

Economic development through transformative community energy planning

A toolkit for municipalities
everywhere



ENERGIZE
BRIDGEWATER

SSG

**SUSTAINABILITY
SOLUTIONSGROUP**

**town of
BRIDGEWATER**

Acknowledgements

PREPARED BY SSG

FOR THE TOWN OF BRIDGEWATER



SSG is a specialist consultancy for the development and implementation of municipal community energy and emissions plans. We design and implement pathways to a low-carbon future, pathways that also increase energy efficiency, support economic development, improve health and quality of life and advance equity. Recognizing that communities are the vanguard of climate action, we develop city policies and actions, designing new decision-making methods and applying sophisticated modelling and processes, an integrated approach that supports multiple community objectives and enhances democracy. ssg.coop

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Introduction

In the summer of 2016, the Town of Bridgewater launched Energize Bridgewater, a planning and engagement program for the community. Energize Bridgewater involved citizens, businesses and other entities in the development of a detailed pathway to a low-carbon future for the community as a whole. This toolkit provides insights from the Energize Bridgewater process that can be applied to other municipalities in Nova Scotia and across Canada.

More than 170 municipalities across Canada have developed community energy plans.¹ The Town of Bridgewater's efforts are distinct for multiple reasons: the level of ambition for a small community, the focus on economic development, the extent of community engagement, and the application of detailed modelling to identify an investment pathway. These characteristics were enabled by key ingredients in the Town including sustained political support that has spanned several mayors and councils, a level of literacy with respect to energy including the recognition that energy is a multi-faceted economic development opportunity, a high level of trust and support by community members and businesses, and leadership by municipal staff and elected officials.

Energize Bridgewater incorporates many of the components that are associated with community energy plans and/or climate action plans as undertaken by municipalities across Canada but the most important variation is that the Town of Bridgewater focused on economic development instead of greenhouse gas emissions reductions. The resulting plan is therefore titled a community energy investment plan (CEIP) and this shift in focus broadens the potential base of support to all of those who have an interest in the economic conditions of the community.

In addition to laying the groundwork for what is a major economic development undertaking, Bridgewater's approach to the CEIP is also good planning. Many municipal decisions taken today on infrastructure and land-use planning will have social, environmental and economic impacts for one hundred years or more. These decisions lead to "lock-in", a situation where past decisions limit options and increase costs for future decisions. The Town of Bridgewater's planning process seeks to understand the long-term implications by developing future scenarios of population, buildings and infrastructure and to ensure these considerations factor into current decisions.

This report identifies lessons and insights from Energize Bridgewater to provide practical guidance to other municipalities seeking to advance community energy and emissions planning and economic development.

1 Littlejohn, D. and Laszlo, R. (2016). National report on community energy plan implementation. Community energy planning getting to implementation in Canada. Retrieved from: <http://gettingtoimplementation.ca/wp-content/uploads/2015/02/National-Report-on-CEP-Implementation.pdf>

Drivers & opportunities

Energy is a substantial economic opportunity for every community in Canada, which is bolstered by the following political, economic and social trends:

GOVERNMENTS ARE INCREASINGLY SUPPORTING LOW OR ZERO CARBON OPTIONS: Federal and provincial policies are increasingly oriented to supporting low or zero-carbon options for the energy system. This means decreased funding or incentives for fossil fuel industries and increased programs and support for renewable energy and conservation activities.

RENEWABLE ENERGY IS INCREASINGLY ACCESSIBLE: It is relatively easy and becoming easier for households and businesses to generate their own energy. Dwellings in Nova Scotia are already adding solar photovoltaic systems onto their homes with a net-metering arrangement with Nova Scotia Power. As the cost of solar systems decline, solar PV systems will become increasingly accessible. New financing mechanisms are also reducing barriers.

COSTING CARBON CREATES NEW OPPORTUNITIES: There is a growing market for carbon reductions and because of its relatively high carbon intensity, there are opportunities for low cost carbon reductions. Households in Bridgewater use more fuel and dirtier fuels than other jurisdictions in Canada, because the dominant heating fuel is fuel oil and the building stock is older and therefore less efficient.

ENERGY STORAGE TECHNOLOGIES ARE CHANGING THE GRID: Energy storage technologies such as batteries are already available for houses and businesses and as the costs continue to decline, number of installations will increase rapidly.

NEW MODELS OF ELECTRIC VEHICLES ARE AVAILABLE EVERY DAY: Consumers are already purchasing electric vehicles in Nova Scotia and as the purchase price decreases and the range increases, there are compelling reasons as to why the number of electric vehicles on the road will increase exponentially.

HEATING SYSTEMS REMAIN A CHALLENGE, BUT NEW OPTIONS ARE COMING ONLINE: Heat pumps continue to improve in efficiency and have been widely adopted in Bridgewater already. District energy systems are gaining traction as a more efficient system for providing heating and cooling to communities with the flexibility to add or subtract technologies as required.

MICROGRIDS ARE BREAKING DOWN THE BARRIERS BETWEEN HEATING AND ELECTRICITY: Microgrids include electricity generation from solar or combined heat and power, converting excess power to hot water which is then used for heating, with electric batteries, and other technologies.

NEW FINANCING STRATEGIES ARE INCREASING PARTICIPATION: Municipalities and financial institutions are offering mechanisms that reduce financial barriers to energy retrofits and renewable technologies. Bridgewater's retrofit financing program is a good example.

Municipalities around the world are creating innovative policies and strategies to support or engage with these trends while advancing local priorities such as reducing air pollution, stimulating economic development and new employment opportunities, increasing the livability of the community, and improving affordability.



A transformational approach

Early energy and emissions planning efforts by municipalities in Canada sought to reduce energy incrementally; these were typically low priority projects without broad community engagement. Subsequent projects used improved technical methods and involved targeted consultation. Bridgewater's approach represents current best practice, focusing on a transformational plan that is integrated and comprehensive and is as much an economic development strategy as an energy or climate plan.

Bridgewater's planning process considered implications not only for energy and emissions but also for finance, transportation, building design, and other aspects.² The transformational approach is technically more complex, with sufficient rigor to support private and public sector investments that will achieve deep emissions reductions and related co-benefits.

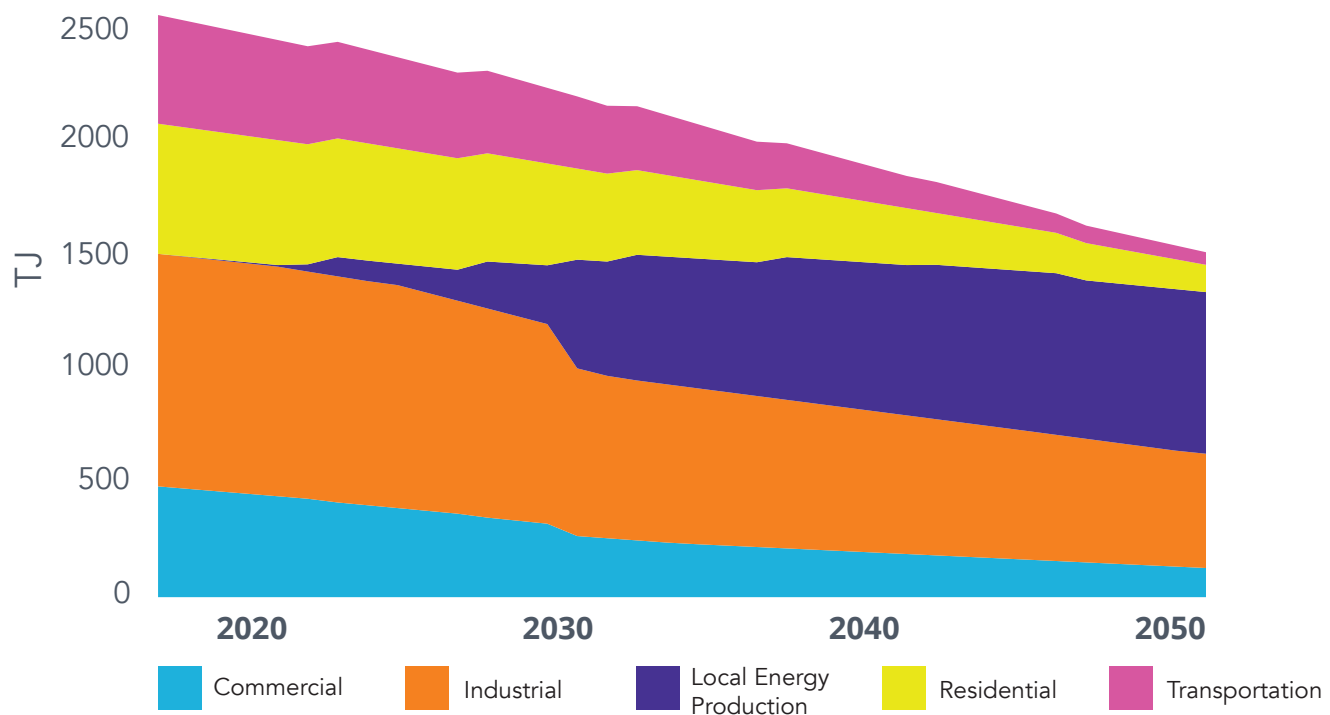


Figure 1. Bridgewater's energy transformation includes major efficiency gains, as reflected in the yellow, blue and pink and extensive new sources of energy generation, in purple.

