citizen's mobility behavior including connection to surrounding regions/suburbs.

### 5.3.1 The Current Transport System

The transportation sector consumed 30% [29] of total energy required in Canada and contributed to 36% of GHG [30], making it the largest contributor of GHG emissions in Canada. The transformation of the transportation sector will not only have environmental benefits, but has the potential of saving Canadians thousands of dollars yearly.

To develop a sustainable transportation sector Oxford County is aiming to further develop its public transportation system, encourage active mobility, encourage the adaptation of EV's and develop EV charging stations.

In many cases where alternative fuels are utilized, energy can be transformed from renewable sources and stored for later use. In the case of battery electric vehicles (BEV), electrical energy can be harvested from renewable sources of energy such as solar or wind and stored to the BEV battery (in most cases, lithium based storage). Similarly, hydrogen can be harvested from renewable energy through the process of electrolysis using solar, wind or any other renewable resource.

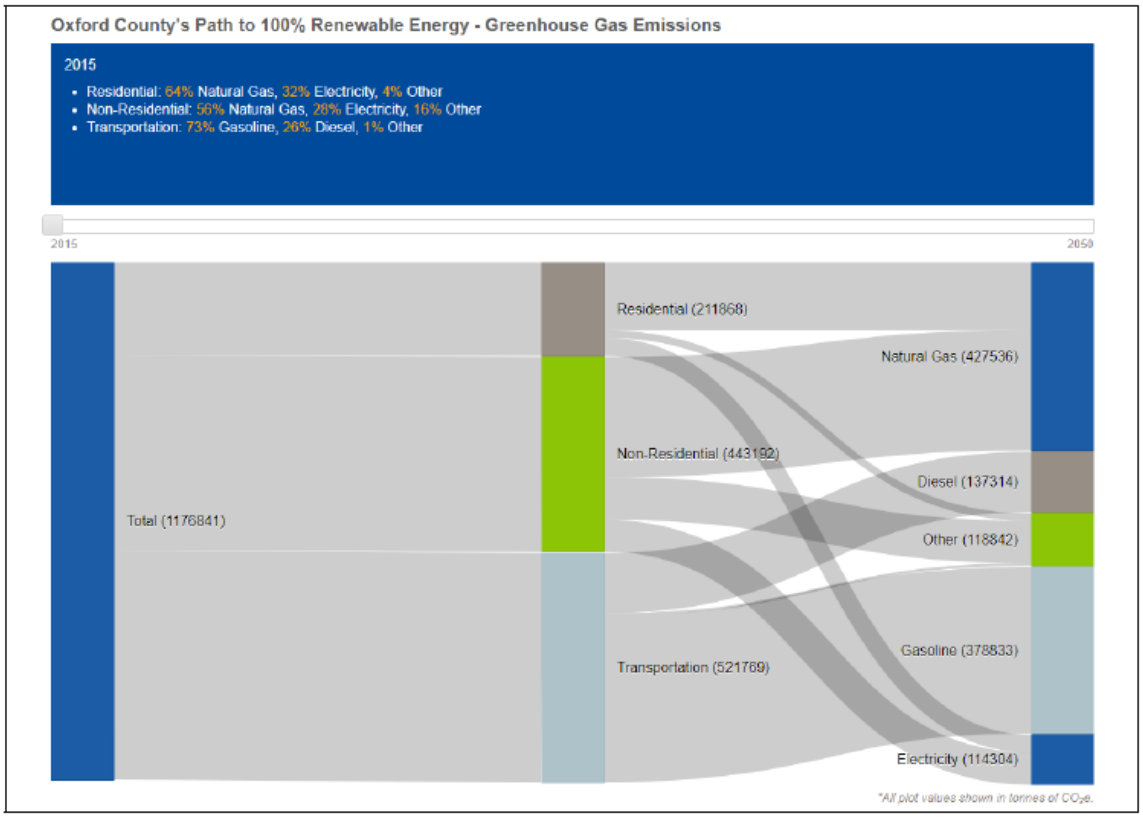
To help advance alternative fuels for transportation across all sectors, Oxford County is exploring opportunities through the development of an accessibility plan aimed at creating battery electric vehicle charging infrastructure across the County. Oxford and its partners are in the early stages of development and this section will undergo constant updates in coming months and years.

[29] http://oee.nrcan.gc.ca/publications/statistics/trends07/pdf/Chapter6_e.pdf
[30] http://oee.nrcan.gc.ca/publications/statistics/trends07/pdf/Chapter6_e.pdf

## 5.3.2 Oxford County GHG Emissions: Transportation

Currently the transportation sector in Oxford County emits 521,769[31] tonnes of CO2 emissions annually. Figure 1 illustrates GHG emissions by sector in 2015 in Oxford County.

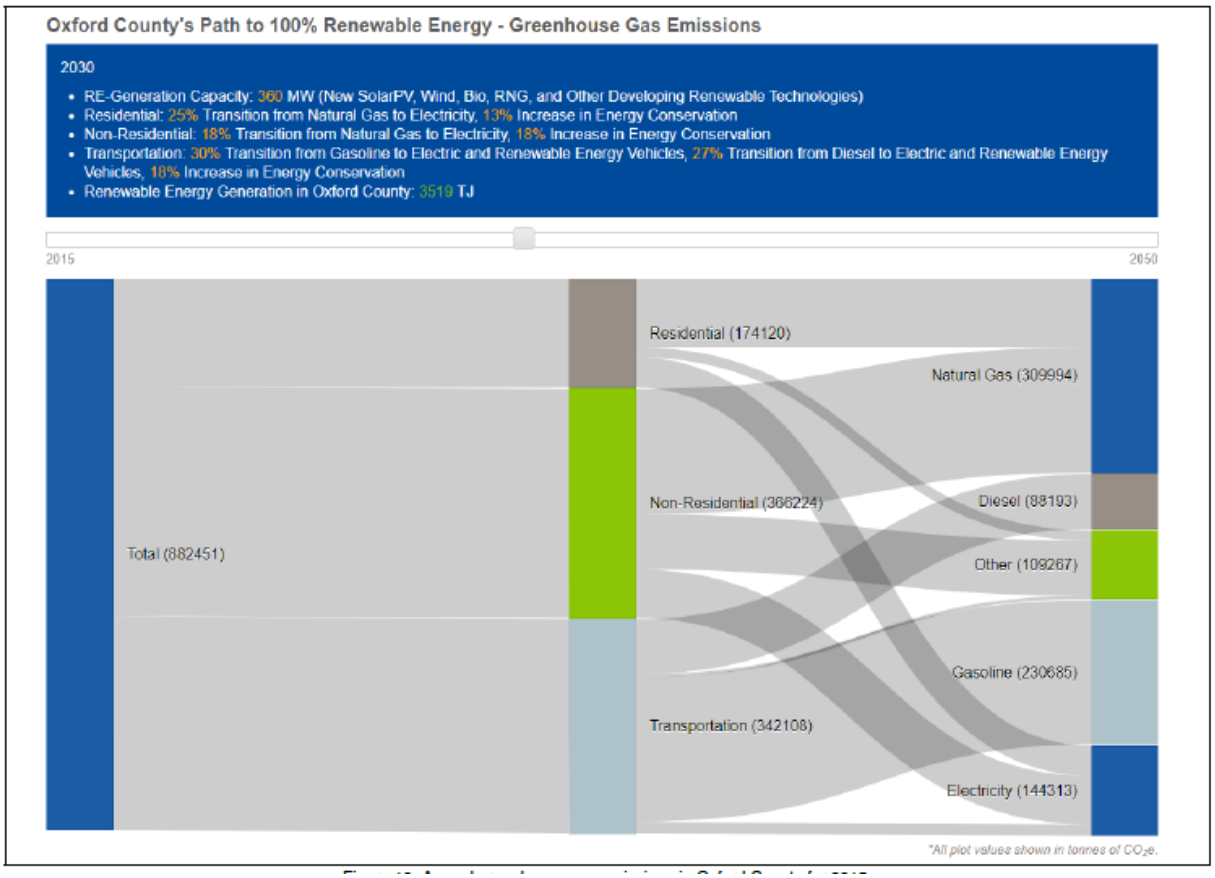
**Figure 1. GHG emissions by Sector 2015**




