County of Essex

Windsor-Essex Climate Change Collaborative

County of Essex Regional Energy Plan

Report #4

Summary and Implementation Strategy

Implementation Plan

Essex County Regional Energy Plan

Contents

1. Regional Energy Planning (REP) Overview

1.1 Beginnings

The County of Essex, Essex Region Conservation Authority, local municipalities, and community partners have worked together to create a Regional Energy Plan (REP) for Essex County.

The REP provides the community with a pathway to reduce energy consumption, energy-related greenhouse gas emissions (GHG) and energy costs. The REP offers an opportunity to create local jobs while ensuring reliable and affordable energy sources for the region's residents and businesses.

Essex County's regional energy planning process was a cross-sector collaboration, drawing strength from the expertise and demonstrated leadership in Essex County and members of a Project Working Team (PWT) and Community Task Force (the Task Force). Please refer to *Report 1 – Rationale and Scope* for more information about the structure, composition, and role of the PWT and the Task Force.

The regional energy planning process was designed for implementation and is comprised of a set of five documents:

1. **Rationale and Scope Report** summarizing the reasons for undertaking the regional energy planning process and the project's scope.
2. **Analytical Report** summarizing the evidence-based rationale supporting the regional energy planning process.
3. **Recommendations Report** summarizing the recommendations from the PWT and CTF based on the findings of the analytical process.
4. **Essex County Strategy and Implementation Plan** to be recommended by the CTF to County Council.
5. **Engagement Report** summarizing the engagement process that informed the development of the Strategy.

This report is the fourth report and describes the CTF recommended 2041 Strategy and 5-year Implementation Plan for Essex County. Figure 1 illustrates the relationship between these five reports and the role of the PWT and the CTF.

A list of definitions to support this report is found in Appendix 1.

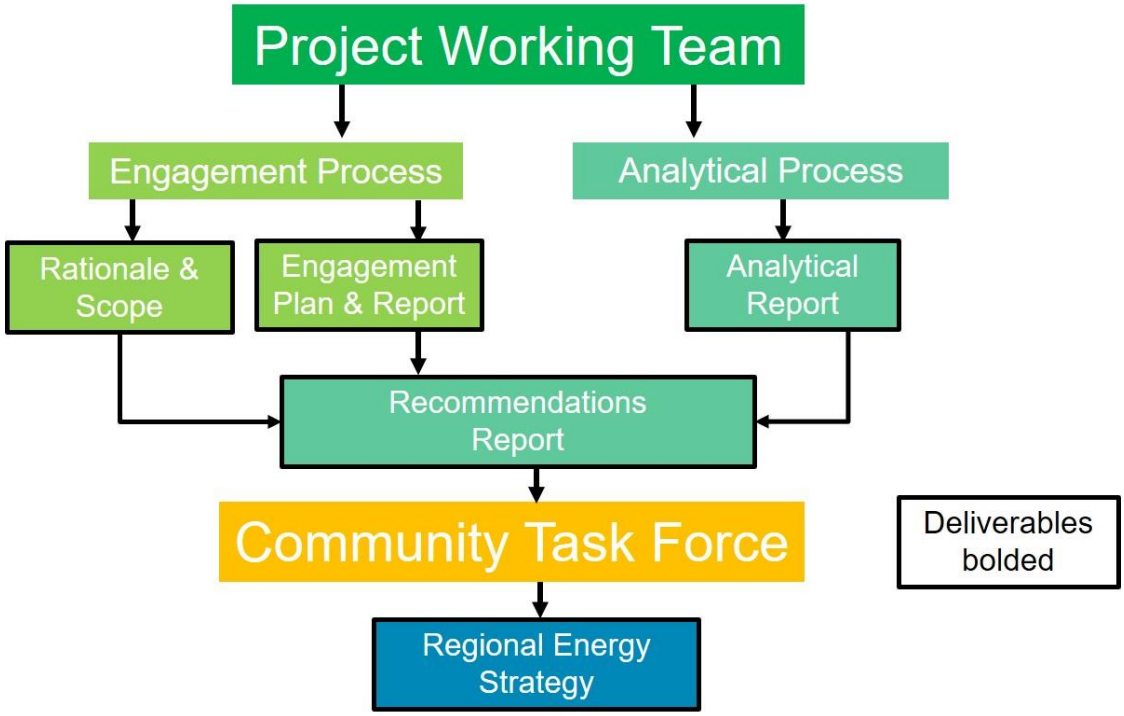

Figure 1: Schematic of project governance and deliverables illustrating the five reports (bolded) that comprise the regional energy planning process in relation to the roles of the Project Working Team and Community Task Force.

1.2 Rationale

In the past few years, climate change issues have become a greater priority for Essex County. In 2019, the County of Essex, the City of Windsor, and other local municipalities declared a climate emergency. Globally, 1863 jurisdictions and local governments representing 820 million citizens have made a climate emergency declaration. The climate emergency declaration recognized that future climate performance must be a high priority in all decisions and called for cooperation in reducing GHG emissions in the wider region. The development of this REP is the next step on this climate action journey.

As a signatory to the Paris Agreement, the Federal Government has set a target to reduce greenhouse gas (GHG) emissions to 80% below 1990 levels by 2050 and is establishing policies and making investments to achieve this target. In January 2021, the University of Ottawa's Positive Energy program released new survey results tracking Canadians' attitudes about climate change action in the context of COVID-19 showing Canadian appetite for climate action is on the rise, with a majority indicating that it is a good time for Canada to be ambitious in addressing climate change even if there are costs to the economy. Federal and provincial policies and programs.[1]

[1] Found at: https://www.uottawa.ca/positive-energy/news/canadians-appetite-climate-action-growing-beware-polarization

The Province of Ontario has also set targets to reduce GHG emissions. For several years, changes in provincial legislation have been mainstreaming energy and climate policymaking at the municipal level. With 60% of energy consumptions and over half of all GHG emissions in Canada are influenced by communities – for instance, the transportation of people goods and services, the powering of local industry and the heating, cooling, and lighting of homes and buildings – municipal government and communities are increasingly recognized as having an important role to play.

While regional energy planning will ensure Essex County benefits from the modern energy transition to decarbonize global energy systems, climate change is not the only reason to act locally. Regional energy planning offers several positive economic, environmental, social, and cultural benefits, including:

- reducing energy costs,
- creating green jobs,
- attracting new business,
- increasing energy efficiency,
- increasing energy security, and
- enhancing climate resiliency.

In 2019, the Essex County community spent approximately $820 million in energy costs or an average of $4300 for each person. Most of those energy dollars leave the community. The REP identifies opportunities to keep more of these energy dollars in the local community by reducing energy bills and generating and distributing more energy locally.

Please refer to *Report 1 – Rationale and Scope* for a fuller description of the rationale for undertaking a regional energy planning exercise.

1.3 Scope

Regional energy planning considers all local electricity, natural gas, gasoline, and diesel flows that impact activities within the regional boundary of the County of Essex, from supply through distribution to end-use. While the REP scope is energy and its related emissions and economic impacts, there are other subject areas that address climate change, like the protection of natural areas and the development of green infrastructure. Other regional initiatives are addressing these subjects. The REP included municipal water consumption within its scope. The connection between water and energy considers how much energy it takes to collect, clean, move, store, heat/cool and dispose of water. Please refer to *Report 1 – Rationale and Scope* for a fuller description of the project's scope.

1.4 Roles

The implementation of a regional energy plan is a community-wide effort. Consequently, the planning process engaged a variety of local stakeholders to earn community buy-in for the REP vision and goals and build local capacity and motivation for action. Please refer to *Report 5 – Engagement* for a complete summary of the engagement activities undertaken to inform the REP. While implementation is a community-wide effort, municipal governments are recognized as key stakeholders. Municipal roles include convening/facilitating, policymaking, economic

development, leading by example and promoting energy and climate literacy. Please refer to Appendix 2 for a description of the role of the County of Essex and area municipalities in REP implementation, which include: convening and facilitating, policymaking, economic development, leading by example and promoting energy literacy and climate action.

