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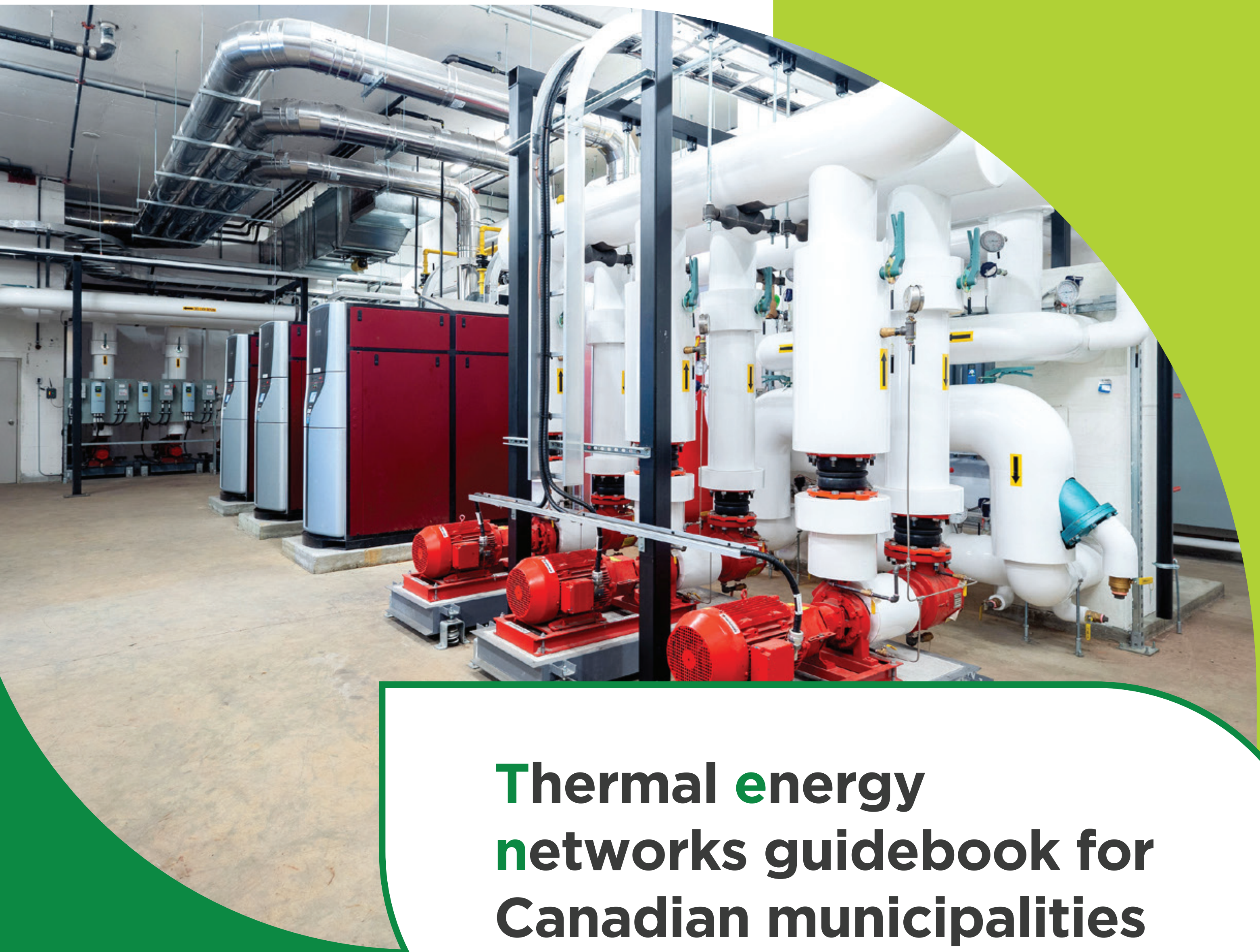

Thermal energy networks guidebook for Canadian municipalities

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FCM's Green Municipal Fund (GMF) is a globally unique organization providing funding and education to municipalities to help them both reach net-zero and build resilient communities, while also delivering economic and social benefits such as jobs, housing and infrastructure. Since inception in 2000, it has helped reduce greenhouse gas emissions by 2.98 million tonnes, funded more than 16,000 person-years of employment, and contributed $1.53 billion to the national GDP via the more than 2,736 approved projects. GMF manages approximately $2.4 billion in programs funded by the Government of Canada.

