



On the path to net-zero communities: integrating land use and energy planning in Ontario municipalities

Ian McVey, Karen Farbridge, Kirby Calvert

Community Energy Knowledge Action Partnership (CEKAP)

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PROJECT CONTACT

Ian McVey, Project Manager
E: imcvey@trca.on.ca, T: 416-451-1420 climateconnections.ca
5 SHOREHAM DRIVE, TORONTO, ONTARIO M3N 1S4

About the Authors

Ian McVey is a Project Manager with the Ontario Climate Consortium (OCC) based within the Toronto and Region Conservation Authority. In his role with the OCC Ian leads efforts to support Ontario municipalities with low carbon policy and planning through applied research and knowledge mobilization. Along with Dr. Calvert, Ian is the co-director of the SSHRC-funded Community Energy Knowledge Action Partnership (CEKAP). He is also a member of the Sustainable Energy Initiative at York University.

Dr. Karen Farbridge is the President of Karen Farbridge and Associates Ltd. and brings over 25 years of experience connecting people and ideas to build more sustainable and resilient communities. She spent 17 years in municipal politics, 11 of them as the mayor of Guelph, Ontario where she promoted policies and program in support of community sustainability and energy. Karen Farbridge is a partner in CEKAP, Chair of the QUEST (Quality Urban Energy Systems of Tomorrow) Ontario Caucus and member of the Sustainable Energy Initiative at York University.

Dr. Kirby Calvert is an Assistant Professor in the Department of Geography at the University of Guelph. Dr. Calvert is Co-Director and Principal Investigator of the Community Energy Knowledge-Action Partnership (CEKAP); a national partnership of Canadian universities, municipalities, and other non-academic partners with shared interests in improving the process and outcomes of community energy planning (www.cekap.ca). He has studied energy policy issues in Ontario and elsewhere using both qualitative and quantitative techniques for approximately eight years, with a focus on land-use issues and the trend toward decentralized energy governance.

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Research Associates:

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About the Community Energy Knowledge Action Partnership (CEKAP)

The Community Energy Knowledge-Action Partnership (CEKAP) was established in spring 2016 as a project of the Ontario Climate Consortium (OCC) with a *Partnership Development Grant* from the Social Sciences and Humanities Research Council of Canada (SSHRC). Combining strengths from Canadian universities, local and regional governance partners and civil society organizations across three provinces, CEKAP's overall goal is to improve thought and practice around community energy planning. CEKAP's research program is building from the principles of 'community engaged scholarship'. In this model, the non-academic community provides direct input into the research agenda: i.e., establishing core challenges that can be met with research (the big picture), articulating key themes (the research programs), and then identifying clear and timely research initiatives (the research projects). Input from non-academic partners is considered by the academic research team in light of existing resources and expertise to formulate near term research objectives (1-3 years) as well as a longer-term research plan (5-10 years).

About the Ontario Climate Consortium

The Ontario Climate Consortium is a network of academic institutions and local and regional governance partners that provides independent advice, research and analysis to support the development and implementation of policies that enable adaptation to the changing climate and the transition to a low carbon society. The OCC Secretariat, based within the Toronto and Region Conservation Authority (TRCA), leverages the wide-ranging expertise of our academic members to provide an evidence base for Ontario provincial and municipal government policy making through timely and objective research. Researchers in four of Ontario's leading Universities are members of the OCC: McMaster University, University of Guelph, Western University, and York University.

Executive Summary

Context

The Government of Ontario has set a 2050 target to reduce greenhouse gas emissions by 80 per cent below 1990 levels. De-commissioning coal-fired electricity generators across the province was a major step toward this goal. Attention must now focus on the building (heating), industrial, and transport sectors, which are almost entirely reliant on carbon-intensive fossil fuels. Among these sectors, buildings will likely need to experience relatively deeper reductions in order to compensate for sectors where emissions reductions may be more challenging (e.g. industrial process-related emissions; long-range freight transportation; air travel). Therefore a net-zero carbon building sector by mid-century is seen as a critical piece of the climate action puzzle in Ontario.

The most cost-effective pathway to a net zero building sector involves highly energy efficient buildings combined with an integrated community-based approach of district energy systems (thermal networks and electricity micro-grids). Developing these net-zero communities requires strategic system-level interventions. The building practices, technologies, and user interface of a net-zero community are all disruptive to status-quo. Furthermore, the traditional role of the local electricity distribution company (LDC) is called into question. Provincial legislation and regulations, municipal land-use planning policies, by-laws and operational practices (e.g. engineering and building standards), energy regulations, utility practices, development industry business models and suppliers will all need to co-evolve. This suggests a critical role for the planning system at all scales.