1.5 Key Findings

The REP process began with collecting local data to understand how Essex County used energy in 2019, the GHG emissions associated with that energy use, and how much the community spent on energy. This was called the **Baseline**. The analytical process then considered what energy use, emissions and costs would be in 2041 if no actions were taken by the Essex County community. This was called the **Base Case**. Figure 2 summarizes the evidence-based process used to develop the REP.

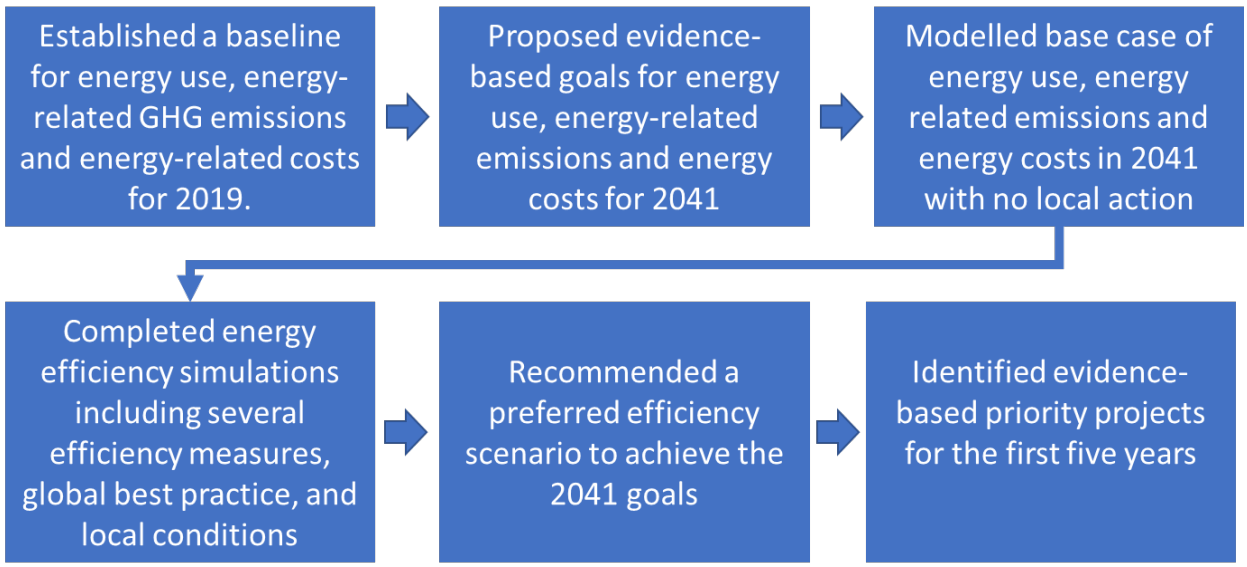

Figure 2: Evidenced-based process to develop the Essex County Regional Energy Plan.

Most of the Essex County community's energy costs come from transportation fuels. Most emissions come from natural gas, and most energy waste[2] costs come from electricity, confirming that the design of strategies needs to address our use of all three energy systems.

Three future-looking energy efficiency simulations considered several efficiency measures, global best practices, and local conditions. The Task Force recommended a preferred efficiency scenario to achieve the 2041 goals. This was called the **Efficiency Case**. This Efficiency Case informed the development of the 2041 strategy and the identification of 2021-2025 priority projects for the first five years found in Sections 2 and 3 of this report. Please refer to *Report 2 – Analytical*

[2] System losses (waste or unusable energy) include 1) conversion losses which occur when energy is transformed from one form to another (e.g., natural gas is used to create electricity) and 2) transmission and distribution losses which occur when energy is moved from one place to another (e.g., electricity is conveyed from generating facilities to end-users over transmission lines).

Results for a full summary of the analytical results. The key results of this analysis are summarized in Table 1.

Table 1: Summary of projected changes between 2019 and 2041 in Essex County for energy use, emissions, and energy costs.

2019 Baseline	2041 Base Case (No Action)
Essex County used 52 Terajoules of energy.	Growth in population and employment anticipated to increase energy use by 13% (21% by 2050).
Greenhouse, residential and transportation sectors' source energy consumption represented 38%, 22% and 20% of total consumption, respectively.	No material change is expected.
The greenhouse sector used 19.7 Terajoules of energy.	Sector growth is anticipated to increase energy use by 27%.
On average, homes and buildings in Essex County were approximately half as efficient as global benchmarks.	The gap is anticipated to widen against global best practices.
System energy losses represented 21% of the total source energy consumption in Essex County.	No material change is expected.
Municipal corporate energy use for facilities and fleets represented only 1.1% of the community's total source energy use.	No material change is expected.
On average, Essex County residents released 11.5 metric tonnes of GHG emissions each year.	Emissions are anticipated to reduce to 10.4 metric tonnes per capita due to a projected increase in the efficiency of new homes, buildings, and vehicles and a reduction in the carbon intensity of the natural gas grid.
Emissions were five times global best practice (three times global best practices if the greenhouse sector was removed from the comparison) and about eight (8) times higher than the Paris Agreement.	The gap is anticipated to widen against global best practices.
$820 million was spent on electricity, natural gas, gasoline, and diesel within the Essex County community.	Spending is estimated to increase from $1.9 billion (low-risk cost profile) to $3.1 billion (high-risk cost profile).
Most of the money spent on energy left the Essex County economy.	No material change is expected.

2. REP Strategy

The strategic framework identified at the outset of the process (see *Report 1 – Rationale and Scope*) was refined throughout the analytical and engagement processes to reflect the needs and opportunities unique to Essex County. The strategic framework is illustrated in Figure 3.