² For details of the outcomes that Bridgewater identified for the project, see Appendix 1.

Category	Incremental Transformational			
Time introduced	1990 2017			
Generation	Incremental Advanced			
Align with Official Plans	Incremental Full integration of land use policy			
Engage ment	X	Targeted stakeholders	Open houses	Broad-based online and in-person engagement process
Technical approach	GHG inventory	Population-driven projections	Spreadsheet-based GHG model	Integrated spatial, energy systems, financial model
Actions	Long lists of actions, no analysis of impacts	Actions targeted to impact area	Analysis of GHG impacts for each action	Analysis of GHG, energy and financial impacts
Co-benefits	X	X	Discussion	Analysis of impacts on health, equity, economic development
Municipal input/ governance	Advocacy tool of the sustainability office	Responsibility of the sustainability office	Multid-departmental engagement	Over-arching policy integrated into all plans & budget. Active GHG partnerships in the community
Investment ready*	X	X	X	Yes/possible

*provides an indication of where and how to invest in the low-carbon future

Figure 2. Community energy planning 2.0: A focus on transformation

Four elements

Drawing on the experience of the Town of Bridgewater, there are four elements that contribute to the development of a transformational community energy plan.

1. **CONTINUITY OF LEADERSHIP:** Ensuring consistent staffing and ongoing support from the Mayor and Council facilitates the development of organisational knowledge and capacity and the development of networks over time. A champion, ideally a staff member, is critical to the development and implementation of the plan.

BRIDGEWATER'S APPROACH: The Town of Bridgewater has had a sustainability planner for more than a decade. This position is also supported by internships and temporary staff.

2. **FOCUS ON ECONOMIC DEVELOPMENT:** Energy is a major expenditure for municipalities, businesses and households. There are many opportunities to reduce this cost and create opportunities for new businesses and employment, some of which can only be unlocked by the municipality.

BRIDGEWATER'S APPROACH: Instead of completing a community energy or climate action plan, the Town of Bridgewater elected to undertake a community energy investment plan, implying that that investment in energy-related activities would generate environment, social and economic returns.

3. **DEEP TECHNICAL ANALYSIS:** Detailed modelling facilitates the development of a plan that can be implemented and the identification of financial and other resources needed. Scenarios can be used to explore the long-term implications of different policies and actions by the municipality.

BRIDGEWATER'S APPROACH: The Town worked with SSG to develop a model of energy, GHG emissions and finance for the Town. Scenarios for different investment pathways were developed for the Town as a whole. Additional analysis of specific building types was undertaken to provide roadmaps for retrofits.

4. **COMMUNITY ENGAGEMENT:** A transformational climate action plan necessitates the involvement of a wide range of organisations and broad support and participation from the community.

BRIDGEWATER'S APPROACH: Community engagement included a series of workshops that helped to inform the development of the CEIP, a small grants programs for innovative projects and a peer-learning process for a group of businesses and organisations. The Town also completed a Culture and Behaviour Change Assessment to identify messages on energy that resonate locally and are effective at stimulating behaviour change.

Deep & sustained engagement

A major effort such as the implementation of a low-carbon community transition requires grassroots citizen involvement and financial investment (municipality + private sector). Active citizen, household, business and investor engagement is the best route to successful energy and emissions action implementation.

The most effective energy and emissions plans reflect local circumstances and local knowledge. There are a variety of potential objectives in performing public engagement in the development of community energy and emissions plans, including:

- > Informing and educating the public, and building public capacity;
- > Collecting public knowledge and opinion inputs;
- > Engaging and empowering citizens in civic democratic processes;
- > Identifying community champions and influencers; and,
- > Developing public support for plans and their implementation.

As part of planning preparation, the project team should identify the stakeholders, organizations, and public to engage at different points in the process, and how best to engage them.

Consideration must be made for what inputs are needed to develop the plan (e.g. local context, data, etc.), who has useful knowledge and experience to contribute (e.g. expert climate change knowledge), who will be responsible or involved in parts of plan implementation (e.g. community partners), and who will be affected by plan implementation (e.g. members of the public).

Community energy and emissions plans comprise many types of plan elements: climate change mitigation and adaptation, environmental conservation, social equity, economic development, land-use, transportation, waste management, etc. As such, the processes of developing the plans has the potential to engage the vast majority of citizens in some manner. There are several engagement activities to choose from in order to reach a variety of citizens, stakeholders, community groups, businesses, and institutions.

Table 1. Example public engagement activities.³

Engagement category	Tactics	Sample Use	Bridgewater's approach	Bridgewater signature initiatives
Inform	Planning project website	A project website can house project background information, local climate issue information, ways to engage in the planning process, reports and project updates, a schedule of events, social media feeds, etc. It can be updated throughout the planning process.	A project website was created for Energize Bridgewater.	Energize Bridgewater website
	Web newsletter and social media posts	Distribution of project information, updates, and invitations in web newsletter format to municipal and partner contacts. The web newsletter can be emailed, posted to social media, and hosted on the project website.	Social media accounts were maintained on facebook and twitter	Energize Bridgewater website
	Media coverage	Project promotion through municipal staff interviews with TV/ radio, press releases	Media releases were issued for events and at key milestones.	Energize Bridgewater website

³ This table is based on the IAP2 Spectrum of Public Participation.

Engagement category	Tactics	Sample Use	Bridgewater's approach	Bridgewater signature initiatives
Consult	Focus groups	Engage representatives of a public sector to provide feedback on how to address an issue or respond to a plan proposal.	Focus groups were held for consulting with the rental housing sector, for identifying community energy values and cultural narratives, and at the end of the planning process for project evaluation.	Discovery Fair Culture & Behaviour Change Assessment
	Surveys and polls	Post a multiple-choice survey on social media and the project website to gather feedback on a project issue.	Surveys were issued for various purposes including data collection, to identify key messages, to identify actions and for evaluation. In some cases different audiences were targeted.	Energize Bridgewater website Culture & Behaviour Change Assessment
	Public meetings	Host a public meeting with small group discussions to identify the issues the plan should address.	Four public meetings/workshops were held as part of the planning process	Community Consultation & Crowdsourcing, Living Energy Laboratory Energize Bridgewater website
Involve	Workshops	Host a public workshop to develop policy ideas or discuss proposed policy.		
	Interactive websites	Use interactive websites to visualize and generate feedback on policy options.	The website included crowd-sourcing capabilities.	
	Interactive meetings	Host meetings in which participants play key presentation and leadership roles.	Small groups undertook specific exercises in the workshops.	

Engagement category	Tactics	Sample Use	Bridgewater's approach	Bridgewater signature initiatives
Collaborate	Participatory decision-making process	Host a decision-making process – such as voting – to determine the direction of a plan, the content of a policy, or the manner of a policy's implementation.	One workshop involved a prioritization process to identify which actions were most in the public benefit.	Energy Partnership
	Advisory committee	Establish an advisory committee with public and stakeholder membership that directs the planning process and has democratic inputs to the plan.	An advisory committee guided the planning process.	Energy Partnership
Empower	Participatory budgeting process	Host a process that enables the public to determine how budget is allocated amongst plan actions.	A small grant program was created to support innovative projects.	Energy Partnership
	Citizen decision committees	Establish citizen decision committees that have – through democratic processes – the power to decide on plan content, policy direction, actions to be taken, and plan implementation mechanics.		

BRIDGEWATER'S APPROACH: Five signature activities were at the heart of Energize Bridgewater's engagement activities. The messaging and framing of these activities was informed by a Culture and Behavior Change Assessment, which used surveys, literature review and focus groups to identify which messages were most relevant for the Town.