There are some promising trends. Through the Ontario Climate Change Action Plan (2016-2020) and proposed changes to the Growth Plan for the Greater Golden Horseshoe, the Ontario government has begun to establish the policy framework for net zero buildings and communities. Meanwhile, municipalities hold a range of policy levers that can influence emissions across the building sector, particularly for new developments. How these existing and emerging policy levers are used will determine whether we are successful in the drive to net zero communities. Success has been modest to date. While many Ontario municipalities have had climate and GHG plans in place for many years, low carbon project development and implementation at the community-scale has lagged and emissions trends aren't aligned with achieving Ontario's 2050 target.

Project objective and methodology

The purpose of this research is to evaluate the role of planning and planning policies in facilitating net-zero developments at the local level. Through a case study approach that looked at five developments, each in a different Ontario municipality, this report builds understanding of the conditions that lead to successful net-zero community developments, and helps to establish greater awareness of the technical and business cases for policy and business model

innovation. Furthermore, the research provides an assessment of how ‘net-zero’ concepts are discussed and treated within and across provincial-level planning policies.

Net zero definitions

While there is growing recognition of the need for net zero buildings and communities, there are no commonly accepted definitions of what net zero is. As such, the concept of ‘net-zero’ is often molded to ‘fit the hand of the user’, which leads to increased risk of ‘greenwashing’ which undermines public policy objectives. For the purposes of developing a workable and practical definition that aligns with municipal land use planning and policy frameworks, there are at least four dimensions to consider:

1. **Priorities:** is the focus on energy, carbon, or the full suite of greenhouse gas emissions?
2. **Scale:** is the focus on individual buildings, or on the community-scale?
3. **Scope:** which activities and sectors should be included in the net zero calculus?
4. **Boundaries:** should offsets or renewable energy credits generated by activities outside of the building or community boundaries be eligible for inclusion in the net zero calculus?

Based on a review of Ontario municipal land use and energy planning frameworks, the following is suggested as practical definition that focuses on energy-related carbon emissions, and is aligned with the municipal sphere of influence:

Net-Zero Energy Emissions Community (NZEEC)

In the context of municipal and regional planning, a net-zero energy emissions community is highly efficient in terms of energy needed to meet demand for: buildings (electricity plug loads, space and water heating), transportation (excluding long-haul freight and personal travel outside of regional boundaries), and municipal services (e.g. water treatment and distribution, wastewater management, and waste management). Energy demand is met by sustainable zero GHG emission sources, ideally generated within community boundaries.

Alignment between this suggested definition and the four dimensions presented above is shown in table 1 below

Dimension	Focus	Rationale
Priorities	Energy-related GHG emissions	<ul style="list-style-type: none"> • Municipal/community-scale emissions inventories are dominated by energy-related emissions in the buildings and transportation sectors. • CH₄ emissions in waste and wastewater sectors are addressed through bioenergy pathways • Municipalities have limited control over non-energy related emissions in agriculture and industry sectors
Scale	Community-scale	<ul style="list-style-type: none"> • Integrated community-scale energy systems offer opportunities for economies of scale and resilience
Scope	Built environment,	<ul style="list-style-type: none"> • Focuses on major sources of community-scale

	transportation (excluding inter-regional), and municipal services	emissions, as well as sectors where municipal land use planning policy can influence trends
Boundaries	<ul style="list-style-type: none"> Limited use of offsets; source-based emissions accounting (i.e. inclusion of electricity transmission and distribution related emissions) exclusion of embodied energy in materials 	<ul style="list-style-type: none"> Focus emissions reduction efforts within the community Focus on activities over which municipal policy can influence