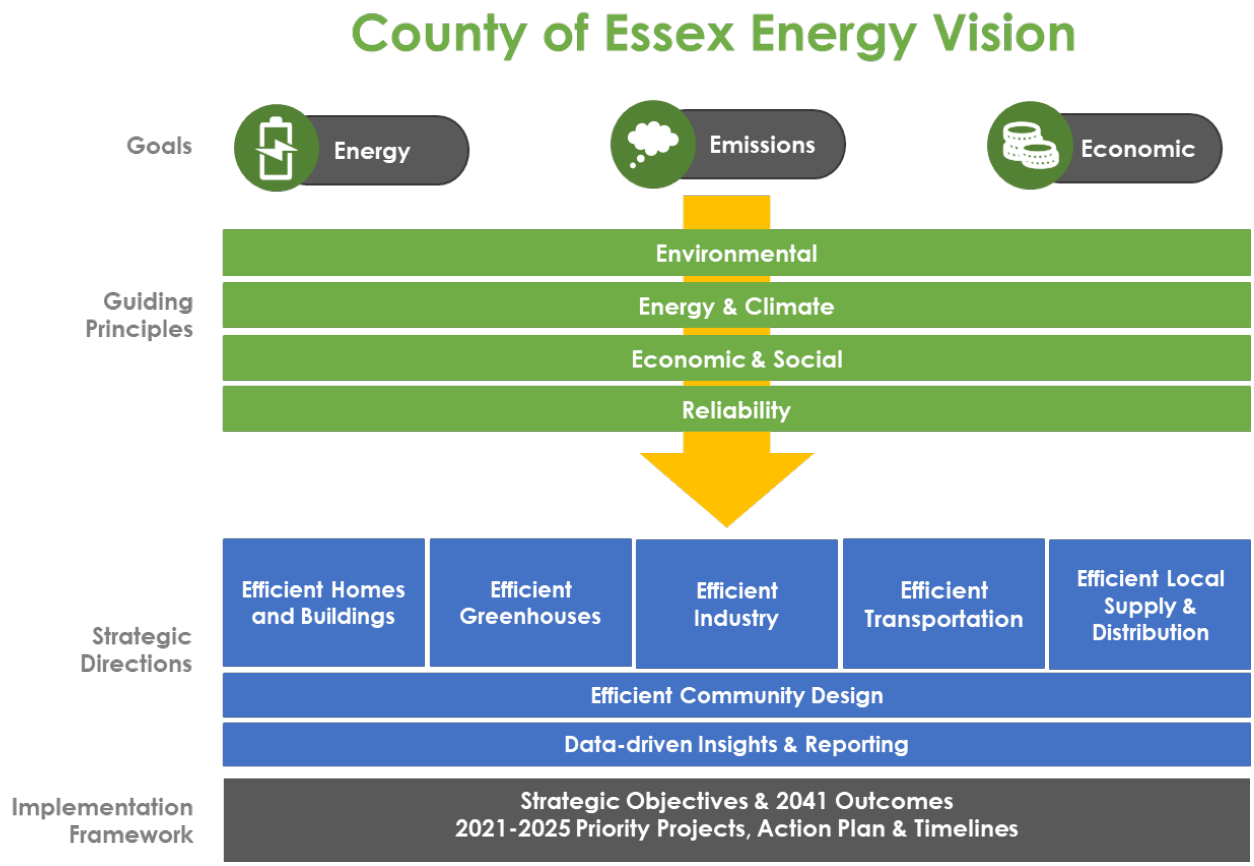

Figure 3: Final Strategic Framework for the Essex County Regional Energy Plan

2.1 Vision

The Task Force establishing the following vision:

Essex Region is an innovative, equitable and sustainable energy community that benefits the environment, economy, and quality of life for all.

2.2 Goals

The goals of the REP position the Essex Region in line with current best practices from around the world and based on an assessment of local data in 2019. The Task Force established goals that could be achieved with existing technologies, processes, and systems. However, much is anticipated to change between now and 2050. Global policy changes will influence markets. Technologies will evolve in response to those changing markets. A common characteristic of successful carbon transformations at a community level has been the identification of the key elements of their transformation and, over time, responding to political, technical and policy

changes by reordering the pace and priorities of those elements while remaining aligned with their Strategy. Consequently, regular (5-year) updates of the Strategy will create opportunities for course correction and accelerate Essex County towards achieving net-zero emissions by 2050. Even so, these goals represent a considerable transformation of Essex County's local energy system and market transformation.

The Task Force's winning aspiration is to shape Essex County's local energy future by creating the right conditions for public and private sector community action to achieve the following goals:

Energy efficiency

Increase energy efficiency by at least 50% by 2041.

Energy emissions

Reduce greenhouse gas emissions by at least 60% by 2041.

Economic return

Return at least $15 billion to the local economy by 2041 and create at least 1000 jobs by 2025.

2.3 Guiding Principles

A sustainable energy system balances the opportunity to benefit the environmental, economic, social, and cultural future of Essex County. Throughout the planning and engagement process, the Task Force identified several principles to guide sustainable decision-making. These principles have been considered in developing both this Strategy and the 2021-2025 priority projects and will also guide future decision-making and performance metrics.

Environmental

- Create a sustainable energy system that meets the needs of the present and future. The energy system creates a sustainable balance between the environmental, economic, social, and cultural needs of Essex Region.
- Recognize that the function, shape and layout of buildings, streets and environments support human health.

Energy and Climate

- Respect climate science and science-based decision making. Work towards carbon neutrality.
- Test strategies against global best practices in terms of energy efficiency and emissions reduction targets.

Economic and Social

- Ensure all energy-related investments have acceptable risk-adjusted returns.
- Ensure energy costs are competitive with comparable communities.
- Create high-quality employment and train youth to pursue energy and environmental careers.
- Create energy solutions that are equitable across all sectors and demographics, strive for accessibility and affordability in the design and communication of programs.

Reliability

- Design reliable and affordable energy systems that are flexible to meet user needs, climate changes and new technology options.
- Meet or exceed 2019 service level quality.

2.4 Strategic Directions

The Task Force approved seven Strategic Directions in support of the REP vision and goals. Energy efficiency is recognized as the first fuel of a sustainable energy system. Strategic Directions 1 through 4 focus primarily on end-use efficiency. Strategic Direction 5 focuses on system efficiency and switching to lower-carbon energy sources. Strategic Directions 6 and 7 support overall REP implementation. The Strategic Directions are found in Table 2, along with a brief rationale.

Table 2: REP Strategic Directions and rationale.

Strategic Direction	Rationale
1. Efficient homes & buildings	The existing residential sector in Essex County accounted for 22% of energy consumption, 15% of emissions and 27% of energy and water costs in 2019. Energy use per household in Essex County is approximately half as efficient as global benchmarks indicating the technical potential for reducing energy consumption, emissions, and costs. Energy use per m^2 in the non-residential sector is also half as efficient as global benchmarks.
2. Efficient greenhouses	The greenhouse sector accounts for 38% of the energy consumed in Essex County, underscoring the economic importance of this sector. The greenhouse sector accounts for 41% of emissions and 15% of energy and municipal water costs. The greenhouse sector is driven to enhance its bottom line with continuous improvement in energy management. Investments in energy management will ensure the ongoing global competitiveness of this vital sector to Essex County. While carbon sequestration does occur in the greenhouse sector, a full carbon life cycle analysis has not been completed for the purpose of the REP.
3. Efficient industry	Industrial activity is most often regulated and guided by broader global best practices and standards. They are driven to enhance their bottom line with continuous improvement in energy management. The industrial sector demonstrates higher energy performance relative to global best practices than other sectors in Essex County. There is an opportunity to share this energy management expertise within the community to promote world-class energy performance.
4. Efficient transportation	The transportation sector in Essex County accounted for 20% of energy consumption and almost a third of emissions in 2019.
5. Efficient local supply & distribution	Proven and cost-effective energy technologies provide opportunities to generate and distribute energy locally more efficiently, release fewer emissions, lower costs, and increase consumers' reliability.
6. Efficient community planning	International Energy Association (Annex 51) research indicates that successful community energy planning is only possible if energy policy is integrated with the entire land-use planning process. However, in many countries, including Canada, consideration of energy issues is missing in land-use planning processes and municipal decision making.

Strategic Direction	Rationale
7. Data-driven insights & reporting	The development of the REP has been a data-informed and evidence-based process. Data is critical to support effective and efficient implementation.

2.5 2041 Outcomes

The Efficiency Case identified Strategic Outcomes to achieve by 2041 for each Strategic Direction. Strategic Outcomes 1 to 18 reflect the measures that comprised the Efficiency Case. Strategic Outcomes 19 and 20 enable implementation. Please refer to *Report 3 – Recommendations* for additional commentary on the 2041 Outcomes.

Strategic Direction 1 – Efficient homes & buildings

Existing homes and buildings

1. Retrofit 80% of existing homes and 60% of existing buildings achieving an average 35% efficiency gain.
2. Require an energy performance label on all homes when sold or rented.

New homes and buildings

3. Build 30% of new homes and buildings more efficient than the prevailing Ontario Building Code (OBC) while ensuring remaining homes and buildings fully meet the OBC energy performance standards.

Strategic Direction 2 – Efficient greenhouses

Existing greenhouses

4. Retrofit 60% of existing greenhouses to achieve a 35% efficiency gain.

New greenhouses

5. Build 30% of new greenhouses more efficient than the prevailing industry norms while ensuring remaining greenhouses meet those industry norms.

Strategic Direction 3 – Efficient industry

6. Achieve a 35% efficiency gain within the industrial sector through the proliferation of best practices.

Strategic Direction 4 – Efficient transportation

Community planning

7. Reduce the average trip length of light-duty vehicles by 20%.

Transportation mode

8. Increase active transportation (walking and cycle) to 5% of passenger kilometres travelled.
9. Increase transit to 3% of passenger kilometres travelled.