By 2030 this number is targeted to decrease to 342,108[32] tonnes of CO2, through the transition from gasoline to electric and renewable energy vehicles (30% increase), transition from diesel to electric and renewable energy vehicles (27% increase) and an 18% increase in Energy Conservation. Figure 2 illustrates this.

[31] SEO Report, 2015 page 32.
[32] SEO Report, 2015, page 35

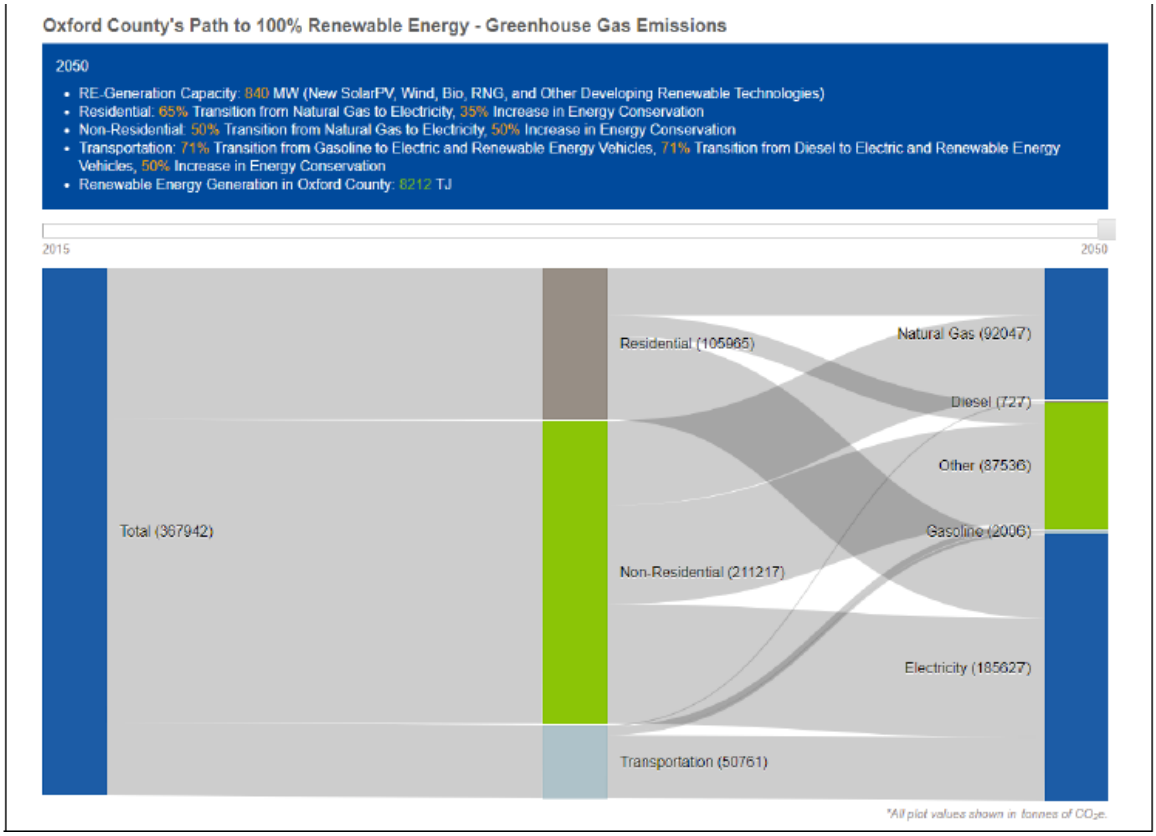
**Figure 2. GHG emissions by sector 2030**




By 2050, the transportation sector aims to decrease its GHG emissions by 90% (from 2015 emissions) to 50,761[33] tonnes of CO2. This target will be achieved through a 71% increase in a transition from gasoline to electric vehicle and renewable energy vehicles, a 71% increase in a transition from diesel to electric and renewable energy vehicles, and a 50% increase in energy conservation. Figure 3 illustrates this.

[33] SEO Report, 2015, page 39

**Figure 3: GHG emissions by sector 2050**




## 5.3.3 Public Transportation

Only 12%[34] of commuters in Canada utilize public transport for their commute, making this one of the most underappreciated and underutilized opportunities in Ontario.

Transport by rail really hasn't changed much. The same tracks laid down a century ago remain and serve multiple purposes. For the most part, they function in terms of moving people and product from point to point, but have not evolved to meet the needs of product and people moving for a 21st century society. Broader public transportation has suffered with the advent of the automobile but must see a resurgence going forward.

### A. South Western Ontario's Public Transportation

New Directions: Advancing Southwestern Ontario's Public Transportation Opportunities is a toolkit developed to assist the communities in Southwestern Ontario connect through high-speed rail (HSR) mobility. The toolkit also highlights a map and a vision of partnership and dialogue to begin the study, planning and implementation of a fully integrated public

[34] https://www.statcan.gc.ca/pub/11-402-x/2012000/chap/trans/trans-eng.htm

transportation system in Oxford and across Southwestern Ontario.

A fully integrated Southwestern Ontario public transportation system that through partnerships, coordination, and cooperation connects communities and reduces our reliance on the personal automobile will be an important feature of the future transportation systems.

"*For Southwestern Ontario, the choice is not whether we can afford to undertake this task, but whether we can afford not to….*"

## 5.3.4 Renewable & Alternate Transport Opportunities in Oxford

According to Transport Canada, 80% of commuters travelled to work using private vehicles. Of this 80% cohort, 83% travelled alone using primarily fossil fuel powered vehicles[35]. While personal convenience is a large part of this decision making, people opt for the personal vehicle simply because practical transportation options just don't exist in most parts of Ontario today.