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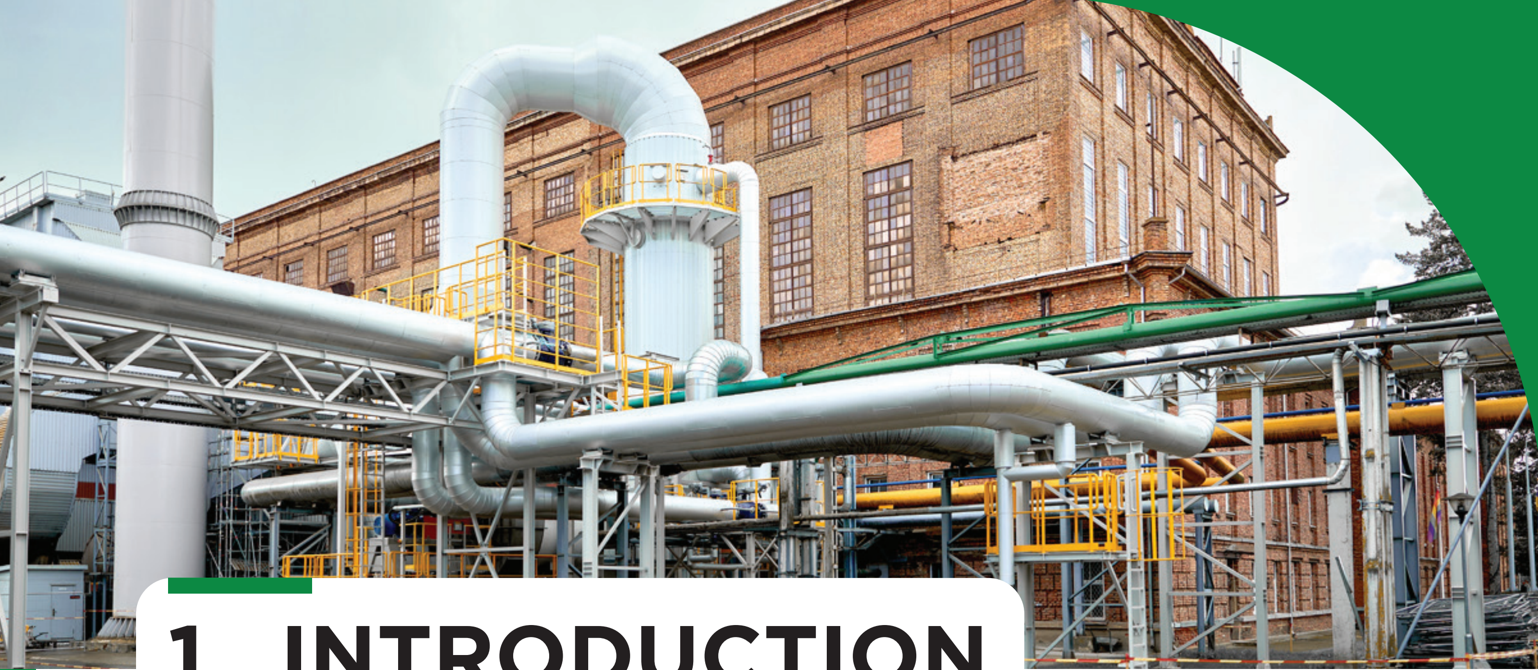


1. INTRODUCTION

1.1 ABOUT THIS GUIDEBOOK

This guidebook is designed to help Canadian municipalities catalyze and implement thermal energy networks (TENs)—also known as district energy systems—within their communities. Developed by Dunsky Energy + Climate Advisors and Reshape Strategies for the Federation of Canadian Municipalities, in collaboration with the Building Decarbonization Alliance, it draws on leading practices and existing resources[1,2]. Recognizing that many different terms are used for TEN technology and municipal planning functions across Canada, we have selected terms for clarity and inclusivity and provided alternative terms and definitions in the Appendix B: Glossary of terms for reference.