Electrification

10. Increase electric passenger vehicles to 80%.[3]
11. Increase electric buses to 80%.
12. Increase electric heavy-duty vehicles to 10%.

Vehicle efficiency

13. Increase electric vehicle efficiency by 22%.
14. Increase gasoline and diesel vehicle efficiency by 50%.

Strategic Direction 5 – Efficient local supply & distribution

15. Supply 15% of electricity demand with locally installed solar PV.
16. Supply 10% of heating, cooling and hot water needs not served by district energy with solar thermal and heat pumps.
17. Supply 70% of existing and 90% of new target commercial, institutional and apartment buildings in higher density areas by district energy.
18. Supply 40% of greenhouses with on-site or near-site integrated energy supply including combined heat and power, local biogas and recovered carbon dioxide injection.

Strategic Direction 6 – Efficient community planning

19. Align all municipal roles in implementing the REP.[4]

Strategic Direction 7 – Data-driven insights & reporting

20. Create a "Smart Energy Region" and establish systems to enable data-driven insights and reporting.

Figure 3 illustrates Essex County's local energy system in 2041 as the community transitions to a more sustainable energy system and reduces energy use, emissions, and costs. The figure also shows the contribution of Strategic Outcomes 1 to 18 to achieving the REP goals.

[3] This includes light-duty commercial vehicles (e.g., pick-up trucks and smaller vans).
[4] Please refer to Appendix 2 for a full description of the role of the County of Essex and area municipalities in REP implementation.

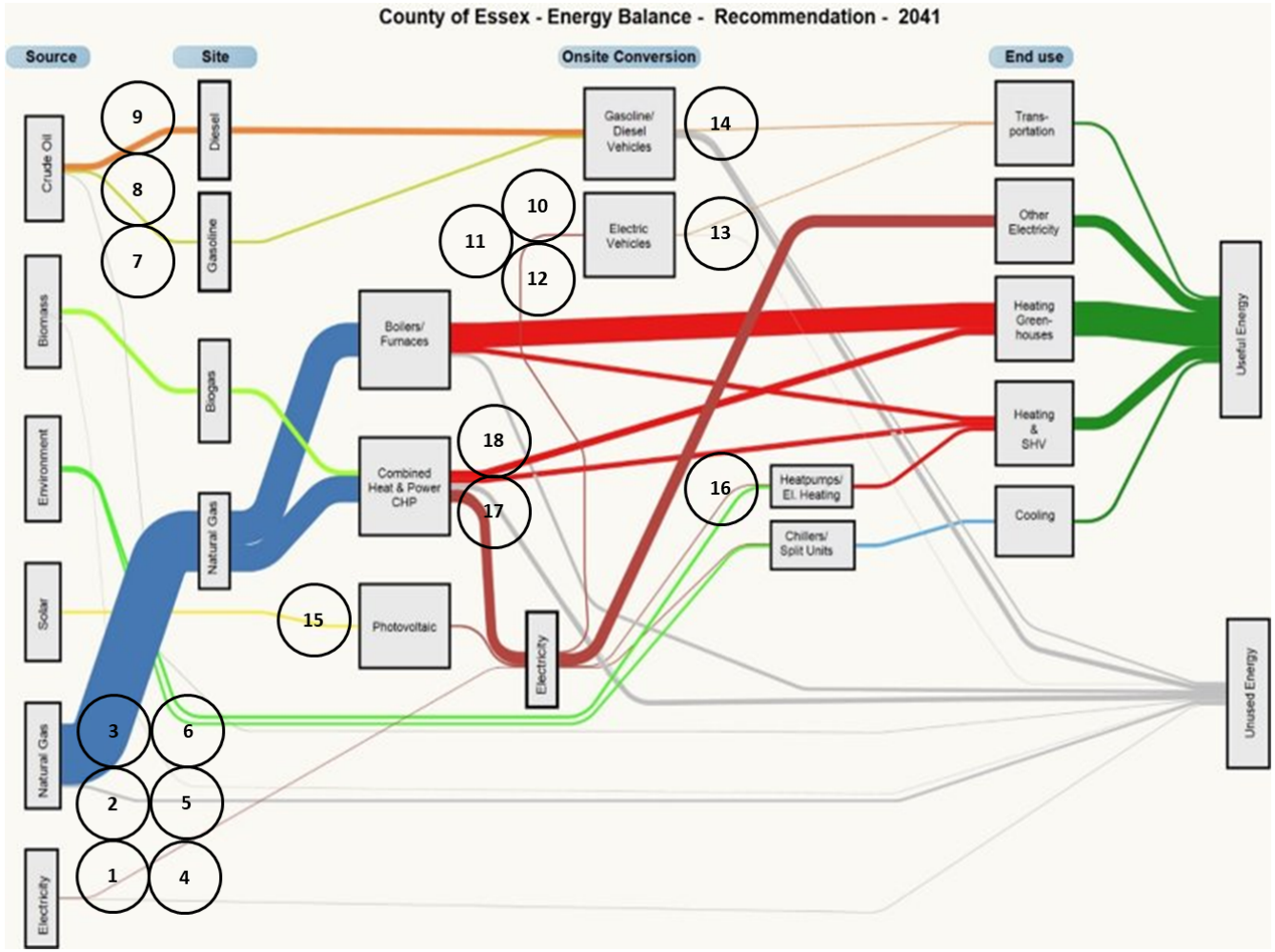

Figure 4: Schematic (Sankey Diagram) of Essex County's local energy in 2041 with energy flowing from source to site to end use (useful and unused). Numbering refers to 2041 Strategic Outcome measures identified to achieve the REP goals.

3. REP Priority Projects, Action Plan and Timeline

3.1 2021-2025 Priority Projects

The following priority projects have been identified for the first five years.

Governance

1. Form a governance and implementation structure to oversee REP implementation.
2. Form a Retrofit Entity.
3. Form a Greenhouse Growers Energy Services Co-operative.
4. Form industry best practice networks, including a network for the greenhouse sector.
5. Form a District Energy Entity

Policy Alignment

6. Align the County Economic and Employment Land Strategy with the REP.
7. Align the County Transportation Master Plan with the REP.
8. Align all Official Plans with REP.
9. Align all Municipal Corporate Energy & Emission Reductions Plans with the REP.
10. Develop enabling municipal policies and incentives to promote REP implementation.

Scale Projects

11. Develop an Integrated Energy Master Plan (IEMP) for a manufacturing cluster.
12. Develop an Integrated Energy Master Plan (IEMP) for a net-zero community.
13. Develop a Bioenergy Master Plan.
14. Develop a community-level E-mobility Strategy.

Education

15. Develop a program to raise energy and climate literacy and action.

Measurement, Reporting & Optimization

16. Create a "Smart Energy Region".

Table 3 describes the alignment of the priority projects with the Strategic Directions. Importantly, all strategic directions will be advanced during the first five years. It is recommended that the REP is updated every five years to respond to changes in climate policy, energy policy, technology, and global best practice and the opportunities they provide to accelerate the local energy transition.

Table 4 provides a rationale for each priority project.