Assuming personal transportation will be a popular choice of mobility until a faster, cheaper and more convenient means of getting around can be found. A transition from fossil fueled vehicles to that of electric or other alternative fuel can form part of the transition solution.

A significant aspect of our 100%RE goal will involve identification, research and piloting alternate fuel resources (or the studying of pilots).Oxford has a unique opportunity to establish a research centre in cooperation with our academic and industrial partners which will form part of the means of identifying options for alternative means of transportation within and outside of Oxford County.

## 5.3.5 Battery Electric Vehicles (BEV)

BEV's are expected to increase in numbers significantly in coming years. The short-term value in BEV's is the fact the electricity infrastructure across Ontario (with the exception of remote communities at this time) is very well established and in fact, enjoys surplus capacity.

This is consistent across most of North America and as such, battery technology research and development investment has increased significantly over the past several years. As one would expect, improvements to the chemistry and energy density of the batteries is improving at a pace proportional with the research.

Aside from cost, the biggest obstacle to a quicker transition from fossil to BEV's is the lack of adequate charging infrastructure. Therein lies the opportunity and obligation of the Oxford community to be among the first communities to proactively create an Electric Vehicle Accessibility Plan that removes the BEV charger gap.

### A. Oxford's Electric Vehicle Accessibility Program

Oxford is typical of most communities in Ontario. We have relatively few electric vehicles on the road and to date and until 2013, electric vehicle charging infrastructure was effectively

[35] https://www.statcan.gc.ca/pub/11-402-x/2012000/chap/trans/trans-eng.htm

non-existent. From a practical perspective, this continues to be the case. Oxford County has performed an in-depth EV Charging Feasibility Study to assess the expansion of EV charging stations in the County.

### 5.3.6 Solar Photovoltaic (PV)

Solar photovoltaic charging of electric vehicles is already a reality in Oxford, albeit on a small scale. The Whites Lane microGRID project, established by Woodstock Hydro and partners, incorporates 33 KW of PV panels that support a 100 KVA 240 volt single phase transformer.

One of the connections to this system supplies two 70 amp Sun Country Highway electric vehicle charge stations. On sunny days, electric vehicles connecting to these chargers are powered in part, by the solar equipment located on the Woodstock Hydro buildings.

*How far will 1 KW of PV take an electric car?*

*Over a two-year period, Woodstock Hydro was able to illustrate the fact that 1 KW of panels (4 panels of 250 watt peak each), provided as much electricity over the course of a year as required to operate their Nissan Leaf electric vehicle for a full year. This analysis was based on the fact the Leaf travelled about 6000 km/year around the City. One KW of solar generated roughly 1200 kwh/year. Since the Leaf average 5 km/kwh, roughly 6000 km of travel was obtained via 1200 kwh produced by WHI's 1 KW PV installation. This fact raises many opportunities for the charging of private and fleet EV's through grid (or non-grid) connected PV systems.*

### 5.3.7 Hydrogen

Long considered the holy grail of energy storage, hydrogen continues to be a promising energy storage resource, but has yet to materialize as a cost effective solution.

Many developers (large and small) continue to research and improve on hydrogen generation and we expect technology advancements will eventually remove the technical barriers (*http://hydrogenhouseproject.org/).*

Unlike battery storage technologies that require expensive and limited mineral resources, hydrogen can be created from plentiful resources, such as water. Many have viewed the television commercials that show a person holding a cup under the tailpipe of a hydrogen vehicle and drinking the water that results from the electrolysis process. The idea that energy from renewable resources can be stored by splitting the oxygen and hydrogen atoms from a drop of water continues to drive the dream.

In spite of the well documented challenges noted with the creation, storage and use of hydrogen as a cost effective energy storage mechanism, we continue to believe hydrogen will play an important role in our 100% RE objectives.

Oxford County plays host to one of two Toyota plants in Canada, an automotive company committed to the development of hydrogen powered vehicles. We have an abundance of RNG and hydrogen generation resources that remain essentially untapped.

We will work with private sector OEM's and other professionals to create a research, testing and fueling facility in Oxford.

### 5.3.8 Biofuel

Unlike fossil fuels, where ancient stores of carbon are pulled from the earth and released in masse to the atmosphere, biofuel creates carbon-based energy from current sources of energy transformation and as such are considered 'carbon neutral'. Examples of biofuel are all around us, and can take the form of gas, liquid or solids.

Every time you enjoy a campfire, you are using biofuel. In agricultural settings we are seeing an increase anaerobic digestion of animal and food wastes that in turn can be used to create Renewable Natural Gas (RNG) that can be used to generate electricity or heat, or both. There is further opportunity to capture 100% of the organic material in our solid waste stream to generate additional RNG while having a dramatic impact on Oxford's Zero Waste target as well.

In many regions around Germany, biomass (in the form of shredded plant and tree matter) is utilized to create district heat and electricity.

Biomass also has the benefit of combining with other sources of stored energy. In a recent example of complex biofuel creation and end use associates multiple energy streams to sequester carbon, create hydrogen from wind energy and combine the results of anaerobic digesters into a renewable synthetic natural gas. In this example, transportation fuels can be derived into multiple streams, including pure hydrogen, methane or a combination of methane and hydrogen that can then be injected into the natural gas network and distributed at great distances utilizing the existing natural gas infrastructure.

Oxford has a very large and rural land area and generates a significant amount of biomass resource, from plant and tree matter through to animal waste. These resources will form a meaningful part of our 100%RE transportation objectives.

### 5.3.9 Existing Transportation by Type

Possible data sources are being researched and will be added when available.

### 5.3.10 Active Mobility

In many European communities, cycling and walking to work and getting around in general is the preferred and promoted means of transportation. In Ontario, priority is given to vehicles during planning development and this is notable in the absence of walking and biking paths in and around most Ontario communities.

Commuter traffic by foot and by bike sits at around 7% in Canada[36]. Planning and development in our communities to incent and enable this physically active means of mobility will form part of our 100%RE transportation strategy.

Area municipalities and community groups have been active in the development of cycling and trail opportunities throughout Oxford to provide recreation and commuter opportunities.

### 5.3.11 Ride Share Programs

As public policy and acceptance evolves, a significant role for autonomous vehicle technology, car share and ride share programs and services will evolve and it is assumed that these programs will be early adopters of alternate fuel technologies.

Through the development of our Sustainability Plan, Oxford has created a robust and diverse community and partner representation. Transportation research and development must include all parties, from public and community stakeholders through academic and government agencies.

### 5.3.12 Measuring Socioeconomic Improvements

As with any disruptive change, we need to balance the short-term pain and costs of the transition to a fossil free transportation network in Oxford with the longer term gains to economic prosperity, social benefit and environmental stewardship. These improvements will be monitored and reported on a regular basis, with a reporting term to be determined as our transportation plans evolve.