Table 1 Net zero definitions - proposed foci along key dimensions

On the path to net zero: key lessons learned from case studies

Provincial enabling roles

- Continue to set the context for municipal ambition on climate action and net zero communities** – complementary amendments to the Ontario Building Code, Municipal Act, Planning Act, and the Growth Plan are required to mainstream net zero policy objectives into land use and energy planning framework for municipalities. Alternative regulatory and market frameworks to enable LDCs to act as platforms for energy services, including generation and storage, are needed.
- Enable municipal/community level implementation through regulatory policy tools** - consider introducing a tiered approach in the building code that enables municipalities to require higher than minimum code levels of energy performance in new building development. Municipal authority to establish mandatory connection by-laws in areas suitable for district energy is needed.
- Revise energy planning and regulatory framework to enable innovation in Local Distribution Company (LDC) business models** – LDCs are struggling to stay relevant in the era of disruptive innovation in energy systems (e.g. distributed energy technologies, storage, and EVs). Policy and regulatory barriers limit their ability to serve as generators, and as aggregators of distributed energy assets. Policy innovation is needed to support LDCs ability to develop economically viable district energy networks in areas slated for growth.
- Enable municipal/community level implementation through fiscal policy tools** – Seed capital for low carbon district energy systems is needed. Funding for demonstrations and pilot projects of innovative development approaches is needed to build awareness of technical and economic feasibility.
- Engage in multi-level collaboration, particularly in context of major urban redevelopment projects, to enable innovation** - multi-level government collaborations, particularly in the context of major urban redevelopment projects, can set the context for policy alignment and innovation. Consider leveraging Infrastructure Ontario land dispositions to require private developers to innovate towards net zero community building.

- **Support research and development, workforce training and skills development related to net zero community construction** - support workforce training and certification programs that build capacity for net zero community planning and development and address the lack of talent and practical experience in the contracting industry.

Municipal enabling roles

- **Create a supportive high-level policy context** – Integrate energy and climate into Official Plans; create Community Energy and/or Climate Action plans to support OP implementation. Clarify roles of upper vs lower tier in the regional municipal governance context
- **Use authority provided by Planning Act and Municipal Act to incent low carbon and net zero development** - The Planning Act provides municipalities with authority to mandate sustainable urban design through site plan approvals, however only a few innovator municipalities are using this authority.
- **Use major redevelopment area opportunities (e.g. Brownfields) to create a test-bed for policy and technology innovation** - Former industrial areas, often located close to urban centres, provide an opportunity for revitalization of vacant or underutilized employment areas. Developing new low/zero carbon districts can attract innovative knowledge industries and talent.
- **Support/enable champions in both political and staff (i.e. technical) ranks** - . Political leadership on municipal Council is needed to establish local ambition on climate and energy and to build key relationships between industry innovators, public institutions, and the broader community. Municipal energy managers, staff level technical champions, are able to break down intra-municipal silos and engage with energy stakeholders in the community.
- **Where LDCs are municipally-owned, support business model innovation** – Several of the case studies provided examples of specialized local energy companies (e.g. Hydro Ottawa, London Hydro, and Enwave) partnering with the private sector to develop community-scale low carbon energy generation and distribution networks. These partnerships need support from municipalities to scale-up.

Development industry role

- **Engage early and often with key municipal government and energy stakeholders** - By putting the net zero vision forward early in the development process, and aligning the business case with existing municipal and provincial policy objectives, developers can build a base of support which enables flexibility in policy and business model innovation
- **Demonstrate the marketability of net zero communities and alignment with housing affordability agenda** - net zero homes and net zero communities can save homeowners and tenants money in the long-run through reduced energy costs. Demonstrations are needed to build public awareness.
- **Demonstrate alternative governance models for implementing district heat and district electricity partnering with municipalities and local utilities** – In the absence

of a supportive energy planning framework for district energy solutions, engage with municipalities and LDCs to establish public-private partnerships to implement community-scale micro-utilities.

Emerging Research Directions

How will the regulatory framework for local distribution companies need to evolve to support them taking a key role in Ontario's transition to net zero communities? -

Transitioning the traditional LDC business model towards a micro-grid network coordinator, and district energy system developer, requires overcoming challenges related to financial constraints, regulatory barriers, business processes and corporate culture. Collaboration between LDCs, third party energy providers, and energy solutions vendors can help achieve cost effective deployment, as has been shown in the case studies presented in this report.

What Provincial and municipal policies, tools and process changes are proving effective in engaging energy decision makers in land use planning decisions, and vice versa? -

Understanding what provincial and municipal policies, tools and process changes are proving effective in engaging energy decision-makers in land use planning and development, and vice versa, along with a comparative analysis of best practice in other national and international jurisdictions, would support the transition to net zero carbon communities.

How can municipalities best leverage existing policy tools to support low carbon and net zero community transitions? Research is needed to understand (1) how existing (and proposed) municipal policy tools can be used to support energy transitions and (2) what barriers are preventing their uptake and implementation by municipalities. This research could lead to the development of a low carbon/net zero policy toolkit or guidance document for municipalities, including template by-laws to facilitate policy implementation.

What is the municipal role in the transition to zero carbon transportation? - Research to better understand the role that municipal policy interventions can play in encouraging fuel substitution (e.g. from gasoline/diesel to electricity and biofuels) within communities is needed. Understanding (1) what policy levers might be available, and (2) what their impact might be in terms of emissions reductions, would help build the municipal policy toolkit to address the most important sector for climate action.