Table 3: Alignment of 2021-2025 Priority Projects with REP Strategic Directions

Priority Project	Strategic Direction 1 Homes & Buildings	Strategic Direction 2 Greenhouses	Strategic Direction 3 Industry	Strategic Direction 4 Transportation	Strategic Direction 5 Supply & Distribution	Strategic Direction 6 Community Planning	Strategic Direction 7 Data & Reporting
1. Governance Oversight	✓	✓	✓	✓	✓	✓	✓
2. Retrofit Entity	✓				✓		
3. Greenhouse Co-operative		✓			✓		
4. Industry Networks		✓	✓				
5. District Energy Entity					✓	✓	
6. Economic Strategy		✓	✓			✓	
7. Transportation Master Plan				✓		✓	
8. Official Plans					✓	✓	
9. Municipal Corporate Plans	✓			✓	✓		✓
10. Enabling Policies	✓	✓	✓	✓	✓	✓	✓
11. Manufacturing Cluster			✓		✓	✓	
12. Net-zero Communities	✓			✓	✓	✓	
13. Bioenergy Master Plan		✓	✓		✓	✓	

Priority Project	Strategic Direction 1 Homes & Buildings	Strategic Direction 2 Greenhouses	Strategic Direction 3 Industry	Strategic Direction 4 Transportation	Strategic Direction 5 Supply & Distribution	Strategic Direction 6 Community Planning	Strategic Direction 7 Data & Reporting
14. E-mobility Project				✓		✓	
15. Energy Literacy	✓	✓	✓	✓	✓	✓	✓
16. Smart Energy Region	✓	✓	✓	✓	✓	✓	✓

Table 4: Rationale for the 2021-2025 REP priority projects.

Priority Project	Rationale and Description
1. Governance Oversight	The implementation of a regional energy plan is a community-wide effort. REP implementation will require ongoing oversight to ensure the REP strategy and priority projects are achieved. This community stakeholder body would oversee, coordinate, and report on overall progress to the community. In general, they would serve as a centre of excellence and/or clearinghouse for regional energy matters, champion REP implementation, promote and facilitate community actions to accelerate the transformation of the region's local energy system, and collaborate with businesses, developers, utilities, governments, institutions, non-profits, investors, and homeowners. Refer to Appendix 3 for additional information.
2. Retrofit Entity	Most existing homes and commercial and institutional buildings will still be in operation in 30 years.[5] Notwithstanding the technical potential for energy and emission reductions in Essex County's built environment, there are many barriers to achieving them. The current energy efficiency retrofit market for home and building owners and contractors is relatively unattractive. Historically, the market uptake of retrofit programs has been very low. From the contractor's perspective, the effort to prepare customized proposals is high, and the closing rate is low. Low volumes and the fact that every project is specific to each household means that material costs are expensive and performance guarantees are risky. From the home and building owners' perspective, obtaining understandable bids from various contractors is burdensome. They are responsible for finding their own sources of funding based on their individual credit rating. Finally, the low volumes result in retrofit costs that typically exceed the energy-saving value, even over many years. To address these challenges, an entity would be identified or established to offer standardized energy retrofits to homes and commercial and institutional buildings at high volumes. Contractors would benefit from increased project predictability, improved margins, and vastly higher project volumes. Home and building owners benefit from a simplified transaction, guaranteed pricing, lower-cost pre-financed retrofits and a simple billing and payment mechanism. Property-assessed financing would be offered to link the efficiency investment to the property, mitigating the home and building owner's risk that their payback period is longer than the time they remain (or intend

[5] Source: Natural Resources Canada

Priority Project	Rationale and Description
	to remain) in the home or building. Attractive interest rates and borrowing terms can be achieved for home and building owners while reducing or eliminating their up-front capital costs. Third-party financing would be attracted to underwrite the program. Solar photovoltaic systems, solar water heaters and heat pumps are predictable and proven renewable energy technologies. The proposed residential, commercial, and institutional retrofit programs offer a channel for promoting the uptake of renewable energy.
3. Greenhouse Co-operative	The agricultural sector has a long history of cooperative ventures. These have included cooperative regional and brand marketing, logistics, and procurement. In Canada, the USA and Europe, growers have created energy co-ops to obtain competitive, reliable energy supplies. The EU has seen a rapid growth of energy-related co-ops serving the clean and renewable energy, energy efficiency and energy supply needs of their members. This is an emerging movement driven by the competitive opportunity and wider social benefits of improving energy efficiency in the entire food chain. It is a cost-effective way for the growers to consolidate the energy efficiency and specific supply expertise needed for the greenhouse sector. The Netherlands' experience supporting the national goal to be carbon-neutral will be a valuable resource in shaping the structure, skills and offerings facilitated by this cooperative.
4. Industry Networks	Industrial activity is most often regulated and guided by broader global best practices and standards. Companies are driven to enhance their bottom line with continuous improvement in energy management. The industrial sector demonstrates higher energy performance relative to global best practices than other sectors in Essex County. There is an opportunity to share this energy management expertise within the community to promote world-class energy performance by establishing Communities of Practice. A Greenhouse Growers' Energy Focus Group is recommended.
5. District Energy Entity	Modern district energy is an internationally recognized pathway to decarbonize urban heating and cooling.[6] A district energy network is typically run as a thermal utility by a company that operates all the plants and networks, ensures service quality, and manages the heating and cooling services' metering and billing. The network allows for economies of scale since the generation of heat in a few larger plants is more efficient than having thousands of boilers, each heating their

[6] Source: http://www.districtenergyinitiative.org/

Priority Project	Rationale and Description
	building. It also enables valuable energy currently wasted in electricity generation, industrial and other processes to be cheaply captured and delivered to other consumers.
6. Economic Strategy	The County of Essex is updating the Economic County Economic and Employment Land Strategy in 2021, providing a timely opportunity to integrate the REP strategy and priority projects.
7. Transportation Master Plan	The County of Essex is updating the Transportation Master Plan in 2021, providing a timely opportunity to integrate the REP strategy and priority projects.
8. Official Plans	The County of Essex will begin the process of updating its Official Plan in 2021, providing a timely opportunity to integrate the REP strategy and priority projects. Lower-tier municipalities will also be initiating Official Plan Reviews over the course of the next several years.
9. Municipal Corporate Plans	All Ontario municipal governments are required to report annually on their energy use and emissions. Each municipality is required to have a Corporate Energy and Emissions Reduction Plan, which is to be updated every five years. The next update year is 2023, which provides an opportunity to align these plans with the REP strategy and priority projects.
10. Enabling Policies	Municipal governments approve policies and by-laws that guide the growth and development of the community, including housing and transportation systems. These policies and by-laws also inform traditional planning processes. Consequently, they have an important role in ensuring their policies and by-laws are aligned with the REP vision and goals. They can establish a policy framework that enables local stakeholders and product and service providers in the transitioning energy market.
11. Manufacturing Cluster	The Ontario Building Code establishes energy performance standards for individual buildings. Neighbourhood-scale Integrated Energy Master Plans (IEMPs) achieve a higher level of energy performance by addressing the entire energy chain starting from source energy (including the energy consumed in the production of source energy), the conversion of energy from one form to another and its distribution to and within a community, through to its end users within a community. The IEMP includes recommendations that optimize investments and other measures between end-use efficiency, energy distribution within the neighbourhood and energy supply choices, including fuel and renewable options. A scale project for a manufacturing subdivision will be identified for an IEMP.
12. Net-zero Communities	See above. Opportunities for Net-Zero Communities will be identified to promote the development of IEMPs.

Priority Project	Rationale and Description
13. Bioenergy Master Plan	The region has tens of thousands of tonnes of biosolids from municipal solid waste, water treatment residues, general agricultural, animal, and other residues, and greenhouse vines and crop residues. While a small amount is processed to create biogas and compost, the vast majority is destined for the Essex Landfill. This breaks down over time, creating landfill gas (methane), which is currently flared to mitigate its high global warming potential but with no useful energy recovery. The combination of biosolids and landfill gas has a substantial energy potential that is currently not realized. Creating a comprehensive, large scale economically viable plan to use this energy potential will require extensive collaboration between many public and private entities. The development of a Bioenergy Master Plan will be the first step in understanding this regional economic development opportunity.
14. E-mobility Strategy	Electric vehicles are cheaper to operate and maintain, reduce greenhouse gas emissions, and deliver better performance. The Federal government has identified electrification as a key to decarbonizing the transportation sector and has set ambitious targets for zero-emission vehicles. The targets include electric vehicles representing 10% of light-duty vehicle sales per year by 2025, 30% by 2030 and 100% by 2040. Access to localized and visible charging infrastructure is key to alleviating consumer concerns about where to charge their vehicle. There are municipal government opportunities to lead by example by electrifying municipal fleet and transit, installing electric vehicle charging stations at public facilities and incentivizing through convenient parking. Identification of a host community will be the first step, followed by developing an E-mobility Strategy and its implementation.
15. Energy & Climate Literacy	Successful REP implementation will be supported by an increase in energy and climate literacy in the community.
16. Create a "Smart Energy Region"	Measuring, communicating, and optimizing the results of the REP over decades will require a holistic approach to capturing and managing energy-related data from all sectors. This will facilitate maximizing the interrelated benefits between projects and sectors. A "Smart Energy Region" will identify areas where the energy and climate performance are exceeding or falling short of tracking targets and allow for appropriate adjustment to be recommended. In a "Smart Energy Region", energy and climate literacy will always be informed by clear evidence-based information.