## 5.4 Modernize the Grid and Other Infrastructure

### 5.4.1 Enlarge & Improve the Network Infrastructure

### 5.4.2 Increase Generation Flexibility and Mix of Resources

### 5.4.3. Demand-side Management and Increase in Efficiency

The Provincial Conservation and Demand management (CDM) program known as Conservation First uses the IESO and gas and electric utilities to implement various conservation and efficiency programs. Oxford believes 50% electricity reduction is achievable in most residential

[36] http://hansonthebike.com/2017/12/12/ottawa-commute-census-data/

and small business applications through education and awareness, culture change and the implementation of new technologies. This program aims to maximize existing CDM programs by providing customers with a real and measurable opportunity to reduce consumption by 50%, while creating a net zero electricity consumption profile over the course of a year.

By combining the concepts of conservation and efficiency and renewable energy, customers will quickly develop a greater sense of what is possible. Net Zero electricity is just a starting point; a means of inspiring people by living with renewable technologies within their own space and lifestyles will generate future innovative thinking.

We believe the successful implementation of a modest program will inspire others to follow a similar path. We also believe that once people experience first-hand, the fact that renewable energy can provide all, or most of their electricity requirements, that other applications will quickly follow. As an example, electric vehicle adoption is expected to increase from 1 % to as much as 20% by 2030. The concept of supporting all or much of a vehicle energy source from renewable energy is foreign to most. This is simply because people have yet to experience the true potential of renewable energy in their lives. It is without question that renewable energy applications will grow significantly once people learn to appreciate the potential of renewable energy.

Next to cost, the most common question asked regarding net metering installations is payback period. This is an important, but very subjective question and we intend to create a profile of expected payback periods based on system size, but also conservation results. As an example, the payback with net metering should also include an allowance for savings through conservation efforts. A payback period based on straight load displacement from the PV installation and a ‘bonus’ payback that considers the extra possible savings of reducing consumption by 50% should be calculated.

The program is intended to entice customers to reduce consumption by supporting up to 50% of their load through PV. For those customers who choose to take up the challenge of meeting net zero, they will accelerate the payback while at the same time reduce their electricity costs, potentially to zero (minus fixed costs).

## 5.4.4. Storage

### A. Hydrogen

### B. Tesla Battery

## CHAPTER 6

# Identify Financial Resources

### Overview

Although major investments in renewable energy infrastructure and technologies require consistent and reliable financial support from governments, local authorities also will need to raise capital to support local projects. Innovative and alternative financing mechanisms will need to be established. .

Promote adoption of innovative, locally based fee systems, such as a cap and trade, and other financial mechanisms to favour low polluting in the marketplace alternatives over carbon and resource intensive processes.

The plan will create financial incentives that stimulate private investments and that encourage private individuals to opt for renewable energy options rather than conventional fossil fuels. Consistent financial support from national, regional and local governments is essential to develop the renewable energy market and to stimulate the necessary participation of companies and private individuals in moving this transition forward.

### Key points

- An inclusive Oxford requires access to renewable energy technology, regardless of financial status
- Oxford County is starting with Social housing projects to demonstrate improvements in health and wellbeing, affordability starts with the most vulnerable in our community

# 6.1 Introduce Innovative and Alternative Financing Mechanisms

## 6.1.1 Canada Mortgage and Housing Canada (CMHC)

The CMHC is a federal body with a mandate of research and financial support in Canada. They have been a world leader in the development of Net Zero buildings, beginning with the Net Zero healthy house competition and later the Equilibrium program.

CMHC will play an important leadership and mentoring role in our transition to better building in Oxford County.

## 6.1.2 Incentives

Financial incentives are often required to generate interest and to make energy efficient updates affordable. In the case of electricity, conservation and efficiency programs, according to the Ontario Ministry of Energy, conservation investment doubles the value returned. Energy efficiency retrofit programs from both federal and provincial governments provide significant access to capital funding necessary to implement retrofit programs, resulting in a reduction of GHG output and costs to the building owner. It has been estimated that for every $1 invested in energy efficiency, Ontario has avoided about $2 in costs to the electricity system.

### A.IESO Save on Energy Program

The **IESO: Save On Energy Program** offers a number of programs and incentives to help business, residents and social housing providers lower energy consumption through energy efficient upgrades.

### B. Home Assistance Program

As a part of the Save on Energy Program, this program offers a detailed in home energy assessment, installation of light bulbs, power bars with timers, water saving showerheads and aerators, and energy efficient refrigerators for qualifying applications. All service are performed free of charge, in the aim of lowering energy consumption in households. Social Housing providers also have access to this program.
https://saveonenergy.ca/Consumer/Programs/Home-Assistance-Program.aspx

### C. Green ONFund

The Green ONFund is funded through Ontario's Cap and Trade system, the program aims to help residents and businesses make energy efficient enhancements through programs and rebates.

## 6.1.3 Government Funding Programs

### A. Electric Vehicle Chargers Ontario Program

Oxford County participated in the first wave of MTO funding in 2016 and continues to expand the EV charger network through additional EVCO funding and through the MTO Workplace incentive program.

Additional investment is expected to follow from both public and private entities as we follow the outcome of the Electric Vehicle Charger Feasibility study.
http://oxfordcounty.ca/Your-Government/Speak-up-Oxford/Campaign-Details/ArticleId/13382/Electric-Vehicle-Chargers-in-Oxford

## 6.1.4 Low Interest Capital Loans

Explore opportunities to lever wealth in Oxford County by opening up investment opportunities for local investors.

## 6.1.5 Public Private Partnerships (PPP)

Community cooperatives and municipally led renewable energy initiatives.

## 6.1.6 Financial Institutions

### A. Scotiabank

Scotiabank is partnering with Oxford County in support of the Solar Oxford Challenge. Additional programming options may evolve based on the success of this program.

## 6.1.7 Legacy Fund

The Future Oxford Legacy Fund provides Legacy Fund, seed funding to entrepreneurs, businesses and partnerships to develop new, and sustainable community and regional opportunities that align with the Future Oxford Community Sustainability Plan.

### A. Access to Capital and Community Development Support

The “Access to Capital” funding stream provides capital for entrepreneurial activities, with an emphasis on youth opportunities, arts and culture, tourism, high-tech manufacturing, and green technology.

### B. Community Development Support

This stream offers non-repayable loans to not-for-profit projects.

## 6.1.8 Youth Solar Leadership

Young people in our community are tomorrow’s leaders in renewable energy. Programming such as the International Renewable Energy Academy (York University SEI) and other initiatives such as Emerging Leaders for Solar Energy (ELSE) may provide opportunities for collaboration as we seek to develop youth education in renewable energy.

ELSE is a growing network of young professionals, students, and solar advocates (up to 35 yrs.), who are working with the Canadian Solar Industries Association and industry stakeholders to build a strong solar energy future across Canada. http://www.elsecanada.ca/

## 6.1.9 Finance Gaps

## 6.1.10 Best Practices for Financing 100% RE

# 6.2 New Mechanisms to Internalize Externalities

## 6.2.1 Ontario Cap and Trade

Ontario has implemented a province wide Cap and Trade system, to lower GHG emissions by putting a price on carbon. Although this is not a local mechanism, it will have major impacts on industrial sector of the County. The aim of the program is to reduce GHG emissions by rewarding businesses that choose lower emitting practices.