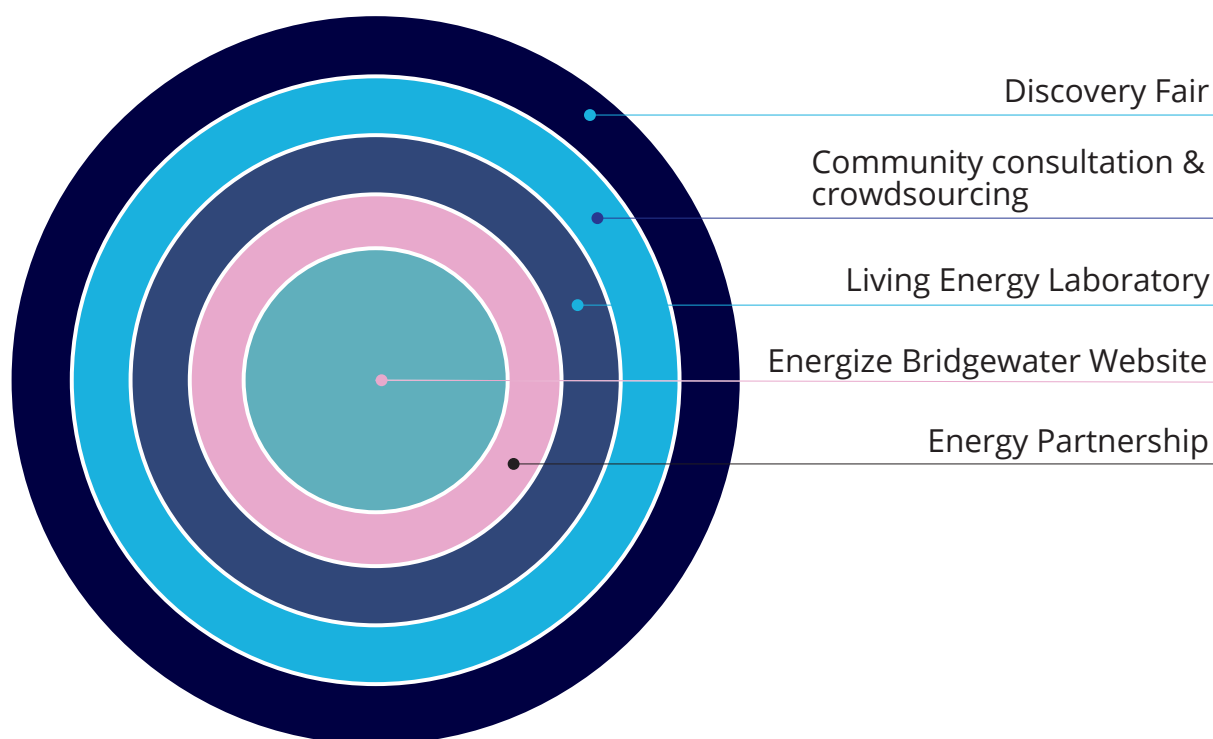


Figure 3. The elements of Bridgewater’s engagement activities, in order of increasing number of people involved

- A. **ENERGIZE BRIDGEWATER WEBSITE (ENERGIZEBRIDGEWATER.CA)**—a versatile and information-rich website. The website houses all important project information, especially the community engagement activities and involved parties. The website has been used to host community energy surveys and polls, and will host to the Community Energy Investment Plan and its implementation reporting. Tied to the website are an active dedicated project Facebook feed and occasional use of Twitter.
- B. **BRIDGEWATER ENERGY PARTNERSHIP**—a learning and action program for local businesses and organizations that encourages innovative energy solutions and increases the collective knowledge of energy sustainability. Launched in September 2016, Energy Partners held holding bi-monthly workshops to learn about energy issues and how to address them in practical ways. They were also consulted with on a regular basis to assist with the development of the Community Energy Investment Plan. At its peak, there were 18 Partners (10 businesses, 8 organizations) enrolled in the program. Members are identified on the Energize Bridgewater website.
- C. **LIVING ENERGY LABORATORY**—a project incubator for innovative energy projects that demonstrate practical approaches to achieving a local energy economy. Starting off with the Community Energy Centre as a demonstration project in the summer and fall of 2016, the program put out a call for proposals in the winter of 2017. In February 2017, a panel of judges welcomed 10 local projects into the initiative, and awarded \$5,429 in cash and other project resources to the participants. The hands-on projects and ventures were planned and managed by individuals, businesses, and organizations both for their own benefit, as well as to offer a teaching tool for the entire community to learn from. Projects are identified on the Energize Bridgewater website. The program is stewarded and supported by the members of the Bridgewater Energy Partnership,

and the Living Energy Laboratory Grant Program is hosted by the Bluenose Coastal Action Foundation, a local ENGO.

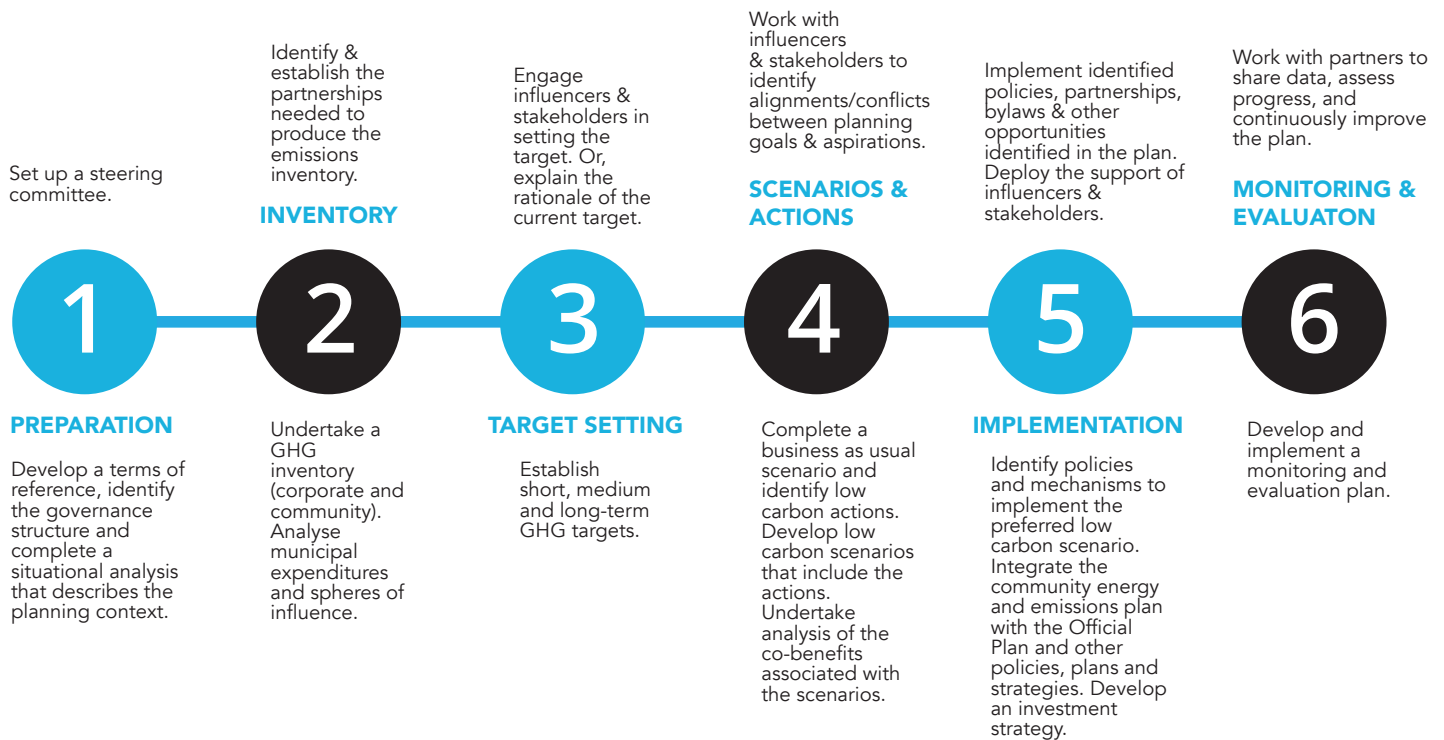
- D. **COMMUNITY CONSULTATION & CROWDSOURCING**—achieved through a variety of modalities, including community meetings and workshops, focus groups, online polls and surveys, door-to-door surveys, public events, and individual correspondence and meetings with specific stakeholders. Engagement activities fed into the Culture and Behaviour Change Assessment and the Energy & Economic Research & Planning work. Bluenose Coastal Action Foundation, a local ENGO, and summer students were retained to assist with these efforts. These efforts were complemented by consultation activities through the Energy Partnership and Living Energy Laboratory programs.
- E. **ENERGIZE NOVA SCOTIA: DISCOVERY FAIR**—a large community education and engagement event held on October 27 and 28, 2017. The event celebrated the community's energy vision and successes, and provided a final opportunity for the community to provide feedback on the draft Community Energy Investment Plan. The event featured keynote speaker Jeff Dahn, renowned battery technology researcher at Dalhousie University, and hosted education and technology stations and workshops.



The planning process

The following section describes a process to develop and implement a community energy and emissions plan. This process is derived from a Guideline for Ontario municipalities and is applicable throughout Canada; Bridgewater's approach to these tasks is described below.

TECHNICAL PROCESS



COMMUNITY PROCESS

Stage 1: Preparation

This stage of the project requires extensive due diligence, coordination with staff and Council, fundraising, and other aspects.