3.2 2021-2025 Action Plan and Timeline

Table 5 provides a preliminary action plan and the timeline for each priority project.

Table 5: Preliminary action plan and the timeline for 2021-2025 REP priority projects.

Action		Lead	2021	2022	2023	2024	2025
Governance							
0	Approve REP	Task Force & County Council	■				
1.1	Establish governance and implementation structure	Task Force	■				
1.2	Report on progress	Governance body TBD			■		■
2.1	Complete Retrofit Business Case	TBC	■	■			
2.2	Form Retrofit Entity	TBD through Business Case		■			
2.3	Complete Retrofit Business Plan	Retrofit Entity		■	■		
2.4	Deliver Retrofit Program	Retrofit Entity			■	■	■
3.1	Complete Growers Energy Co-operative Business Case	WEEDC, OGVG (TBC)	■				
3.2	Form Co-operative	TBD through Business Case		■			
4	Develop industrial best practice networks	WEEDC, LIUNA, OGVG, WCA	■	■	■	■	■
5.1	Complete District Energy Utility Business Case	TBC	■	■			
5.2	Complete District Energy Utility Business Plan	TBD through Business Case		■	■		
5.3	Form District Energy Utility	TBD through Business Case			■		
Policy Alignment							
6	Align Economic and Employment Land Strategy	County of Essex		■			
7	Align Transportation Master Plan	County of Essex	■	■			
8	Align Official Plans and Secondary Plans	County & Lower Tier	■	■	■	■	■
9	Align Corporate Energy and Emission Reduction Plans	County & Lower Tier			■		
10	Develop enabling policies and programs	County & Lower Tier		■	■	■	■
Scale Projects							
11.1	Identify Manufacturing Cluster	County & Lower Tier; WEEDC	■				
11.2	Develop IEMP and implement	Private Sector Partners (TBC)		■	■	■	■
12.1	Identify Net-Zero Community	County of Essex	■	■			
12.2	Develop IEMP and implement	Private Sector Partners (TBC)		■	■	■	■
13.1	Form bio-energy partnership	TBD Private Sector	■				
13.2	Develop Master Plan and implement	Bio-energy Partnership		■	■	■	■
14.1	Identify host community for e-mobility project	County & Lower Tier	■				
14.2	Develop project planning and implement	County & Lower Tier		■	■	■	■
Education							
15	Develop program and implement	School Boards, Regional Comm. Group (TBC)	■	■	■	■	■
Measurement, Reporting & Optimization							
16.	Create a “Smart Energy Region”	WEEDC, St. Clair College, U of W	■	■	■	■	■

4. Final Thoughts

The Strategy outlined in this report establishes a pathway to reduce GHG emissions from 270 GJ per capita to 150 GJ per capita by 2050. In the fullness of time, global policy changes will influence markets, technologies will evolve in response to those changing markets, and communities like Essex County will be able to accelerate their transition to net zero.

The Strategy also put Essex County on a pathway to reduce source energy consumption from 2.2 million to 0.59 metric tonnes by 2050, resulting in a cumulative $28 billion in energy savings.

The Priority Projects are aligned with achieving the goals and objectives of the Strategy and establish the first steps on that pathway. Embedded in those first steps are actions that will identify the systems, capabilities and resources that will be required, as well as lay the next steps in the journey. As an example, the Business Case for the proposed retrofit entity would consider the skilled trades that would be required to deliver high volumes of retrofits to residents and businesses, how to address any potential gaps identified in the workforce and the opportunity for partnerships with local colleges.

The planning process to develop this Strategy was deliberate in engaging a broad cross-section of the community to earn buy-in, build capacity and motivate action. Successful implementation of the strategy and priority projects will rest equally on the effective engagement of key stakeholders.

The modelling undertaken to determine the potential cumulative savings from energy efficiency was conservative. The subsequent Supreme Court ruling on the constitutionality of the Federal carbon tax, along with announcements that the carbon tax will rise to $170 tonnes by 2030, only makes the economic case for implementing this Strategy more compelling for the residents and businesses of Essex County.

Appendix 1 – Definitions

Base Case – a "business-as-usual" future projection of energy use, emissions and/or costs.

Baseline – energy use, emissions and/or costs at a certain point in time.

Carbon Footprint – the amount of greenhouse gases released due to an activity, event, organization, person, etc., considering all relevant sources, sinks and storage, and expressed as carbon dioxide equivalent. An individual or organization's carbon footprint is the total amount of greenhouse gases released from supporting their needs, lifestyle, and daily life choices.

Carbon neutrality – achieving net-zero carbon dioxide emission by balancing carbon dioxide emissions with carbon dioxide removal or eliminating carbon emissions altogether.

Carbon sinks and sequestration – the capture and storage of carbon dioxide through means such as urban forestry, urban farming, green roofs, naturalization, and natural heritage conservation. This can result in other energy-related benefits like the ambient climatic effects that shade, solar energy reflection, and transpiration provide. Community energy planning often does not include measures that sequester carbon dioxide through green infrastructure.

Centralized energy systems – supply of energy through large-scale energy generation infrastructure that delivers energy via a vast distribution network, often far from the point of use.

Climate change – refers to changes in global climate patterns caused by the increasing level of atmospheric greenhouse gases arising from human activities.

Climate mitigation – decreasing the human-induced sources of climate change to reduce future impacts, such as minimizing the amount of greenhouse gas-emitting fossil fuels burned for energy or enhancing carbon sinks that store greenhouse gases.

Cogeneration or combined heat and power – is an energy-efficient technology that generates electricity and captures the heat that would otherwise be wasted to provide useful thermal energy such as steam or hot water. The heat can be used for space heating, cooling, domestic hot water, and industrial processes. Combined heat and power systems produce electricity and thermal energy from a single fuel source (e.g., natural gas, biomass). When electricity is generated in large-scale regional gas-fired power plants, as much as 60% of the energy value is lost (most as heat at the point of generation and the remainder during transmission). This systemic inefficiency can be addressed by generating electricity within the community and capturing the heat for use in a district energy system.

Community – in the context of community energy planning, the word "community" is meant to be inclusive of all citizens, groups and stakeholders that share the common attribute of being residents with a prescribed geographic boundary and direct and indirect consumers of energy.

Community energy planning – is a data-informed approach to understanding where and how energy is used and emissions released in a community to identify local opportunities and priorities for increasing energy efficiency, reducing greenhouse gas emissions and lowering energy costs.

Community Improvement Plan – is a land-use planning tool that allows a municipality to direct funds and implement policy initiatives toward a specifically defined project area.

Community Task Force – represents the team of community champions and principal advisors for a Community Energy Plan.

Conversion (energy transformation and losses) – the process of changing one type of energy to another (e.g., wind (mechanical energy) to electricity, electricity to heat (thermal energy). From energy source to site use, energy can undergo multiple transformations. During each energy conversion, an amount of energy is lost through heat (waste heat).