## 6.2.2 Local Waste Tax

## 6.2.3 Agricultural Energy Generation Incentive

# 6.3 Establish Stable, Long-Term Support Schemes

## 6.3.1 Fit and MicroFIT

The FIT and microFIT programs provide investment opportunities into renewable energy between 2010 and 2017. These programs fulfilled their mandate of creating momentum in the renewable energy sector and the programs were closed the end of 2017. Future renewable energy installations will be connected through net/virtual net metering installation, or as off-grid applications. Energy storage is expected to increase significantly in coming years to assist in the cost effective harvest of renewable energy.

## 6.3.2 Net Metering

## Net Metering

Alternatively, renewable energy generators have the option to offset their current electricity bills by feeding excess energy generator into the distribution system and help lower their costs by ‘trading’ supply for consumption. The Ontario Government is allowing customers to supply energy into the grid and offset their electricity costs. There is no size requirement for net metering, however, energy must be generator by renewable energy sources (wind, water, solar, biofuels). Virtual net metering is now under review by the Ministry of Energy and IESO as demonstration projects and may provide the opportunity for generators to offset electrical loads in locations geographically displaced from the renewable energy installation.

### 6.3.3 Residential Retrofit Program

Deep energy retrofit is identified in the City of Woodstock Municipal Energy Plan (MEP) as a prerequisite to net zero energy. Since the first step toward 100% RE is conservation and energy efficiency leading up to renewable energy installations, a formalized energy retrofit program will be necessary.

Both Provincial and Federal governments are presently working on energy efficiency programs for building, largely financed through the Cap and Trade carbon reduction program. Our objective is to monitor progress at these levels, leverage funding and resources as much as possible and to enhance these programs through County led initiatives for the purpose of maximizing building retrofit results in Oxford. Natural gas and electric utility companies are considered key partners in cooperation with government agencies.

# CHAPTER 7

# Support Decentralization and Inclusion

## Overview

Holding political leaders responsible and ensuring an environment of trust among community members and political authorities are essential to raising and maintaining public engagement. Accountability and transparency are fundamental aspects of an effective, inclusive and "future just" transition that ensures citizens are motivated to take ownership of the 100% RE system.

Mechanisms to ensure accountability and transparency legitimize government commitments and, in turn harness the citizen support, trust and consensus needed to govern effectively. Greater accountability and transparency also ensure politicians legislate with the best interest of the community in mind and align their political commitments with a decentralised, participatory approach such that they promote energy democracy and equitable access to clean renewable energy.

Without a shift in awareness by the broader population, far-reaching energy transition processes cannot be launched. Citizens need to be involved in decision-making processes that lead to a shared 100% RE goal. Information and consultation raise citizen awareness to motivate energy conservation.

It is necessary to promote inclusive communication and outreach so that citizens stay informed about how they can participate throughout planning and development processes.

Since not all citizens can be reached through electronic communications other materials will complement the public engagement strategy including brochures, press articles and conferences.

The shift from a centralized energy system based on fossil fuels to one that is decentralized and run entirely on renewable energy sources requires citizens and communities to evolve into "Prosumers"—not just consumers but also producers of energy.

Communities must be empowered to innovate and transform in a manner that ensures that all, including the most vulnerable members of the community, participate and benefit in an equitable way from this transition. For this reason, policy will need to ensure that a transition to 100% RE really serves and benefits the greatest number of people and that is centred on community participation, engagement, accountability, and transparency of decision-making processes[i]. Policies should also protect those communities, such as low-income communities or indigenous groups, that tend to be the most vulnerable to changes as well as most directly affected by climate change[ii].

### Key points

- Ensure Accountability and Transparency
- Promote inclusive communication and outreach
- Empower a decentralized and diversified energy transition
- Safeguard a Socially Just Transition
- Public inclusion and engagement is critical to any transition
- A variety of methods must be used to prepare the public for a transition to 100% RE

# 7.1 Ensure Accountability and Transparency

## 7.1.1 Mechanisms to ensure Accountability and Transparency

## 7.1.2 Future Oxford

The Future Oxford Partnership is a community based entity established to monitor, guide and provide leadership towards then development and implementation of the 100% RE Plan. The committee comprises of 15 appointed community members, representing Oxford's social, environmental and economic interests.

Comprised largely of community volunteers, Future Oxford Partnership serves in part, as a barometer for transparency of access to community sustainability practices. Sub-committees responsible for specific goals of the Plan provide advice and guidance to the Partnership as we build outreach programs that are open and accessible to all.

# 7.2 Promote inclusive communication and outreach

## 7.2.1 Public Consultation Processes

In addition to Future Oxford Partnership and committee outreach, Oxford County promotes the Speak Up Oxford forum as a means of launching new initiatives, while providing the public with an opportunity to provide comments.

Alternatively, the public always has access to political leaders from across the 9 municipalities that comprise Oxford County.

### 7.2.2. Communication Strategy

a. Define a communication strategy and identify channels to reach a diverse range of actors
b. Assess beneficiaries and losers of the transition to 100% RE and align the commination message based on analysis

### 7.2.3 Public Education and Training

Public education has arguably never been more important. If we are to affect change that will salvage our environment and allow us to transition to a sustainable economy, we will need to work together as we begin to understand the challenges and solutions that lie ahead of us.

### 7.2.4 Existing Renewable Energy Installations

Existing and further demonstration projects will be the cornerstone of our stakeholder and public outreach campaign.

#### A. Large and Small Scale Solar

Several solar PV and solar thermal installations exist around the County that can serve as demonstration projects. These installations generate significant renewable energy, yet they go largely unnoticed and provide very little information in the form of public education.

Oxford County continues to work closely with Ministry of Energy and IESO to gather a complete database of renewable energy installations in the region.

## 7.3 Empower a decentralized and diversified energy transition

### 7.3.1 Net Metering

Net Metering is another great method that allows new actors to participate in renewable energy generation, as it does not have a size limit for the generation system. This is a good option for participants looking to install small-scale PV systems for their own use, and have the capability to inject excess energy into the grid. .

### 7.3.2 Autonomous Vehicle Auto Share Cooperative

The County of Oxford EVAP program is not simply a program to encourage the wide-spread use of EV’s across our region; it is also an enabling project that will prepare us for the

implementation of emerging technology applications. Autonomous vehicles are making exceptional progress and will likely be part of our transportation network within the next decade. Autonomous vehicles may present themselves as a solution to our 'accessible Oxford' aspirations, as noted in the Sustainability Plan and as such, should be researched in that context as well as that of our 100%RE goal.