Stage 1: Preparation		
Tasks	Description	Bridgewater's approach
1.1 Terms of reference/project charter	Describes the objectives of the process, who will be involved and how, the schedule and the outcomes.	The program design was articulated both for an application for Federation of Canadian Municipalities and for an RFP to secure a planning consultant (see appendix).
1.2 Governance and leadership	Provides guidance on the approach to encourage leadership and different governance/organizational structures to support plan development.	A clear governance structure was outlined as part of the FCM application. Critical to the process was a staff member who was dedicated to shepherding the entire process for almost two years with 0.5 FTE. An additional staff member at 0.25 FTE coordinated community engagement and students and interns provided additional support, including more detailed research or engagement activities. A steering committee acted as the community steward of the process and ultimate responsibility for approving the plan as well as any financial considerations lay with Council.
1.3 Situational analysis	Describes the current planning context, including: <ul style="list-style-type: none"> » Climate and ecosystem » Demographics » Policies by other levels of government » Policies and strategies of the local government, » Built environment characteristics » Transportation systems » Other relevant factors 	The planning consultant prepared a situational analysis that described the context of Bridgewater.
Engagement activities		<ul style="list-style-type: none"> » Steering Team formed » Core Energy Partners convened

BRIDGEWATER'S APPROACH: The Town of Bridgewater's vision and objectives were intended to address a wide range of community objectives, beyond reducing GHG emissions and conserving energy, with a particular emphasis on economic development; the vision also established the level of ambition.

Bridgewater's Vision

BY 2050, BRIDGEWATER'S GREEN, SELF-SUPPORTIVE ECONOMY WILL BE SECURELY POWERED BY CLEAN AND EFFICIENT ENERGY SYSTEMS. THE COMMUNITY'S CONSCIOUS INVESTMENTS INTO ENERGY INFRASTRUCTURE, EQUIPMENT, TRAINING, AND EDUCATION WILL MAKE ENERGY AFFORDABLE AND ACCESSIBLE FOR ALL MEMBERS OF THE COMMUNITY, AND CONTRIBUTE TO OUR TOWN'S PROSPERITY AND RESILIENCE IN THE FACE OF A CHANGING CLIMATE AND WORLD.

~BRIDGEWATER'S ENERGY SHIFT VISION

This plan provides a pathway for the community of Bridgewater to a low-carbon future—the Energy Shift. The pathway was developed by first conducting a detailed quantitative analysis of current conditions and what might happen if not additional policies are introduced—the business as usual scenario. Detailed technical analysis and consultation with energy experts has allowed for the development of an ambitious and fully-costed new 'energy pathway' for the community.

The development of the pathway was guided by community values, which are aligned with the sustainable community vision established by the ICSP, as follows:

- > **CLEAN**—our energy systems should not pollute the environment or harm our health. This plan focuses on switching the community away from fossil fuels and onto renewable sources, such that by 2050 its GHG emissions are reduced by 80% compared to 2011 emissions levels.
- > **EFFICIENT**—our use of energy should minimize needless consumption and waste. This plan's primary strategy is to reduce wasted energy especially from heating systems and commercial / industrial processes, which together account for well over half of the community's energy consumption. Energy conservation also relates to our personal and organizational behavior, and requires education and training to change awareness and habits.
- > **SECURE**—our energy systems must be resilient to economic shocks and climatic disruptions. This plan prioritizes solutions that lower our dependency on externally-sourced energy by driving down energy needs, increasing local energy generation and ownership, and increasing the skill and capacity of the community to innovate its own energy solutions.
- > **AFFORDABLE**—energy should be affordable for all people, businesses, and organizations in our community. By participating in the actions in this plan, overall energy costs will decline substantially in all sectors and for all residents. The actions in this plan have been developed to maximize economic viability, and offer significant local investment and economic development opportunities.

Empowering Bridgewater: A cultural perspective

The process of change and transformation can have major impacts on the culture of a community as people seize opportunities and adjust expectations and behaviours. As part of the Energize Bridgewater project, an analysis of current best practices related to culture and behavior change programming were analysed. The research was informed by a literature review, a series of community workshops and a survey in order to identify the current perception of energy in Bridgewater, barriers and motivators to action, and strategies to empower citizens. Key findings of the report are as follows:

1. All households, businesses, and organizations feel strongly that energy use in the Town today is convenient, important to the economy, in need of change, and making them feel helpless and that they have no control.
2. There is a high degree of uncertainty regarding the characteristics of the energy system in the Town today; educational programs therefore need to be enhanced.
3. Having a common goal or vision is a strong motivator for residents, businesses and organizations. The common desirable characteristics of an energy system identified through this work are: clean, efficient, secure, and affordable.
4. Residents, businesses and organizations of Bridgewater care more about ensuring that the energy system is clean and efficient than others in the community think they do. Community members should be made aware of the strong desire for a clean and efficient energy system so that community members are aware that these objectives are more broadly shared than they think.
5. Any actions, programs or initiatives in Energize Bridgewater should:
 - a. Build on the current belief that energy is good for the economy;
 - b. Indicate that the initiative or program represents a shift in the way things are currently done;
 - c. Increase the influence of participants, and the Town in general over their energy consumption;
 - d. Result in the energy system becoming cleaner and more efficient, secure, and affordable; and
 - e. Continue to make energy use as convenient as possible.

Source: Adapted from Indeco Strategic Consulting (2017). Culture and behaviour change assessment report.

The Energy Shift: Partnering with the Mi'Kmaq

The Town of Bridgewater is located in Sipekne'katik (the Wild Potato Area) on the unceded territory of the Mi'Kmaq. This land contains abundant natural resources, including windy coastlines, powerful tides, and ample forests. In managing these resources, Nova Scotia's Indigenous people have long practiced the concept of Netukulimk, the responsible use of the natural bounty provided by the Creator without jeopardizing the integrity and productivity of these resources. Renewable energy projects, like wind farms or solar fields around Bridgewater, offer the opportunity to practice Netukulimk while promoting economic development and greenhouse gas reductions.

The Town of Bridgewater reached out to local Indigenous groups with requests to incorporate their teachings into the Community Energy Investment Plan (CEIP), as well as to establish a long term relationship centered around dialogue, understanding, and partnership building. The Town consulted with local and regional experts on how to facilitate Indigenous project participation in a way that aligns with First Nations mandates, and bringing First Nations representation into Energize Bridgewater events. Next steps include engaging with the Mi'kmaw Conservation Group (MCG) and the Acadia First Nation at Gold River to identify the challenges for participation and how to overcome these through meaningful and supportive partnership.



Stage 2: Inventories

In this stage the project begins in earnest. Modelling is used to analyse subsequent scenarios and the development of a detailed inventory is used as a basis for that modelling. Key community engagement activities are also launched during this stage.

Stage 2: Inventories		
Tasks	Description	Bridgewater's approach
2.1 Data request	The GHG inventory is a snapshot of energy use and emissions production, and their driving factors. The year for which the most complete and reliable data is available can be set as the 'baseline year'.	The consultant team issued a data request that addressed population, land-use, building stocks, energy use, transportation system and other aspects.
2.2 Data collection		The data collection process took nearly five months and involved liaising with various town departments, utilities, and the tax assessment authority.
2.3 Energy and emissions inventory		An energy and emissions inventory was built in a model for the year 2011 in order to correspond with the latest census data.
2.4 Spheres of influence	An analysis of the GHG emissions or activities that the local government can influence.	The Steering committee and Energy Partnership involved key organisations and individuals from the community and beyond such as industries, utilities, institutions and others.
2.5 Financial inventory	An analysis of the GHG impact of existing expenditures by the local government and other entities in the community.	This task was not completed as part of the project.
Engagement activities		<ul style="list-style-type: none"> » Energy Partnership launched » Living Energy Laboratory launched » Community consultations » Culture & Behaviour Change Assessment completed

BRIDGEWATER'S APPROACH: A detailed representation of the built environment was created in an energy, emissions and finance model. The model tracks the impact of population and land-use on energy consumption, energy systems, buildings, transportation systems and waste. The following datasets were used in preparing inventories of energy and emission for the Town:

- > The Town's GIS data, allowing for property-by-property as well as transportation energy modelling
- > The Property Valuation Services Corporation (PVSC) data set for all Town properties, providing information on every building in the community
- > Community data from Statistics Canada (e.g. population)

- > Home energy audit information from Efficiency Nova Scotia for all Bridgewater properties that have undergone energy assessments in the past 5 years – used to develop a set of locally-calibrated “archetypes” for residences (34 distinct archetypes in total).
- > Online and door-to-door energy surveys completed by Bridgewater residents, businesses, and organizations. Includes data from all municipal facilities and large facilities in the community.
- > Community-wide fuel and energy sales data from power, fuel oil, and automotive fuel suppliers
- > Data from an energy model of the province, CanESS, calibrated to the National Energy Board
- > Technical and economic data from public and proprietary sources for all the energy interventions described in this plan (e.g. solar, heat pumps, transit systems, etc.)