Municipalities at any stage of TEN readiness—from initial exploration to full implementation—will find practical guidance here. The guidebook is organized around the framework depicted in Figure 1, which divides actions into three key chapters, each tailored to a specific municipal audience:

- **Create the enabling conditions:** For planners and legal and finance staff.
- **Assess technical feasibility and business case:** For energy and building experts.
- **Evaluate ownership and governance options:** For senior managers and utility operators.

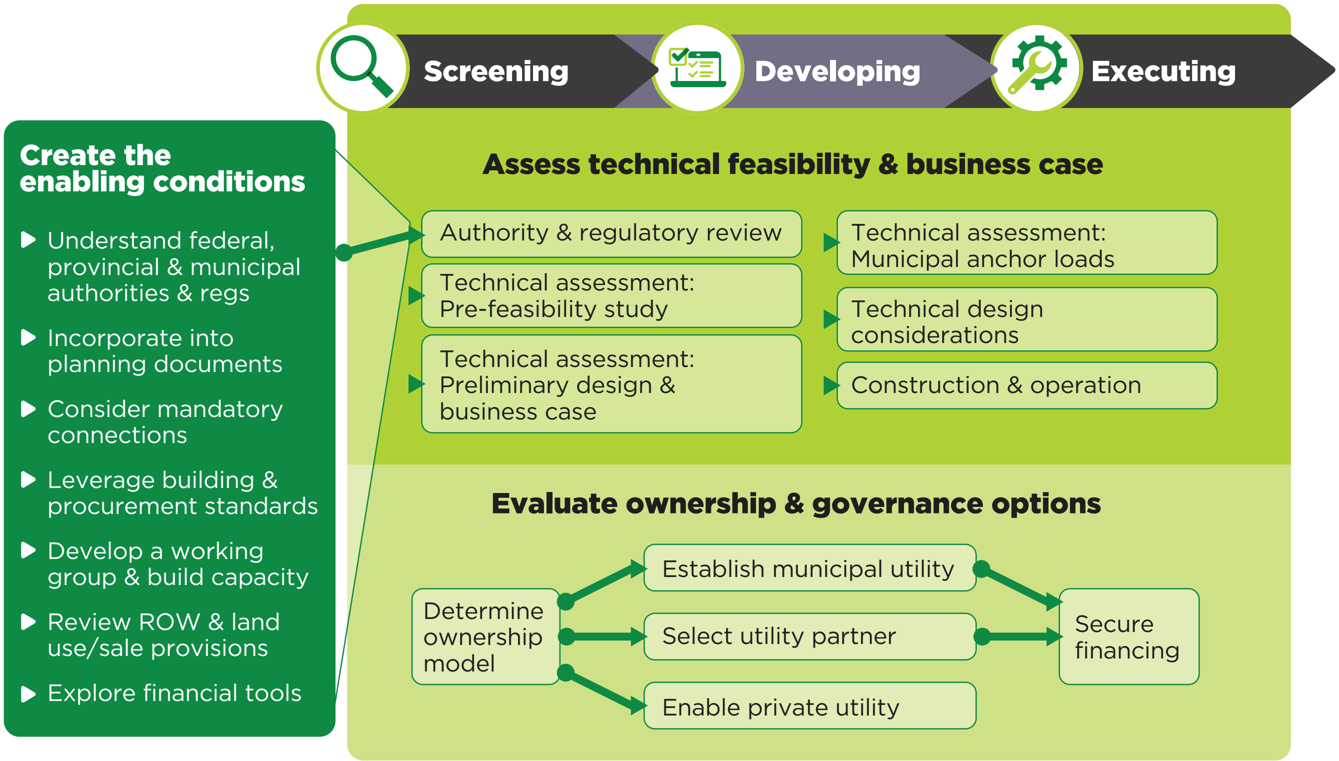
While the "Create the enabling conditions" chapter provides overarching guidance, the other chapters focus on specific TEN sites and are structured into three stages: **screening, development** and **execution**. Each of these stages is **indicated with an icon,** as shown in Figure 1, helping readers navigate the process. Although most TEN projects follow this sequence, each project may take a unique path based on local context, stakeholder involvement, objectives and market conditions. Projects can span many years. Municipal staff are encouraged to coordinate internally and to brief council regularly to ensure sustained support for TEN-related initiatives.