### 7.3.3. Community Based Cooperatives

Oxford Community Cooperative is a local example of a community based renewable energy cooperative. With both wind and solar installations in their portfolio, they are an example of how local leaders from within the community can increase access to renewable energy. OCEC is "*a renewable energy cooperative in which residents of Oxford County and all of Ontario are invited to become members to jointly create a more environmentally sustainable community without a need to compromise their investment objective for profit potential Oxford Community Energy Co-operative will serve the communities it operates in by keeping the ownership, the profits, and the business is conducts local.*"

More detail can be found at http://www.oxford-cec.ca/

### 7.3.4 Existing Decentralized Investment Models

a. Map existing models for decentralized investment or decision making in other sectors an explore transferability to energy sector

## 7.4 Safeguard a Socially Just Transition

### 7.4.1 Transforming the Work Force

a. Assess number and the kind of jobs in the conventional energy sector (direct and indirect) and define steps to facilitate a smooth transformation of traditional work forces.

As renewable energy expands, new skills are required and in many cases, lead to new and ongoing employment to maintain and grow the renewable energy content. This trend is just now showing up in Oxford County.

## 7.4.2 Oxford Innovation & Research Cluster

If we are to lead Oxford and indeed, Ontario toward a 100% renewable economy, establishing a culture of innovation will be critical. New technologies and applications seem to appear every day. Oxford needs a space where these new ideas can be presented, fostered and implemented on a demonstration basis, utilizing the expertise of our academic partners through to the production and applications professionals we now have operating in Oxford.

In 2018, Oxford County is assessing interest in the development of a sustainability cluster that may be situated in a newly renovated County owned building that will perform to the PassiveHouse EnerPhit standard.

### A. Ryerson University

In 2017, Oxford County joined the Ryerson University Smart and Future Cities program.

### B. York University

Working closely with the York University Sustainable Energy Initiative, Oxford County co-hosts the International Renewable Energy Academy. Details of the first two year program can be viewed at http://rea.info.yorku.ca/

### C. University of Western Ontario

In 2018, UWO building science researchers will work with Oxford County and partners on a post-occupancy performance monitoring program. Ongoing details of the program will be hosted at http://www.oxfordcounty.ca/Services-for-You/Human-Services/Shelter-and-Housing/Build-Better

## 7.4.3 Smart Cities generation

In 2018, municipalities across Oxford County submitted an application to participate in the Infrastructure Canada Smart Cities Challenge.

This initiative is expected to drive significant public interest and engagement as we take our sustainability initiatives to the Federal stage.

Details of this Country-wide program can be view here http://www.infrastructure.gc.ca/sc-vi/map-applications.php The Oxford County submission will be continuously updated at our own Smart Cities Internet location at http://www.oxfordcounty.ca/Your-Government/Speak-up-Oxford/Campaign-Details/ArticleId/13931/Smart-Cities

## CHAPTER 8

# Nurture Vertical and Horizontal Cooperation and Integration

### Overview

Chapter 8 suggests that cities, regions and municipal governments cannot work in isolation and cannot achieve the 100% RE target without engaging the support across all levels of government. Building partnerships and intensifying coordination and collaboration throughout international, national, regional and local levels are critical actions to ensure policy coherence and integration.

It is therefore important that local communities consider ways either to contribute to the creation of new platforms or that tap into existing local, subnational or international groups that can already support multi-level governance and vertical cooperation.

It is important to ensure that the broadest possible coalition of actors is included in the process. Key actors within a local government's territory usually represent the administration, political parties, city managers, indigenous populations, business associations, citizen initiatives, research bodies, and so on. The more diverse the community participants in the 100% RE strategy are, the further reaching and reliable are the results.

These actors include: Political parties, city managers, business associations, citizen initiatives, research bodies, local energy suppliers, agriculture and forestry representatives, freight and trade agents, technical experts, financial institutions, and land developers.

Horizontal collaboration is also about cooperation between regions, especially between urban and rural areas, which face different challenges and opportunities during an energy transition and in addressing climate change issues.

### Key points

- Further Vertical Cooperation
- Cultivate Horizontal Cooperation
- A diverse set of stakeholders is needed to ensure a variety of perspectives are sought
- All aspects of life are dependent on energy and will impact every sector of our community

# 8.1 Further Vertical Cooperation

## 8.1.1 International

### A. World Future Council (WFC)

Oxford County is referenced in several articles and documents, as an international player and innovator. Our continued relationship with WFC is most recently notable in the adoption of the Kassel Criterion and subsequent Building Blocks 100%RE planning guideline.

Oxford County is recognized by WFC as the first government agency to use the Building Blocks guideline for Zero Waste and most recently, Zero Poverty planning processes. WFC is leading the way to create a planning toolkit that can be replicated anywhere in the World, and by adopting the same standard for Zero Waste and Zero Poverty, Oxford County is building on this leadership and expanding the realm of possibilities that WFC initially created.

### B. Renewable Cities

Renewable Cities is a Canadian based organization with an International reach. Our continued support and participation in their bi-annual conference continues to help us expand our own International network and to serve as a resource for new participants considering a 100%RE future.

### C. Non-Governmental Organizations (NGO's)

Oxford County has joined an ad-hoc NGO team that meets with members of parliament and government agencies on a regular basis. These NGO's include:

- David Suzuki Foundation
- Greenpeace
- Environmental Defense Agency
- Clean Air Alliance
- Clean Air Partnership

## 8.1.2 National

### A. Infrastructure Canada

In 2018, Oxford County was invited as a participant in the Infrastructure Canada Smart Cities Challenge. This Challenge presents an opportunity for municipalities in Oxford County to join Future Oxford Partnership and other stakeholders to promote our leadership in sustainable planning activities.

More information can be found at http://www.oxfordcounty.ca/SmartCities

### B. Federation of Canadian Municipalities (FCM)

FCM represents Canadian municipalities, many of whom are participating in the Smart Cities Challenge. Oxford County is participating with FCM in Greenhouse Gas Inventory activities and continues to promote sustainability planning ideas with FCM members across Canada.

### C. Canada Mortgage & Housing Corporation (CMHC)

Oxford County Human Services division, specifically the social housing office, is in constant communication with CMHC staff as we strive to improve our social housing services. CMHC participates with Oxford County staff in to fund new projects and to promote energy efficiency improvements to social housing stock.

## 8.1.3 Provincial

### A. Provincial Ministries

Oxford County liaises with all provincial ministries, however our interaction with energy and environment and climate change has increased significantly as we strive to support GHG reduction and energy efficiency and renewable energy deployment activities across our various services.

Independent Electricity System Operator (IESO)

In 2016, Oxford County joined the IESO Data Strategy Advisory Council to assist in the development of 3rd party access to smart metering data. Oxford County is hosting one of several provincial pilot projects as we refine our community energy baseline profiles.

In 2018, Oxford County will begin the process of harvesting over 40,000 smart metered accounts and establish one of Ontario's first electricity smart metering community profiles in support of a comprehensive and accurate community electricity profile.

# 8.2 Cultivate horizontal cooperation

## 8.2.1 Future Oxford Partnership

www.FutureOxford.ca
Driven largely by volunteer members of our community, the Future Oxford Partnership is a critical resource in the development of our sustainability plan. Subcommittees drive specific areas of study, such as energy, waste, wetland and forest cover, economic and community wellbeing.

### 8.2.2 Association of Municipalities of Ontario (AMO)

AMO is an advocate for Ontario municipalities that provides policy updates and other relevant legislation that may impact the way municipalities do business.