Stage 3: Target setting

There are different approaches to setting targets; most targets focus on GHG emissions reductions, however, others have focused on 100% renewable energy, which is considered a more positive vision, as opposed to reducing GHG emissions. Other approaches include aligning with provincial or national targets, recommendations of scientists, which are typically an 80% reduction over a base year, net zero emissions and a science-based target calculation, which involves the application of specific methods.

Stage 3: Target setting		
Tasks	Description	Bridgewater’s approach
3.1 Set an emissions reduction target for the community	Establishment of a GHG target consistent with best practices.	The Town adopted the target of an 80% reduction in GHG emissions by 2050 compared to the 2011 baseline year, which is consistent with recommendations from the Intergovernmental Panel on Climate Change.
Engagement activities		» Energy & Economic Analysis started

Stage 4: Scenario development

The scenarios development phase involves identifying actions and constructing possible future scenarios for the municipality. A preferred scenario is then selected which is the basis of implementation planning.

Stage 4: Scenarios development		
Tasks	Description	Bridgewater's approach
4.1 Actions identification	Develop a catalogue of potential municipal actions.	Actions were identified based on the situational analysis, best practices from other municipalities, and the GHG inventory/baseline.
4.2 Alternative scenarios development	Bundle the actions into alternative energy and emissions future scenarios. Land-use patterns need to be one dimension of the scenarios.	Various scenarios were developed including a business as usual scenario and low-carbon moderate and ambitious scenarios. Various population scenarios were also developed that evaluated population growth, economic decline and rural to urban immigration.
4.3 Modelling	Quantitatively evaluate the emissions impact of the scenarios versus the reference scenario.	The consultant built a detailed stocks and flows model of the Town.
4.4 Analysis of co-benefits	Evaluate the impact of the scenarios and actions on a range of co-benefits.	A detailed financial/economic analysis of the preferred scenario was completed including return on investment, marginal abatement cost and other aspects.
4.5 Preferred scenario	Select a preferred scenario	One scenario was identified that achieved the 80% reduction target.
4.6 Prioritization of actions	Prioritize the actions within the scenario.	A community engagement process was used to prioritise actions.
Engagement activities		<ul style="list-style-type: none"> » Living Energy Laboratory projects evaluated » Community consultations part 2 » Draft strategies & actions developed » Energy & Economic Analysis completed

A scenario is a comprehensive representation of a possible future. Scenarios help decision-makers explore cause and effect; for example, envisioning high, low or no population growth or an economic upturn or downturn. A scenario emphasizes the process of change rather than a particular point in the future. Scenarios need to address all the aspects that influence the urban energy system including assumptions on population, land-use, buildings, energy systems, transportation systems, etc. in a coherent package.

In community energy and emissions planning, scenarios are used to explore different types of actions and to identify a low-carbon trajectory. The application of scenarios provides a framework for bundling the actions into a coherent picture of the future.

Table 2. The application of scenarios in energy and emissions planning.

Use	Description	Sample Questions
Decision-making	"Future proof" a portfolio of activities and proposed actions.	What is the impact of changing climate on heating and cooling loads and potential district energy locations?
Prioritization	Determine where and how to allocate infrastructure investments.	Where should future development be located to support frequent transit?
Testing	GHG reduction impacts of taking actions to differing extents.	How much money can be saved by retrofitting the building stock in the community?
Oversight	Add perspective and insight to transportation, land-use planning or other planning processes.	How do different land-use patterns impact total vehicle kilometres travelled?
Integrative	Explore the impact of different interventions on the community as a whole.	What is the impact of introducing heat pumps and electric vehicles on total electricity demand?
Generative	Generate innovative ideas, programs, products, and services.	What mechanisms can be used to support retrofits in low income households?
Timing	Understand the timing of interventions.	What is the optimal order of actions to maximize benefits to the local community?
Scanning	Monitor for major technological or technical shifts.	How do autonomous vehicles impact land-use planning and GHG emissions?
Anticipatory	Prepare for major changes in the future.	Where should district energy systems be located?
Engaging	Support engagement around complicated and difficult issues in a safe (hypothetical) way.	What are the implications of scenarios on employment and energy costs?

BRIDGEWATER'S APPROACH: A Business-as-usual (BAU) scenario was developed for the time period from 2012 to 2050 to illustrate energy use and GHG emissions for the Town of Bridgewater, if no additional policies, actions or strategies are implemented. The BAU reflects plans, policies, programs and/or projects at the municipal, provincial and federal levels that have been funded (i.e. provincial electric vehicle incentives) or are currently being implemented (i.e. federal fuel efficiency regulations).

Through community engagement and technical analysis, an Energy Shift scenario was developed which consists of 19 actions. Detailed modelling was used to identify the specific assumptions associated with the actions and the impacts of the actions on energy, GHG emissions and finances.

Table 3. Actions in the Energy Shift.

BUILDINGS	
New buildings—buildings codes & standards	
1	New dwellings are net zero energy
2	New commercial buildings are passive house
Existing buildings—retrofitting	
3	Retrofit old homes (prior to 1980)
4	Retrofit new homes (after 1980)
5	Retrofit commercial buildings
6	Increase the efficiency of industrial operations
Renewable energy generation (on-site, building scale)	
7	Install heat pumps in homes
8	Install heat pumps in businesses
9	Install solar PV on homes and businesses
10	Solar hot water heating on homes and businesses
ENERGY GENERATION	
Low or zero carbon energy generation (community scale)	
11	Ground-mounted solar PV
12	Develop a district energy system in the downtown
13	Home or business-based energy storage
14	Run of river hydro system
15	Wind turbines
TRANSPORT	
16	Expand and electrify transit
17	Increase/improve cycling & walking infrastructure
18	Electrify personal vehicles
19	Electrify commercial vehicles

Modelling of the scenario revealed a pathway that achieved the 80% GHG emissions target, as illustrated in Figure 4.

Future Greenhouse Gas Emissions

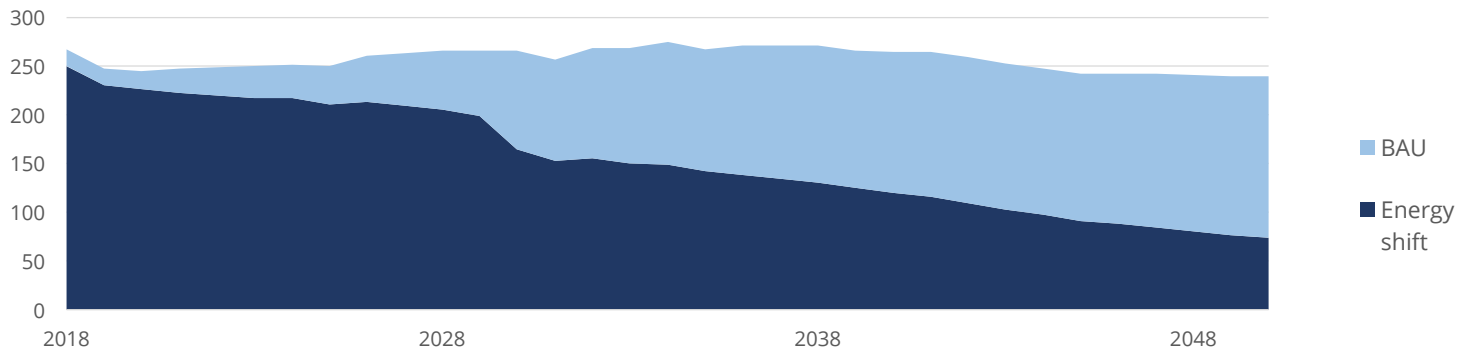


Figure 4. Energy shift emissions reductions, 2016-2050.

Detailed financial analysis was completed of the preferred scenarios and the actions were bundled into three strategies: 1. Energy efficient buildings; 2. New community scale energy systems; and 3. Clean and active transportation systems. The financial analysis included expenditures on capital, operations and maintenance, carbon price, return on investment, marginal abatement cost, and employment impacts.