For all actions outlined, municipalities may choose to complete the work using in-house expertise or to hire external support through RFPs or other procurement channels.

1 International District Energy Association. 2013. *Community Energy*.

2 Vermont Community Thermal Networks. 2025. *How to Develop a Thermal Energy Network*.

Figure 1: Thermal energy network framework for municipalities



1.2 WHAT ARE THERMAL ENERGY NETWORKS?

Thermal energy networks (TENs) offer an **efficient, scalable** approach to heating and cooling buildings by leveraging shared infrastructure. Instead of each building relying on its own furnace or air conditioner, multiple buildings, neighbourhoods or campuses are connected via underground pipes that circulate water or other fluids. This pooled system **optimizes performance and reduces costs** by balancing the variable thermal energy demands of different building types.

TENs present a compelling solution for municipalities seeking to:

- Reduce energy costs and demand on electrical grids,
- Support the transition to clean energy,
- Increase energy resilience, and
- Lower greenhouse gas (GHG) emissions.

Traditional heating systems often depend on fossil fuels, while conventional cooling systems tend to consume large amounts of electricity. TENs can integrate renewable sources such as geothermal, solar thermal or waste heat from industrial processes and wastewater systems to provide clean energy at the building level across a whole district. While many TENs in Canada were originally built using natural gas—reflecting the technologies available at the time—newer systems now enable rapid adoption of community-scale, low-carbon solutions that are not available to individual buildings.

TENs also offer benefits to builders and developers by simplifying designs and eliminating the need for space-consuming individual heating and cooling systems, thereby increasing a building's usable floor area.

KEY BENEFITS OF TENS FOR LOCAL GOVERNMENTS:

- Reduce demand on electrical grids
- Increase resilience to grid disruptions
- Reduce GHG emissions
- Lower capital and operating costs
- Diversify investments and provide steady financial returns (if owned)

Thermal energy networks can operate at various temperatures, ranging from ambient-temperature loops to steam loops. TENs operating at higher temperatures with a centralized thermal plant are known as **fourth-generation** (or low-temp loop). Those that circulate low or ambient temperatures and require each building to have a heat pump to adjust temperatures are known as **fifth-generation** (or ambient loop). See Section 3.3.1 for more details on these two models.

Overall, thermal energy networks represent a forward-thinking solution for urban energy systems that **aligns with climate goals** and **offers long-term economic and environmental benefits**.

1.3 COMMON APPLICATIONS OF THERMAL ENERGY NETWORKS

TENs are versatile and can be applied across a wide range of building types and land uses, including:

- High-density residential developments,
- Institutional campuses (universities, hospitals, government complexes), and
- Industrial and commercial areas.

They are particularly effective when connecting buildings with complementary heating demand profiles—for example, commercial buildings with peak demand during business hours and residential buildings with higher demand in the evenings and overnight. Institutional campuses often use TENs to manage energy use across multiple buildings, benefiting from centralized control, predictable energy costs, and the ability to incorporate renewable sources. For instance, a university might use a thermal loop to heat dormitories while cooling laboratories, improving efficiency for both.

Photo: Lonsdale Energy Corporation

Many TENs are catalyzed by **opportunities to access waste or free thermal energy**, such as capturing heat from industrial processes, large bodies of water or wastewater—either at treatment facilities or through linear infrastructure.

1.4 MUNICIPAL BENEFITS FROM THERMAL ENERGY NETWORKS

Thermal energy networks offer a wide range of benefits to communities, especially as local governments strive to meet climate goals, enhance energy resilience and foster economic development. Key advantages include:

Environmental and operational benefits:

- Provision of a **strategic pathway to decarbonize** fossil fuel–based heating and cooling, which are among the largest sources of greenhouse gas emissions in urban areas.
- Potential for **improved energy affordability** through stabilized long-term costs for municipalities, building owners and residents.
- **Extended asset lifespans, reduced capital and operational costs and increased usable floor area** via shared infrastructure and professional management.
- **Enhanced electric grid resilience** by reducing peak electricity demand in constrained areas of the grid.
- **High adaptability**, with the ability to integrate multiple and evolving low-carbon energy sources over time.
- Potential for **easier maintenance and restoration** compared to individual building-level systems.
- **Enhanced public safety** during emergencies by providing centralized warming or cooling centres during prolonged electrical outages.