Decentralized/distributed energy systems – small-scale energy generation, operation, and/or energy storage used to provide an alternative to or enhance the traditional electric power grid.

Deep decarbonization – measures to significantly reduce and/or sequester carbon dioxide emissions, with an ultimate objective of zero carbon dioxide emissions.

District energy – district energy systems supply thermal energy (heating and/or cooling) to multiple buildings from a central plant or from several interconnected but distributed plants; thermal energy is conveyed with water through a close network of pre-insulated pipes to meet end users' need for cooling, heating, and domestic hot water. Historically, steam networks have been used and are still used in some older systems. A district energy system is comprised of three sub-systems which include the collection and/or generation of thermal energy, the distribution of that thermal energy from the plant(s) to end-users and the transfer of the thermal energy to the energy consumer. Modern DE systems facilitate creating a flexible portfolio of many kinds of low carbon heat sources. These include large solar-thermal arrays, biofuel boilers and CHP, sewage waste heat recovery from multiple sources, geothermal arrays, and even boilers using renewable electricity.

Efficiency Case – the Efficiency Case considers how different combinations of energy efficiency measures can impact the projection of a community's energy future.

End energy – the energy we use in our homes and buildings and industrial processes and transportation.

Energy efficiency – using less energy to perform the same task and eliminating energy waste.

Energy Performance Labels – measure and display the energy efficiency and environmental impact (e.g., greenhouse gas emissions) of an item, such as a home, building, appliances, etc.

Energy security – maintaining an adequate and resilient supply of energy (electricity, liquid fuel, and gas) while also addressing issues of affordability, accessibility, and reliability.

Energy transition – a major and long-term structural change in energy systems, often including a significant transformation in how energy is sourced, distributed, and/or utilized.

Framing Goals – framing goals are established at the beginning of the analytical process and are used to evaluate the performance of the Base Case and Efficiency Case simulations.

Gigajoule (GJ) – the gigajoule is a unit of measurement of energy. A gigajoule is 1 billion joules.

Global Best Practice – method or technique that is generally accepted as superior to the alternatives because it produces results that are superior to those achieved by other means. For community energy planning, global best practice is achieved in Northern Europe/Nordic countries, where municipalities have taken the lead in developing and implementing community energy plans that result in order of magnitude improvements in energy efficiency and over 50% reductions in per capita GHG emissions.

Greenfield – in an urban context, undeveloped land that is typically dominated by agriculture, open space, and/or natural heritage features.

Greenhouse gas – any gas that absorbs thermal radiation from the sun and emits it back into the earth's atmosphere, including water vapour, carbon dioxide, methane, nitrous oxide, and ozone. Without them, the average temperature at the surface of our planet would be around -18°C rather than 15°C.

Heat pumps - A heat pump is an electrical device that extracts heat from one place and transfers it to another. The heat pump is not a new technology; it has been used in Canada and around the world for decades. Refrigerators and air conditioners are both common examples of this technology. The heat pump cycle is fully reversible, and heat pumps can provide year-round climate control for the home – heating in winter and cooling and dehumidifying in summer. Since the ground and air outside always contain some heat, a heat pump can supply heat to a house even on cold winter days. In fact, air at –18°C contains about 85 percent of the heat it contained at 21°C. An air-source heat pump absorbs heat from the outdoor air in winter and rejects heat into outdoor air in summer. It is the most common type of heat pump found in Canadian homes at this time. However, ground-source (also called earth-energy, geothermal, geo-exchange) heat pumps, which draw heat from the ground or groundwater, are becoming more widely used, particularly in British Columbia, the Prairies and Central Canada.[7] Their application in practice is highly situational and may not always be the right solution for a home or building.

Integrated Energy Master Plan (IEMP) – the equivalent of a Community Energy Plan but developed at the scale of a portfolio of properties, or a neighbourhood or subdivision.

Modern energy transition – the current energy transition underway being driven by the decarbonization and the localized distribution of energy.

Near-net zero (NNZ) neighbourhood – near net-zero implies little, or no energy is drawn from the electricity grid or from pipelines, and little or no greenhouse gas emissions are released.

Project Working Team - comprised of municipal and utility representatives and the consulting team leading the analytical and engagement processes.

Regional Energy Plan – the equivalent of a Community Energy Plan but developed at the scale of a region.

[7] Source: https://www.nrcan.gc.ca/energy-efficiency/energy-star-canada/about-energy-star-canada/energy-star-announcements/publications/heating-cooling-heat-pump/what-heat-pump-and-how-does-it-work/6827

Resiliency - Resilient communities can absorb, recover, and prepare for future shocks (economic, environmental, social & institutional).

Site energy – considers the energy use of at the meter by end-users (e.g., homes, buildings, industry, and transportation).

Source energy – considers all energy flows from production to end-use.

Standardized retrofits – a consistent set of modifications to existing buildings designed to improve energy efficiency or decrease energy demand.

Thermal utility - A district energy network is typically run as a thermal utility by a company that operates all the plants and networks, ensures service quality, and manages the metering and billing of the heating and cooling services. The network allows for economies of scale since the generation of heat in a few larger plants is more efficient than having thousands of boilers, each heating their individual building. It also enables valuable energy currently wasted in electricity generation, industrial and other processes to be cheaply captured and delivered to other consumers.

Tonne – a tonne is a metric tonne (1,000 kilograms)

Transmission (of energy) – the movement or delivery of energy from its point of generation to the point of consumer/site use, and usually referring to the transmission of electricity across specialized cables or structures.

Urban Centre – an urban area with high population density.

Appendix 2 – Municipal Role

While the implementation of the Regional Energy Plan (REP) is a community-wide effort, municipal governments (including the County of Essex and member municipalities) have an essential role to play through:

1. Convening and Facilitating (REP planning and implementation)
2. Policy Making
3. Economic Development
4. Leading by Example
5. Promoting Energy Literacy and Climate Action

1. Convening and Facilitating

Municipal governments have the moral authority to convene stakeholders to establish a vision and goals for their community. A critical success factor in implementing broad system-wide change is municipal endorsement and support of the vision and goals.

- **Convene stakeholders and facilitate the planning process to develop an energy and emissions reduction plan and regular 5-year plan updates.**

The County of Essex and lower-tier municipalities have demonstrated leadership through regional collaboration to address climate change. The development of a REP is the next step on this climate action journey.

2. Policy Making

Municipal governments approve policies and by-laws that guide the community's growth and development, including housing and transportation systems. These policies and by-laws also inform traditional planning processes. Consequently, they have an important role in ensuring their policies and by-laws are aligned with the vision and goals of the plan. They can establish a policy framework that enables local stakeholders and product and service providers in the transitioning energy market.

Land-use and development planning policy

- **Integrate energy and GHG emissions reduction targets and supportive policies and actions across official plans, secondary plans, zoning by-laws and design guidelines.**
- **Ensure policy alignment between regional and area municipalities.**

The County of Essex is updating its Official Plan in 2021. Many lower tier municipalities are also undergoing Official Plan Review processes. This provides a timely opportunity to integrate the REP into local Official Plans while encouraging policy alignment between upper and lower tier municipalities. Five of the lower tier municipalities are also undertaking secondary plans of large greenfield areas which offers an excellent opportunity to integrate energy and climate goals and draw on emerging municipal practice in Ontario.

- **Create policies that allow for and streamline the development of district energy systems to create local energy supply (e.g., district energy area mapping, district energy design guidelines, solar hot water and solar power installation, micro-utility partnerships with local electricity distributors and developers).**

The County of Essex has an opportunity to accelerate the adoption of district energy systems and the creation of local energy supply and support REP implementation by identifying potential district energy areas in the Official Plan as well creating an enabling policy environment.

- **Create policies that allow for and streamline electric vehicle charging station installation.**

The County of Essex and lower-tier municipalities have an opportunity to create an enabling policy environment to accelerate the adoption of electric vehicles to support REP implementation.