Clean Energy Capital Investments

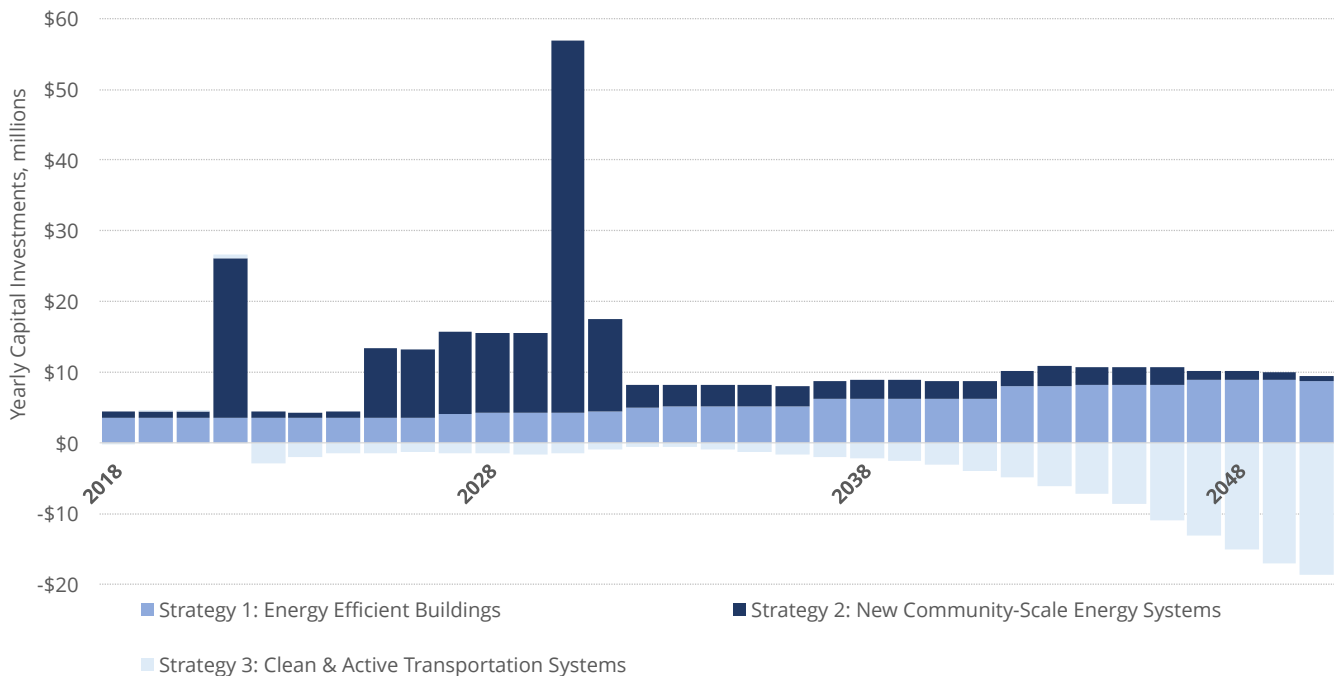


Figure 5. An investment schedule for the Energy Shift Pathway

Dollars invested in renewable energy and building retrofits will mostly go to tradespeople, equipment suppliers, contractors, and associated services such as engineering, legal, and financial. The analysis indicates that these investments will generate new employment locally. For example, every million dollars invested:

- > ...is expected to generate 9 person-years of employment when spent on building retrofits.
- > ...is expected to generate 8 person-years of employment when spent on community-scale energy systems.
- > ...is expected to generate 3 person-years of employment when spent on new vehicles.

On the negative side of the jobs equation, automotive trades may see a net decline in jobs due to the arrival of autonomous vehicles, which require less maintenance than the internal combustion engine.

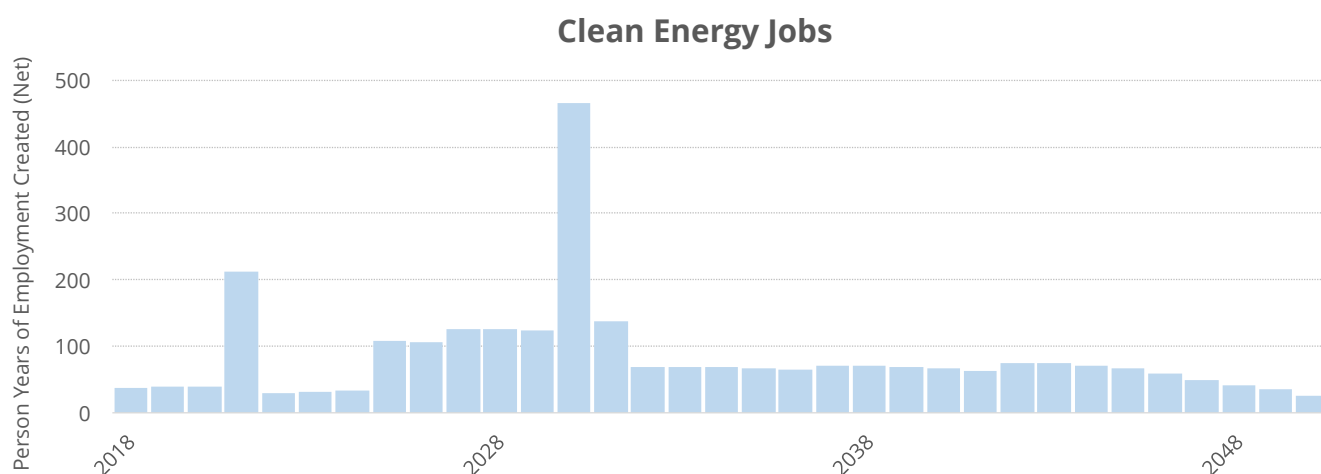


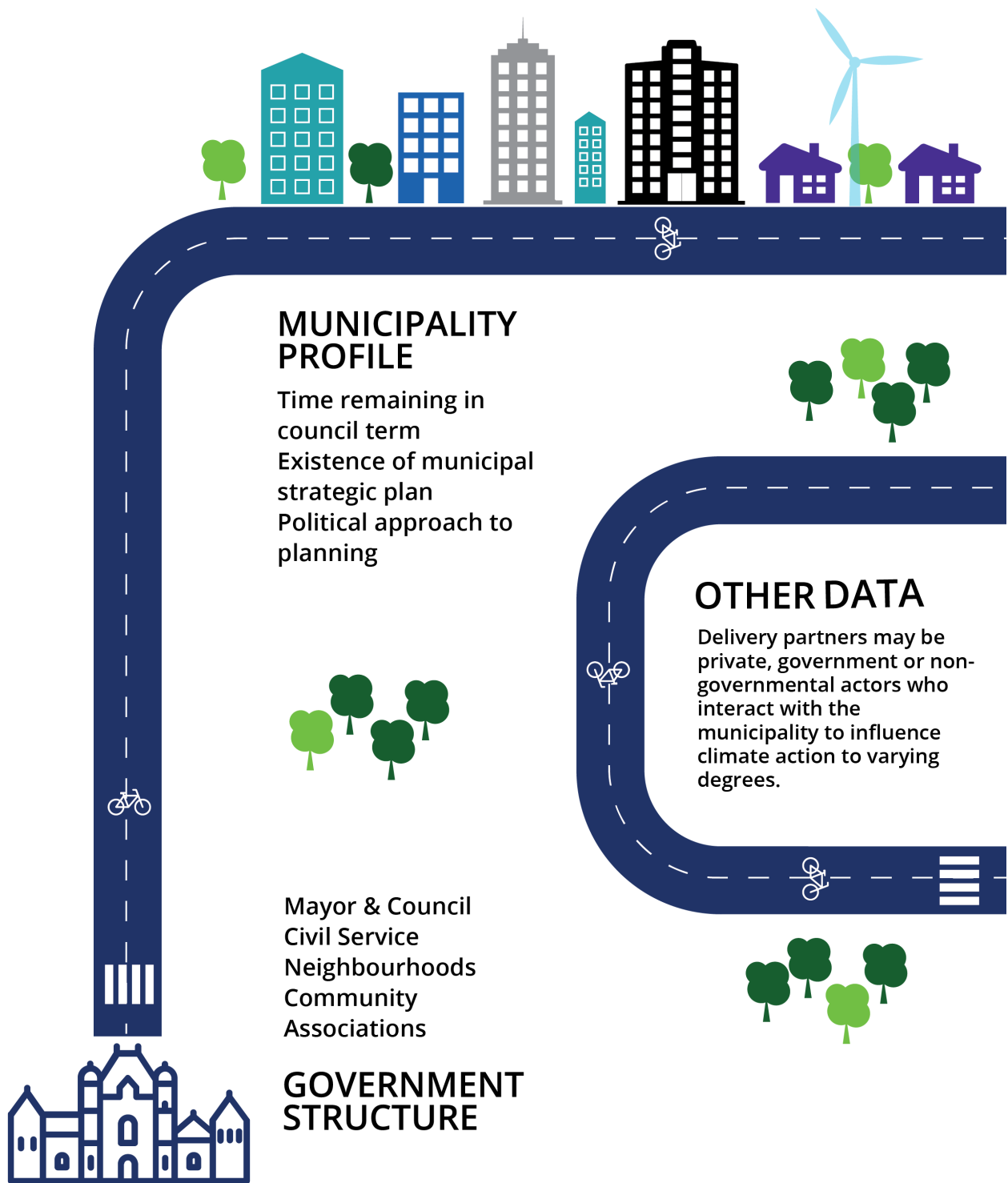
Figure 6. Impact on the Energy Shift on employment