Economic benefits:

- **Local job creation** during system planning, design, construction and ongoing operations.
- New, stable **municipal revenue streams** and opportunities for investment diversification.
- **Retention of energy expenditures** within the local economy.
- **Increased attractiveness** to green investors and energy-intensive businesses seeking reliable, low-carbon energy solutions.

By leveraging TENs, municipalities can advance climate action, strengthen energy resilience and support sustainable economic growth.

2. CREATE THE ENABLING CONDITIONS

In Canada, **local governments have a variety of policy tools** available to facilitate the growth of TENs. As such, they are key players in catalyzing or orchestrating TENs. But to do so, they must utilize the levers at their disposal. This chapter gives useful guidance on where to begin.

2.1 UNDERSTAND FEDERAL, PROVINCIAL AND MUNICIPAL AUTHORITIES AND REGULATIONS

In this section, we outline the authorities of other orders of government that municipalities should be aware of, following which we detail the tools in the municipal tool belt that can enable TENs.

2.1.1 Federal and provincial

Municipalities should first become familiar with the relevant authorities of the federal and provincial governments, which are outlined in Table 1 and further detailed in the report *Thermal Energy Networks in Canada*.[3]

2.1.2 Municipal

Municipal governments can have significant **influence over TENs**, especially in provinces without clear provincial frameworks. Sections 2.2 to 2.6 describe how municipalities can use their authorities and planning processes to enable or catalyze TENs.

3 Building Decarbonization Alliance and Dunsky Energy + Climate Advisors. *Thermal Energy Networks in Canada.*

TABLE 1: GOVERNMENT REGULATIONS AND INITIATIVES RELATED TO TENS

Authority	Relevancy
Federal	
Energy efficiency standards, product regulation	Efficiency standards for appliances affect the thermal demand in buildings and the relative cost of individual versus networked thermal solutions.
Emissions and clean electricity regulations	Pricing emissions and requiring clean electricity directly influences the business case for TENs as compared with individual building solutions. As of April 2025, there is no longer a federally mandated consumer carbon price to be included in business case analyses.
Financing and funding programs	Financing—such as that offered by the Canada Infrastructure Bank—and grants can bolster the business case of a TEN project.
Air pollution and fuel standards	Regulations on air pollutants and fuel standards affect the technology choices available to buildings and TEN providers.
Provincial	
Energy codes for new construction	Energy codes, especially for large buildings, can have a significant impact on TEN adoption. Some provinces have already implemented relevant legislation: British Columbia, New Brunswick, PEI and Nova Scotia have adopted higher tiers of the National Energy Code for Buildings by 2030.
Municipal building code authority	In some provinces and territories allow municipalities can adopt stricter building code bylaws and thereby create the conditions for TENs to be a cost-competitive solution. This authority can be especially valuable for municipalities with dense urban areas where TENs can be most effective, as has been demonstrated in Vancouver and Toronto.
Carbon pricing	Carbon taxes have a significant impact on the economics of thermal energy solutions by increasing the price of fossil fuel heating, which makes low-carbon TENs more competitive. Provinces have the authority to establish their own carbon pricing systems. Quebec is the only province that has done so, with its cap-and-trade program.

Authority	Relevancy
Thermal energy regulation	Provinces have the authority to regulate the production, distribution and sale of thermal energy as they do for electricity and gas. As of May 2025, only BC has implemented regulatory oversight of thermal energy utilities, through the British Columbia Utilities Commission. In Quebec, the government modified the obligation to serve, allowing gas distributors to provide an alternative energy source such as a TEN, renewable natural gas or hydrogen in lieu of a gas service.
Mandatory thermal energy plans	Provinces can require municipalities or utilities to develop thermal energy plans for specific parts of their region, such as dense urban areas. These plans can ensure that energy infrastructure is planned in an optimized manner and coordinated with other municipal or utility activities. Mandatory thermal energy planning is gaining momentum in Europe and in the United States but has not yet been implemented in Canada. In Europe, municipalities tend to create the plans, whereas in the United States, it is more common for utilities to create them.[4]

2.2 INCORPORATE INTO PLANNING DOCUMENTS

Land use planning is among a municipality's core functions, ranging from high-level, municipality-wide official plans to property-level site plans. Land use planning tools are primarily designed to manage new development or redevelopment areas and properties. They can also influence existing built forms, though this use is more restricted by pre-existing development rights. Some land use planning steps are statutory, defined and required in legislation, and others are best practices.