### 8.2.3 Ontario Municipalities

As we develop and refine our various sustainability planning processes, we are committed to sharing our project plans and outcomes with our Ontario cohorts.

It is beneficial to work with other Municipalities to share best practices and share knowledge on what has and has not worked when creating policies and targets that impact large communities. Sharing knowledge with Vancouver city will especially be beneficial, as both jurisdiction are on a target towards 100% RE.

### 8.2.4 Oxford Municipalities

Collaboration with all eight Oxford municipalities is an ongoing process and in all cases where sustainability plans are created, unanimous support from partner municipalities in Oxford has been achieved.

Working with Oxford Municipalities will be critical to ensure that each municipality needs are met and the 100% RE plan compliments each community’s needs and capacity.

# CHAPTER 9

# Promote Knowledge Generation and Capacity Building

## Overview

Chapter 9 surveys the sorts of activities, projects and research partnerships that generate further knowledge on RE development by the local government.

A number of activities can accelerate shared learning between actors from both research and practice. For example, hosting demonstration and pilot projects to test the viability of an idea, becoming part of a research alliance, establishing a training centre, hosting educational programs, or ensuring continuous process of evaluation and monitoring will all provide increased opportunities to share knowledge.

Policy makers and political leaders at the local level, globally all stand to gain from a free and open exchange of lessons learned, best management practices and promotion of a further exchange of knowledge across jurisdictions, regions and countries around the world.

A major restructuring of this nature cannot be achieved simply by swapping human capital and technologies, but by making sure that stakeholders develop and reinforce their own local capacities and expertise that take advantage of their local human capital and fit their local requirements. Skills and training will be developed to support a structural transition of this scale and scope.

## Key points

- Generate and Disseminate Specific Knowledge
- Make Knowledge and Data Accessible
- Promote Capacity Building and Training
- Demonstration projects are critical to the success and expedience of our transition to 100% RE
- Innovation, applied research and education must be a priority

## 9.1 Generate and Disseminate Specific Knowledge

### 9.1.1 Smart Cities Challenge – Infrastructure Canada

In 2018, Oxford County entered into a Canada-wide municipal challenge with a goal of sharing our progress and plans for a sustainable and smart community. Using buildings as our platform, we intend to demonstrate that connected technology and data used to create and enhance the built environment is instrumental in the development of all aspects of our sustainability plan.

We intend to use this Challenge as a means of sharing our progress toward a smart and sustainable community and to create new partnerships from across Canada to both learn from and to share with, new ideas that will be mutually beneficial.

### 9.1.2 Build Better Project

Build Better Project

The transformation of buildings is a critical step in our transition to 100%RE. Buildings represent up to one-third of our energy consumption and continue to be a significant source of GHG emissions.

In 2018, the Blossom Park social housing project will be constructed to PassiveHouse standard and will be home to 34 families who will experience significant improvement in comfort and air quality.

Working with academic, private sector and not-for-profit partners, post-occupancy energy and building quality outcomes will be monitored and lessons-learned will be shared with the public and interested stakeholders.

### 9.1.3 Oxford County Resource Management Center

http://www.futureoxford.ca/stories/detail.aspx?appid=1e6d8ff8778d4277baec69b79e50be6c

In 2018, Oxford County will launch an operational Zero Energy waste management administration facility. This new zero energy building constructed to meet the Canadian Green Building Council standard will serve as an administration office and public training facility with the goal of providing renewable energy and zero waste training using actual facility loads and renewable generation.

Powering the site will be a new 120 KW solar PV array connected under a net metering agreement with Hydro One, the local electricity distribution company. When complete, the entire facility (building and operations) will achieve net zero electricity.

## 9.1.4 EnerPhit Retrofit

Retrofitting existing building stock is an important part of our 100%RE transition. While many buildings are poor performers from an energy perspective, most have many years of structural service remaining.

PassiveHouse standard addresses this through a retrofit standard known as EnerPhit. Located at 75 Graham Street in Woodstock, this project will combine high-performance upgrades with post-occupancy monitoring. In partnership with University of Western Ontario, information from sub-metering and other sensor equipment will be gathered and reports created to determine performance outcomes as compared to design models.

## 9.1.5 IESO Smart Metering

### IESO Smart Metering 3rd Party Access

Ontario is one of the world's few jurisdictions with hourly electricity data available at residential and commercial customer facilities. This information is vastly under-utilized by customers and essentially unavailable to third party requesters.

In 2016, Oxford County joined IESO and other stakeholders with a goal to enable access and subsequent value creation from using Smart metering data.

Oxford County will serve as one of six provincial pilot projects with a goal of enhancing electricity baseload information in Oxford County. Outcomes of this pilot project will be shared with other interested parties.

## 9.1.6 Community Events

### Oxford Community Events

In cooperation with Future Oxford Partnership and committees, Oxford County participates at various community events.  Community events are an opportunity to facilitate knowledge sharing and advance capacity building in the Oxford Community.

## 9.1.7 Future Oxford Education Trailer

Powered by solar energy and supported off-grid with energy storage batteries, the Future Oxford Trailer is designed to showcase renewable energy, while serving as roving educational venue across Oxford County.

As a multi-purpose education center, the trailer is designed to promote all goals and action items associated with the community sustainability plan.

# 9.2 Make knowledge and data accessible

## 9.2.1 Future Oxford Communications

www.futureoxford.ca

The Future Oxford Partnership oversees several community driven committees with specific areas of expertise and goals. These committees typically meet on a monthly basis and share information via the Future Oxford Internet and social media venues and through ongoing participation in community events.

## 9.2.2 Oxford County & Speak Up, Oxford!

In addition to ongoing posted content through Oxford County , Speak Up Oxford is an online tool that provides a means of both sharing and receiving information and ideas from the public. It was a tool created to allow the residents of Oxford to actively participate in current municipal programs and services through an online “town hall”. Also, this allows those residents to be involved in decision making that may not be able to physically be present at scheduled town halls.

## 9.2.3 Online Knowledge Sharing

- Future Oxford Committees
- Future Oxford Speakers Series
- Future Oxford Sustainability Trailer
- Sustainability Cluster
- Zero Energy Training Center – Oxford County Waste Management Facility
- Infrastructure Canada Smart Cities Challenge

## 9.2.4 Role of Existing Stakeholders

Existing stakeholders play an important role in the ongoing business of committee work, identifying and mentoring new stakeholders as we make the transition to 100RE.