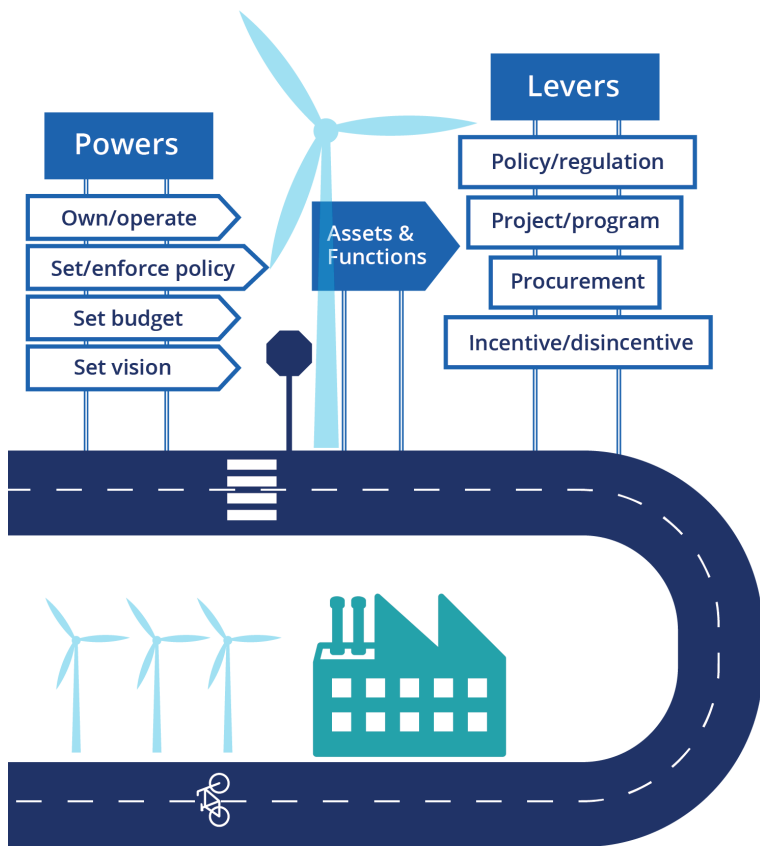
The impact of different land-use and population trajectories was evaluated on the Energy Shift scenario. The Town of Bridgewater developed two different land-use scenarios that were tested against the Energy Shift Scenario:

1. **Large-scale regional decline:** All of the South Shore, including Bridgewater, rapidly lose population and development opportunities are significantly stunted by the middle of the century. Population experiences -10% population growth (decline) over 20 years, and no net non-residential growth by 2050.
2. **Regional retreat into small urban centres:** in this scenario, Bridgewater's growth is significantly accelerated not due to its business success, but to the loss of viability in living and doing business in the surrounding rural areas. Rural residents, unable to keep up with rapidly rising cost of living, energy, and transportation, and the continued erosion of rural services and infrastructure, retreat into the nearest available town, which sees a strong increase in population growth. Increased business activity follows suit. The Town experiences 30% population growth (mostly older demographics) and 25% non-residential growth by 2050.

The results of the analysis indicate that Bridgewater's GHG emissions profile is sensitive to population growth and highly sensitive to population decline. A significant increase in population

COMMUNITY ENERGY & EMISSIONS IMPLEMENTATION PATHWAY





DELIVERY PATHWAYS

STAGES ON THE URBAN GOVERNANCE PATHWAY

The political context & governance structure describe the municipality from an institutional perspective. The assets, such as road infrastructure and functions, such as promoting economic development, are what the municipality exercises power over. The levers deliver change. The delivery partners may help the municipality take further action than it could alone. All result in the delivery of the low carbon pathway.

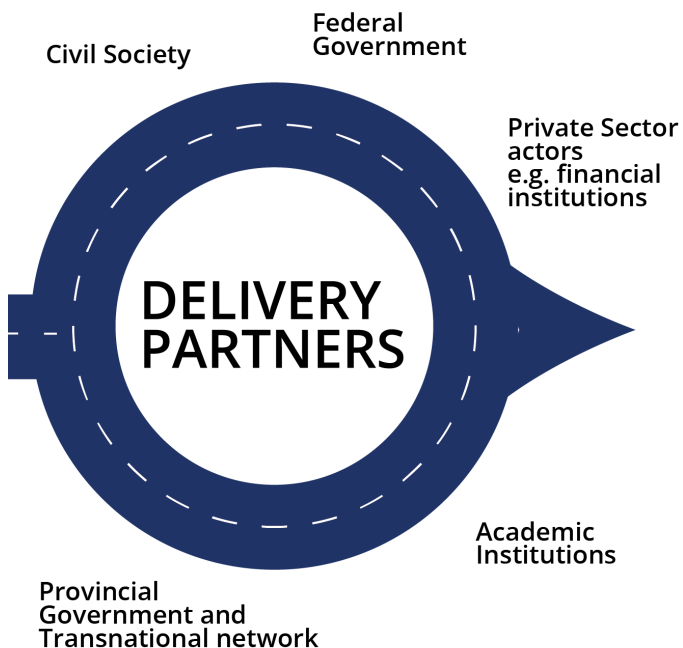


Figure 7. Implementation pathway⁴

⁴ Graphic prepared for: Government of Ontario (2018) Community Emissions Reduction Planning: A Guide for Municipalities. Draft. Original graphic derived from - Powering Climate Action: Cities as Global Changemakers (2015), C40 Cities and ARUP.

downtown results in a small increase in GHG emissions, while a less significant decline in population results in a proportionately larger decrease, in one case nearing zero GHG emissions.

The implication is that the Town can absorb additional population without altering its GHG emissions pathway, assuming the growth is concentrated downtown. If on the other hand, the population decreases, the Town's GHG emissions will fall more precipitous, because the modelled local renewable generation becomes closer and closer to providing 100% of the Town's energy requirements.

Stage 5: Implementation

The implementation stage involves consideration of the policies and programs required to support the preferred scenario, as well a financing plan and schedule.

Stage 5: Implementation		
Tasks	Description	Bridgewater's approach
5.1 Policies and mechanisms identification	Identification of policies and other mechanisms to achieve the actions.	Bridgewater identified a list of policies and actions for the municipality, businesses and individuals that will advance the plan. A schedule of implementation was also identified that aligns with the modelled Energy Shift scenario.
5.2. Investment strategy	Evaluation of the financial requirements for the actions and how to secure the required funding.	A detailed financial evaluation of the pathway was undertaken and capital requirements for each action were identified. A financing strategy will be an important next step.
5.3 Integration	Ensure that the actions are reflected in all local government policies and actions.	The Town has integrated its economic development plan with the community energy investment plan, and intends to integrate the transportation and official plans as well.
Engagement activities		» Large community energy event- Discovery Fair

Bridgewater's approach: The Town completed a prioritisation process and identified specific tasks and resources to support the implementation of four streams of work in the next three years. These streams are designed to achieve some quick wins in order to build momentum, to develop and articulate key mechanisms that will support implementation, as well as to "walk the talk" so that the Town can continue to build its expertise and to continue to build support in the community. A key strategy is developing the financing mechanisms to support the investments required.

Table 4. Short term action plan

Implementation Priority	2018	2019	2020
1. Financing systems			
Local energy development utilities & structures	Research & early development	Develop & deploy	Deploy & maintain
2. Signature energy projects			
Neighbourhood energy programs	Research & early development	Develop & deploy	Develop & deploy
Solar farm	Scoping study & land allocation	Develop	Develop
District energy system	Research	Pre-Feasibility Study	Develop
3. Community engagement			
Energy Partnership	Re-launch	Maintain	Maintain
Living Energy Laboratory	Launch round 2	Launch round 3	Launch round 4
Events	Small events, plan Discovery Fair 2	Host Discovery Fair 2 (spring)	Small events, plan Discovery Fair 3
4. Town Operations			
Facilities energy management plan	Implementation & evaluation	Scoping Study & New Plan	Implementation
Fleet energy management	Research & development	Deploy	Maintain
Active transportation & public transit	Maintain	Maintain, AT plan revision	Maintain
Regional support & collaboration	Maintain	Maintain	Maintain

Stage 6: Monitoring and evaluation

The process of monitoring and evaluation will track the community energy plan's progress and effectiveness, while facilitating its evolution. This process will enable the municipality to track how well actions achieve objectives, the impact of changing policies and technologies on the effectiveness of those actions, the impact of those actions on GHG emissions, and the impact of the actions on co-benefits.