Municipalities can effectively **use land use tools to catalyze TENs**, since a **TEN is usually initially built for a sizable new development**, after which it may be expanded into existing buildings. At each stage in the land use planning process, municipalities can embed support for a TEN to streamline its realization. The relationships between the plan types below are shown in Figure 2, with thermal energy plans spanning three of the planning processes, as they can relate to any or all of these.

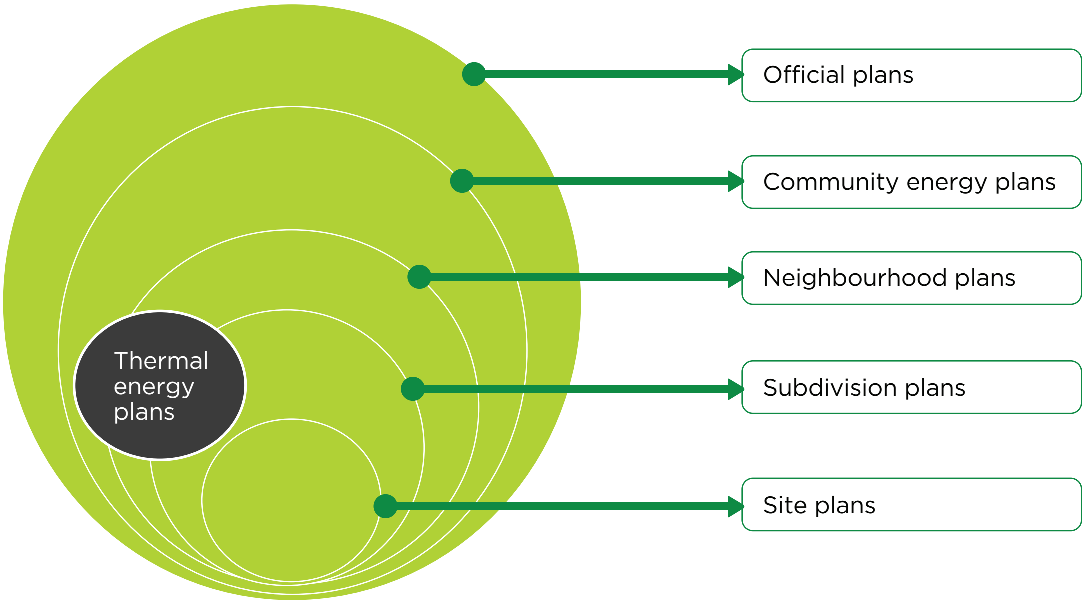
When defining TENs in planning documents, municipalities should ensure flexibility by not specifying technologies.

2.2.1 Official plans

Official plans (also known as municipal development plans or official community plans) provide the overarching framework for development within a municipality and are critical to laying the groundwork for TENs. Municipalities can achieve this by incorporating municipal objectives such as **emissions targets, energy security, climate resiliency and economic development** into the vision statements as well as the policies for all land uses and neighbourhood types, especially for dense neighbourhoods. Official plans communicate a municipality's intentions to external stakeholders and identify which developments and activities are desirable.

4 Building Decarbonization Alliance and Dunsky Energy + Climate Advisors. *Thermal Energy Networks in Canada.*

Figure 2: Municipal planning documents



2.2.2 Community energy plans

Community energy plans (also known as community emissions plans) have been gaining traction across Canada over the past 15 years.[5] Generally they inform a municipality's official plan, but they can also be applied at the secondary plan level, which can help catalyze TENs. This is especially important in denser development areas. Community energy plans **identify the thermal loads of a given neighbourhood**, but do not typically explore ways to meet these thermal loads. A more detailed analysis is usually done through a thermal energy plan, as discussed in the next section.