# 9.3 Promote Capacity Building and Training

## 9.3.1 Buildings Capacity Building

1. Sustainability Cluster
2. BuildBetter Project
    a. Blossom Park
    b. 75 Graham Street
    c. Zero Energy Waste Facility

## 9.3.2 Transportation Capacity Building

1. Electric Vehicle Charger Feasibility Study
2. MTO EVCO project
3. MTO Workplace Charger program
4. County fleet CNG conversion project
5. Heavy Duty Electric Truck (HDET) recharging infrastructure

## 9.3.3 Electricity Capacity Building

1. Net Metering
    a. Woodstock WWTF 500 KW PV
    b. Oxford County Zero Energy Waste Facility 120 KW PV
    c. Virtual Net Metering
    d. IESO/Oxford County Smart Metering 3rd Party access pilot project

## 9.3.4 Training

1. Develop capacity building projects to support and train staff

## 9.3.5 Stakeholder Capacity

1. Define relevant capacities among different stakeholders
2. Assess existing capacities and expertise in the jurisdiction
3. GHG Inventory Report
4. Smart Energy Oxford Committee
    a. Smart Energy Oxford 100% RE

## CHAPTER 10

# Engage in Networks

### Overview

Chapter 10 illustrates that Oxford County has already been a tremendous benefactor of relationships with many friends and partners (new and old) from around the world to our own backyard.

The willingness of these many partners to share their knowledge, innovation and ideas has been humbling and is genuinely appreciated. Along with our many local partners, we will continue to work with academic and international networks. Our progress and accomplishments will be shared with our networking community to ensure progress continues at a rapid pace. At local or regional levels, interesting opportunities can often only be seized through a common and joint effort. Exchanging experiences and know-how with other local municipalities and civil society groups can enable leapfrogging and can even manifest in a joint wind or solar farm, for example.

Becoming part of an international networking platform not only supports constructive knowledge exchange and cooperation but can also enhance a local government's visibility and branding.

Membership provides opportunities to promote a city's or community's efforts, emboldening political leaders to partake in a common 100% RE planning process.

### Key points

- Form and Engage in Local and Regional networks
- Participate in International Networks
- Along with our many local partners, we will continue to work with academic and international networks
- Our progress and accomplishments will be shared with our networking community to ensure progress continues at a rapid pace

# 10.1 Engage in Local and Regional Networks

## 10.1.1 Civil Society

Oxford County is part of a greater network of municipalities, comprises part of the Province of Ontario and contributes significantly to the economic output of Canada. Networking is an important part of the education and implementation process.

We view participation in various and diverse networks of professionals as a privilege. Our contacts through networking create academic research hubs, government funding and

demonstration opportunities and a wealth of other outcomes that could not otherwise be achieved.

### 10.1.2 Public

#### A. Southwestern Ontario Public Transportation Network

There is much to do on this emerging issue. Along the way, we will build partnerships to advance the role of public transportation across Southwestern Ontario. Connecting communities and advancing mobility options is our goal.

#### B. Smart Energy Oxford

The cornerstone committee of our 100% renewable energy transition, SEO was established under the environmental pillar of our Future Oxford Sustainability plan. SEO is comprised of rough a dozen community energy experts with diverse backgrounds.

Smart Energy Oxford (SEO) is comprised of private, municipal and utility stakeholders. Their primary mandate is the development and implementation of this plan through meeting and discussion, public outreach through their respective personal and professional circles and facilitating or championing a variety of projects and initiatives.

#### C. Future Oxford

Municipal energy planning is a relatively new endeavor. In fact, most municipalities, as of the writing of this plan, do not have a comprehensive energy plan and those who do are in the very early stages of implementation.

Oxford County municipalities are working together and individually to gather baseline energy data and to begin the process of first identifying ways to better utilize their supplies of energy, while mapping out a path to transition to renewable energy.

Future Oxford, established in 2007, is a committee that includes private and public representatives to assess energy topics ranging from municipal asset improvements to building code advancements, such as Net Zero and Passive House concepts.

Future Oxford Partnership: www.futureoxford.ca

Note that this includes consultation with all sub-committees of Future Oxford (Zero Poverty, Zero Waste, Smart Energy Oxford, Reforest Oxford, Economy Oxford, Community Oxford).

#### D. Sustainable Energy Initiative/York University

By partnering with Dr. Jose Etcheverry, Oxford has been connected to the worldwide renewable energy movement. Organizations such as the World Future Council and Renewable Cities have welcomed us with open arms and supportive venues like Kassel International Dialogue on 100% Renewable Energy. The Sustainability Energy Initiative is a great opportunity for Oxford to connect with young individuals and bring current and innovative ideas into the community.

#### E. Ryerson University

Oxford County continues to develop smart city strategies through the Ryerson Future and Smart Cities initiatives, to which Oxford County representatives serve in an advisory capacity. Maintaining our relationship with Ryerson University to an opportunity for Oxford to engage with other local smart cities networks.

#### F. University of Western Ontario (UWO)

UWO research scientists and programmers are an important part of our post-occupancy

building performance program. Our relationship with the team at UWO continues to evolve and as it does, new opportunities to collaborate are being identified.

### 10.1.3 Private

#### A. CUTRIC

The Canadian Urban Transit Research and Innovation Consortium board was formed in early 2016 and both the County of Oxford and City of Woodstock became founding members. A national organization, CUTRIC has mandate to identify alternative energy sources for municipal transit.

We are proud to both support and be part of CUTRIC and have great expectations under the direction and guidance of Director Dr. Josipa Petrunic.

#### B. Electric Vehicle Power Providers (EVPP)

Dr. Petrunic is a leader in the establishment of the Electric Vehicle Power Providers (EVPP) working group. Established in 2014, Dr. Petrunic was able to assemble a consortium of electric utilities, industry stakeholders and a diverse group of provincial government agencies for the common goal of transitioning Ontario's personal transportation system from fossil driven to that of electricity centric mobility.

#### C. Oxford Builders Association

Networking with the developer community along with controller agencies and public stakeholders is essential if we are to make meaningful improvement in building efficiency and better understand the challenges and opportunities facing the builder/developer community.

## 10.2 Participate in International networks

### 10.2.1 The World Future Council

#### The World Future Council

Located in Germany, World Future Council works to pass on a healthy planet and fair societies to our children and grandchildren. "We envision a sustainable, just and peaceful future where universal rights are respected. To achieve this, we research, identify and spread the best and most sustainable policy solutions worldwide".

Oxford County is leveraging the work of WFC through their Kassel Criterion framework and subsequent Building Blocks format. By applying this framework to our 100%RE, Zero waste and Zero poverty plans, we hope to promote the value of standardized approach to multi-discipline planning locally and by extension to inspire other jurisdictions to share in the WFC approach.

## 10.2.2 Local Governments for Sustainability

### Local Governments for Sustainability

Global network for more than 1500 communities, providing practical strategies and methodologies in achieving a low carbon economy. ICLEI provides a valuable resource for sharing of ideas across the municipal sector.

## 10.2.3 Go 100% RE

### Go 100% RE

This is the first global platform advocating for a 100% RE future. The is organization helps in creating a dialogue around what a 100% RE future looks, and explores success stories, best practices and policies from around the globe.

[i] http://energydemocracyny.org/wp-content/uploads/2015/04/REEM_Document_FINAL.pdf
[ii] http://jobscleanenergywa.com/wp-content/uploads/2016/04/Alliance-Policy-Four-Pager_final.pdf

Advancing the

# FutureOxford

Community Sustainability Plan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