- **Create policies that allow for and streamline the development of net-zero communities.**
- **Require appropriate studies (e.g., integrated energy master plans) to implement energy and emissions policies and actions to be submitted in support of development applications and approvals.**

In support of the REP, the County of Essex and low-tier municipalities have an opportunity to promote scale net-zero or near-net zero communities through the creation of an enabling policy environment and by engaging with the development industry during the development application process. This includes developing policies promoting the development of Integrated Energy Master Plans (IEMPs) to support the business case for net-zero communities.

- **Ensure municipal council support throughout all stages of the process, including policy development, strategic investments, and direction for neighbourhood design (e.g., net-zero).**

County Council approval of the REP and its integration into municipal planning tools is an important first step on this journey.

Zoning By-laws

- **Align the Zoning By-law with Official Plan energy and climate policies.**

Development Design Guidelines

- **Consider the development of performance indicators and targets for new development and the development application process.**

In support of the REP, the County of Essex can consider following the lead of other Ontario municipalities (e.g., Peel Region, Toronto, and Whitby) who have developed guidelines to achieve certain thresholds for energy efficiency, renewable energy, and integrated energy systems such as district energy.

Infrastructure Planning

Infrastructure is a significant driver of GHG emissions. Infrastructure decisions can lock in emission profiles and consumption patterns for decades.

- **Ensure investments in municipal infrastructure are aligned with REP implementation.**

The County of Essex and lower-tier municipalities can review capital plans to support REP implementation.

Financial Tools

- **Investigate financial incentives in support of achieving policies and regulations.**

The County of Essex and lower-tier municipalities have an opportunity to consider the application of Community Improvement Plans (CIPs) and Tax Increment Financing (TIF) to promote REP implementation. Local Improvement Charges (LICs) should be considered as a financing tool to support the REP strategy for improving residential and building energy performance.

Building Inspection

While Ontario municipal governments do not control their building codes, they can advocate for change with the Ontario government. Municipal governments can ensure the energy performance standards of the current code are met. This can include hiring a Resource Conservation Inspector in Building Services to strengthen the enforcement of the current Ontario Building Code energy standards and enhance internal alignment on energy policy implementation.

- **Advocate for higher energy standards in the Ontario Building Code (OBC).**
- **Ensure OBC energy performance standards are fully met.**

Transportation planning policy

- **Integrate transportation energy and emissions targets and supportive policies and action into existing transportation, active transportation, transportation demand management and transit strategies and master plans.**

The County of Essex Transportation Master Plan will be updated in 2021 providing a timely opportunity to integrate the REP. There is also an opportunity to developing an e-mobility strategy for a host community.

3. Economic Development

Through their economic development departments and organizations, municipal governments can play a key role in retaining existing businesses and attracting new businesses through the plan's value-added opportunities.

- **Integrate the REP into regional economic development strategies.**
- **Partner with community stakeholders to achieve the REP economic goals and non-municipal priority projects.**
- **Partner with local educational institutions to develop local skills and trades for REP implementation.**
- **Participate in communities of practice to share energy management best practices and expertise.**

The County of Essex is updating its Economic Development and Employment Land Strategy in 2021 providing a timely opportunity to integrate the REP.

The County of Essex has an opportunity to partner with the members of the Community Task Force to develop a community entity with a mandate to promote REP implementation.

In support of the REP, the County of Essex and lower-tier municipalities have an opportunity to partner with community stakeholders to develop business cases for a:

- Residential and Non-Residential Energy Efficiency Retrofit Entity to achieve deep energy savings in homes and buildings.
- District Energy Utility to distribute thermal energy to homes and buildings
- Windsor-Essex Bioenergy Master Plan to promote fuel switching from fossil fuels to local biomass.

4. Leading by Example

Municipal operations (e.g., facilities, fleet, transit) represent a small percentage of the community's energy use. However, they have an important role in demonstrating corporate leadership in the community.

- **Align corporate and energy emission reduction plans with the REP.**
- **Assign implementation to a specific department/division that will administer responsibility for each municipal priority project and facilitate interdepartmental collaboration, funding, communication, education, and performance reporting.**
- **Identify staff resourcing gaps and allocate resources to ensure municipal priority projects are completed.**
- **Align city strategies and master plans with the REP.**
- **Incorporate an energy and emission reduction framework into the decision-making framework for all programs and projects.**
- **Ensure capital expenditures contribute to REP implementation.**
- **Develop a strategy to secure external funding and partners to supplement municipal resources.**

The County of Essex and area municipalities can align their corporate energy and emissions reductions plans with the REP including:

- Integrated Energy Master Plans for priority municipal facilities (including distributed and thermal energy options)
- green fleet and equipment strategies,
- transit and municipal fleet electrification
- public electric charging stations at municipal facilities
- transparent energy performance labelling and reporting

5. Energy and Climate Literacy

Municipal governments have many opportunities to engage with residents and business owners to promote community energy planning benefits and raise energy literacy.

- **Develop and comprehensive communication strategy that highlights the benefits of implementing energy and emission reduction policies.**

The County of Essex and lower-tier municipalities have an opportunity to build the successful work of the Windsor-Essex Climate Change Collaborative.

Appendix 3: Governance Oversight

The implementation of the REP is recognized as a community-wide effort. However, maintaining community momentum beyond the initial planning process is challenging. Barriers to implementation are less about technology or even cost but arise from an existing system that prefers conventional modes of energy generation and distribution within prevailing regulatory systems, utility business models, and energy markets.

Establishing an intermediary organization to fulfill this mandate is an emerging social innovation to address this challenge. Intermediary organizations "institutionalize collaborations and serve to catalyze and coordinate the implementation of community energy plans".[8] Intermediary organizations do not deliver services or products. Rather, they work between organizations that do. They serve as a backbone for collaboration across government, NGOs, businesses, and the public.

Intermediary organizations are well used in other sectors but are new to the community energy planning sector. Examples of existing and emerging intermediary organizations in Ontario include:

- Our Energy Guelph (incorporated not-for-profit)
- Waterloo Region Community Energy (unincorporated network)
- Future Energy Oakville (incorporating as a non-profit)
- Brampton Centre for Community Energy Transformation (incorporating as a non-profit)

The general purpose of such an independent entity, regardless of governance structure, would be to lead and champion the community-wide implementation of the REP Strategy to achieve the REP 2041 energy efficiency, emissions, and economic goals.

The core functions of the entity would generally include:

- **Program Planning and Delivery** – plan, coordinate, and identify priority project leads; facilitate connections with post-secondary institutions and local industry to support workforce development; support partnership with the City of Windsor to promote scale in priority project implementation; encourage policy and program alignment between County and lower-tier municipalities; promote a climate lens in all decision making.
- **Community Engagement and Communications** – build a network of cross-sector stakeholders and partners; serve as a connector to existing programs that support implementation; educate the community about the REP and its goals and benefits.
- **Transparency and Accountability** – identify key performance metrics related to management and administration of priority projects.
- **Management** – anticipate and plan for future resourcing on an as-need basis.

[8] Source: https://questcanada.org/aire-protocol/cross-sector-implementation/

Some of the advantages of an independent entity include:

- Municipal risk mitigation (i.e., the municipality is positioned as a partner rather than the primary implementer)[9]
- Access to resourcing and funding (i.e., other government sources and the private sector).
- Political resilience.
- Resonance as a community voice and neutral convenor.
- Flexibility to define procurement practices.
- Whole systems approach as a shared governance model.
- Platform for partnerships to harness the knowledge, expertise, and other resources of a broad range of organizations.
- Forum for innovation.

The challenges of establishing an independent entity include:

- Securing seed funding and in-kind services
- Identifying an appropriate governance model
- Establishing a sustainable, long-term financial model
- Building legitimacy with stakeholders and the public

[9] Refer to Appendix 2 for a description of the municipal implementation role.