Examples:

1. The **City of Toronto's Downtown Plan** (TOcore) explicitly calls for "connecting development to the Deep Lake Water Cooling system and other low-carbon thermal energy networks" as a key strategy for meeting energy and emissions targets.[6]
2. The **City of Richmond's 2041 Official Community Plan** identifies district energy utilities as a "leading strategy" to achieve the BC municipality's goal of net-zero emissions by 2050. This lays a foundation for mandatory connection bylaws in district energy service areas.[7]

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5 CEPs are frequently used in some provinces and in the Northwest Territories, though they are still emerging in Alberta, Manitoba, PEI, Saskatchewan, Newfoundland and Labrador, Yukon and Nunavut.

6 City of Toronto. 2022. *Downtown Plan*. Accessed January 5, 2026.

7 Lulu Island District Energy Company. April 1, 2025. *Bulletin DISTRICTENERGY-01*. Accessed November 20, 2025.

2.2.3 Thermal energy plans

In leading jurisdictions, thermal energy plans (also known as area-based plans or local clean heat plans) are emerging as a **best practice** for municipalities and/or utilities. These plans are **strategic frameworks designed to optimize heating and cooling** in a defined geographic area. The plans can be at various scales: city-wide, neighbourhood-wide or for a specific development. Thermal energy plans can help align stakeholders for efficient energy transitions, incorporating electricity, gas and thermal energy utilities' strengths and limitations. The plans may be designed to achieve emissions reduction, energy resiliency or economic development goals.

Thermal energy plans can also help identify where building-scale solutions may be more cost effective than system or networked solutions. They can coordinate infrastructure upgrades, align incentive programs, aggregate demand, reduce rate increases, incorporate equity considerations, identify optimal locations for thermal energy networks, and develop plans for decommissioning areas of an existing gas network.[8]

European municipalities are increasingly being mandated to develop thermal energy plans for urban centres, including in the U.K., Germany and the Netherlands. Across Europe, municipalities benefit from tools to support mapping and business case development that will facilitate the creation of these plans and studies.[9,10] For a good **example of a municipal thermal energy plan**, see the City of Munich's Heat/Cool Plan.[11] In the United States, it is more common for **states to mandate utilities** to develop thermal energy plans (or clean heat plans), as is the case in Colorado and Massachusetts.

STAKEHOLDER ENGAGEMENT CONSIDERATIONS

Throughout planning processes, municipalities should look for opportunities to consult and interact with the public and stakeholders around TENs. Engagement goals might include:

- Building awareness
- Identifying resources and considerations
- Building stakeholder networks

Example:

The City of Guelph's Community Energy Initiative 2050 explicitly identifies TENs as a priority for achieving emissions and energy targets, and directs where and how TENs should grow, which embeds thermal networks into long-term planning and infrastructure sequencing.

8 Gerard MacDonald and Trent Berry. Area-Based Thermal Energy Planning. District Energy, Q2 2025.

9 Advanced Infrastructure. LAEP+. The Award Winning Net Zero Planning Tool by Advanced Infrastructure. Accessed October 27, 2025.

10 ArcGIS Web Application. European Union Forum. Accessed October 27, 2025.

11 City of Munich. 2022. *Heating and Cooling Plan.*

DANISH LEADERSHIP

In Denmark, 100 percent of the country is covered by thermal energy plans. Since 1979, the Danish Heat Supply Act has required municipalities to map, analyze and designate specific zones for district heating, natural gas or individual heating solutions. These zoning decisions ensure that energy infrastructure is planned in a coordinated and optimized manner across the country.[12]

INTEGRATED RESOURCE PLANNING

Electric, gas and thermal energy systems are increasingly interdependent, with all operators under pressure to reduce emissions and boost fuel-switching. As a result, integrated resource planning is becoming increasingly common. In Ontario[13] and Quebec[14], gas and electric utilities have been mandated to work together to develop multifuel plans. This is paralleled by the Regional Energy Strategic Planning bodies that have been created across the U.K.[15] for regional planning of multiple energy sources.