Stage 6: Monitoring and evaluation		
Tasks	Description	Bridgewater's approach
6.1. Monitoring and evaluation plan	A monitoring and evaluation plan, including indicators and surveys, is developed.	The consultant developed a monitoring and evaluation plan for the Town.
6.2 Implementation	Governance strategies are identified and the plan is implemented.	The Town is beginning the process of implementation, with several short term and high profile projects.
Engagement activities		<ul style="list-style-type: none"> » Community Energy Plan approved by Town Council » Long term community energy transition engagement and monitoring programs launched

BRIDGEWATER'S APPROACH: The following indicators are proposed for tracking the implementation of Energize Bridgewater.

Table 5. Indicators proposed for Energize Bridgewater

Indicator	Trend	Data sources
Total new dwellings by type	An indication of the growth of the building stock.	Buildings permits
Average total floor area of new dwellings	An indication as to whether there is more or less additional floor space to heat or cool.	Building permits
Diversity of dwelling types	An indication of the types of dwellings and whether or not they have shared walls.	Building permits
Total new non-residential floorspace by type	An indication of the growth of the building stock.	Building permits
Total demolitions	An indication of the change in the building stock.	Demolition permits

Indicator	Trend	Data sources
Percentage of new dwelling units that are in downtown	An indication as to whether residential development is occurring in areas more appropriate for walking, cycling and transit or not.	Building permits and GIS analysis
Percentage of non-residential floorspace that is occurring in downtown	An indication as to whether commercial development is occurring in areas more appropriate for walking, cycling and transit or not.	Building permits and GIS analysis
Number of new dwellings that are within 400 m of a transit stop	Indication of transit accessibility.	GIS layers of transit and building footprint
Annual or monthly energy price by fuel (electricity, gasoline, diesel) (\$/GJ)	Energy costs are an important indicator of opportunities for energy savings and renewable energy, household, municipal and business energy costs.	The Town already tracks energy costs.
Total energy consumption by sector for electricity (GJ)	An indication of trends in energy use in buildings.	Available on request from NS Power. Other fuels can be tracked if data becomes available.
Total solar PV installs (# of installation)	An indication of extent of decentralized renewable energy.	Building permits.
Total gasoline sales (\$)	An indication of GHG emissions from vehicles.	Available for purchase from Kent Group Ltd.
Total transit trips	An indication of whether non-vehicular trips are increasing or not.	Available from the Town.
Length of physically separated cycling lanes	An indicator of opportunity for people of all ages to cycle.	Town

The outcomes

The key outcomes of a community energy plan are as follows:

1 COMMUNITY CHAMPIONS

The engagement process will provide the education and inspiration to enable community members and business leaders to become champions as the plan is implemented. Champions actively advance the low-carbon pathway in their own context.

2 PUBLIC KNOWLEDGE

Public knowledge of the issues and opportunities will increase. In particular, the community will identify the low-carbon pathway as an opportunity to increase the well-being of the community as opposed to a sacrifice required to address climate change.

3 A LOW-CARBON PATHWAY

The pathway is a long-term strategy for the community that will help to inform decisions and actions by the municipality, businesses, individuals and other levels of government. The pathway will make the journey from the present to a future that doesn't require fossil fuels tangible and real.

4 AN INVESTMENT PLAN

The investment plan will describe the funds required to implement the pathway and the return on those investments. The investment plan will facilitate the identification of entities that can make those investments and be used to seek funding from other levels of government, the community and the private sector.

5 CO-BENEFITS

An analysis of co-benefits will demonstrate how the low-carbon pathway advances other community priorities such as reducing the energy cost burden on low income households, stimulating economic development and increasing the general health of the population.

Conclusion

The Town of Bridgewater is fully integrating its economic development strategy with its community energy investment plan. The Energy Shift pathway requires an unprecedented investment for the community in clean local infrastructure and equipment: nearly \$400 million in energy efficient buildings, new community-scale energy systems, and clean & active transportation systems over 32 years (2018-2050). This investment more than pays for itself both when all the actions are combined and at the level of specific actions.

The Energy Shift requires a major and sustained effort by the community, businesses, organizations, and the Town. The Town will play a leadership role, and has already established programs or activities that support the pathway.

Municipalities have a long history of addressing challenges to improve the quality of life of citizens. The transition to a low-carbon economy represents an opportunity to stimulate economic development, improve quality of life, improve public health outcomes, reduce poverty, reduce air pollution and GHG emissions, and generate new employment opportunities.



Appendix 1: Bridgewater Community Energy Initiative Outcomes

Bridgewater Community Energy Initiative

(ALSO KNOWN AS “ENERGIZE BRIDGEWATER”)

Desired Program Outcomes

Updated August 5, 2016

Energize Bridgewater is a community-wide initiative to accelerate the transition of our community into a “sustainable energy future”. Starting summer 2016, the 18-month initiative will result in practical energy demonstration projects, new partnerships, and increased knowledge and skills. The community’s shared vision and commitments will be recorded in a Community Energy Investment Plan that will provide practical financial tools that will make energy solutions more affordable for residents, businesses, and organizations.

‘Energy sustainability’ is defined, as a starting point for the BCEI, as the transition to a low-carbon energy future while enhancing quality of life and meeting the community’s basic needs.

The following are the 10 desired outcomes of the BCEI, and the program components contributing to each outcome.

Desired Outcome	Program Components Contributing to Outcome
COMMUNITY-BASED STEWARDSHIP: The initiative is stewarded by a strong and diverse partnership of local businesses & organizations that have a long-term interest in its success.	<ul style="list-style-type: none">» MWB Student Research Project» BCEI Advisory Committee» Municipal Energy Learning Group» Energy Partnership» Community Energy Investment Plan

Desired Outcome	Program Components Contributing to Outcome
DEEP ENGAGEMENT: Strong community participation is achieved in the initiative, from a variety of stakeholder groups including residents of all age demographics, business, and organizations. Engagement activities are accessible for all.	<ul style="list-style-type: none"> » BCEI Advisory Committee » Energy Partnership » Living Energy Laboratory » Community Consultation & Crowdsourcing » Community Energy Plan Public Validation Event
ACTION FOCUSED: Practical, creative, and effective sustainable energy actions are identified and prioritized, and early actions are implemented and evaluated for their successes. Existing energy successes in the community are measured and documented as a source of education and inspiration.	<ul style="list-style-type: none"> » MWB Student Research Project » Living Energy Laboratory » Community Consultation & Crowdsourcing » Energy & Economic Analysis » Culture & Behaviour Change Assessment » Community Energy Investment Plan
CONTINUOUS LEARNING & CAPACITY BUILDING: All participants and partners including the Town and other municipalities engage in a conscious process of learning and evaluation about energy sustainability and energy actions to increase the community's capacity to achieve energy solutions in the long term.	<ul style="list-style-type: none"> » Energy Partnership » Living Energy Laboratory » Municipal Energy Learning Group » Community Energy Initiative Toolkit
UNDERSTANDING BARRIERS TO ACTION: Barriers to energy sustainability for residents and businesses are described and concrete enabling strategies and solutions are identified that would increase their capacity to participate in energy sustainability.	<ul style="list-style-type: none"> » Culture & Behaviour Change Assessment » Community Consultation & Crowdsourcing
AMBITIOUS ENERGY MODELING & TARGETS: The community's likely "business as usual" energy future is mapped out, and compared against a transition to a sustainable, low-carbon energy future.	<ul style="list-style-type: none"> » Energy & Economic Analysis

Desired Outcome	Program Components Contributing to Outcome
<p>INVESTMENT STRATEGY: The costs and benefits of a community-wide transition to energy sustainability are described from a broad economic perspective, and 'best value' strategies and actions for energy sustainability are identified. This analysis contributes to a new foundation for economic development and municipal and private investment over the next decades.</p>	<ul style="list-style-type: none"> » Energy & Economic Analysis
<p>CULTURALLY RELEVANT COMMUNICATION: The Town and its partners learn how to effectively communicate sustainable energy information and values to local residents, clients, businesses and organizations, based on a local understanding of motivators and barriers, and cultural narratives about energy.</p>	<ul style="list-style-type: none"> » Living Energy Laboratory » Culture & Behaviour Change Assessment » Municipal Energy Learning Group » Community Energy Plan Public Validation Event » Community Energy Initiative Toolkit
<p>HIGH VISIBILITY: Sustainable energy efforts become highly visible to the community. They generate broad interest and dialogue, to the point where thinking and talking about this topic starts to become the norm, and contributes to the community's participation in the initiative.</p>	<ul style="list-style-type: none"> » Energy Partnership » Living Energy Laboratory » Energy Initiative Website » Community Energy Plan Public Validation Event
<p>LONG TERM COMMITMENTS & MONITORING: Long term energy commitments are made by the Town and community partners and recorded in a strategy and action plan that maps out the community's transition to energy sustainability. The community's progress is monitored and communicated through a transparent and effective online tool that is stewarded by the Partners.</p>	<ul style="list-style-type: none"> » Energy Partnership » Community Energy Investment Plan Energy Initiative Website