In Canada to date, no provinces have directed municipalities or utilities to develop thermal energy plans, though some municipalities have shown leadership in this area. For example, the **City of Toronto published a Wastewater Energy Map**[16], an interactive map that identifies sewer segments with potential for thermal energy recovery based on their flow rate and temperature. Also, **the City of Vancouver has introduced the Energize Vancouver** initiative, which includes mandatory reporting and, ultimately, limits on energy and GHG emissions for large buildings. Vancouver also created a **Neighbourhood Energy Strategy** that promotes TENs in certain neighbourhoods,[17] which is an optional pathway for buildings to meet their emissions targets. The City of Edmonton developed a **District Energy Strategy** to lay the groundwork for a city-wide, decarbonized district energy network.[18]

When developing a thermal energy plan, both municipalities and utilities bring valuable strengths to the table, all of which should be leveraged regardless of which entity holds the pen. **Integrated resource planning** processes are becoming increasingly common and provide a valuable framework for collaboration between electric and gas utilities and municipalities. See Table 2 for the key steps in developing a thermal energy plan.

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12 Building Decarbonization Alliance and Dunsky Energy + Climate Advisors. *Thermal Energy Networks in Canada*. Accessed October 30, 2025.

13 Government of Ontario. June 2025. *Energy for Generations*.

14 Dominique Rolland et al, Stikeman Elliott. June 20, 2025. Québec Government Adopts Bill 69 to Modernize Energy Legislation.

15 Ofgem. April 2, 2025. Regional Energy Strategic Plan policy framework decision.

16 City of Toronto. Wastewater Energy Map. Accessed October 1, 2025.

17 City of Vancouver. Neighbourhood Energy Strategy. Accessed October 27, 2025.

18 City of Edmonton. August 2022. *District Energy Strategy*. Accessed November 20, 2025.

TABLE 2: CHECKLIST FOR DEVELOPING A THERMAL ENERGY PLAN

Key steps in developing a thermal energy plan
☐ **Form a multidisciplinary project team** that represents key departments (e.g., planning, sustainability, finance, energy, climate, land development, operations, facilities).
☐ **Conduct a geospatial analysis** to identify which areas are likely to have the optimal conditions (e.g., density, land uses) to support TENs. Identify (both existing and planned): • Development density (e.g., new transit-oriented development areas), • Energy-intensive land uses (e.g., industrial parks, data centres), • Potential "anchor loads" (e.g., pools, arenas, hospitals, recreation centres), • Potential thermal energy sources (e.g., paper mills, wastewater treatment plants), • Proximity to existing or planned district energy systems capable of expansion, • The presence of municipally owned land available for TEN infrastructure purposes (e.g., energy hubs, pumping stations, geoexchange borehole fields, solar panels), and • Ease of access and other constraints (e.g., environmental).
☐ **Model the anticipated baseline energy demand** in each of the priority areas identified, including current and projected energy consumption of land uses (including sensitivities of rising temperatures, rate of development, energy demand intensity, etc.) and anticipated seasonal load profiles.
☐ **Align with electric and gas utilities' long-term (or integrated resource) planning processes.**
☐ **Set clear criteria** for assessing TEN projects compared to building-level solutions.
☐ **Develop a robust and inclusive stakeholder engagement strategy** that aims to identify key stakeholders, build buy-in for TENs and lay the groundwork for partnerships.
☐ **Engage stakeholders** including municipal staff, utilities, developers, potential clients, Indigenous communities and equity-deserving groups. Gauge general awareness and support for TEN deployment and understand the industry's availability, readiness and interest in various partnership opportunities.
☐ **Build awareness and buy-in for TENs** among political leaders, senior municipal staff, the local community and implementation partners (e.g., utilities, developers, landowners).
☐ **Identify opportunities to advance equity and Reconciliation objectives** (e.g., supporting affordable housing development, partnering with Indigenous communities).

- ☐ **Align TEN implementation activities** (e.g., load connections, underground work and future expansions) with other planned activities (e.g., road cuts and closures) to minimize construction impact and cost.
- ☐ **Assess how the plan integrates with existing strategies, standards and programs.**
- ☐ **Conduct a policy review** to identify potential barriers (e.g., right-of-way access).
- ☐ **Assess the need for and develop enabling municipal land-use policies** (e.g., spatially identifying and creating policies for community energy system land-use zones).
- ☐ **Identify, assess and prioritize municipal mechanisms** that could accelerate TEN development (e.g., property tax rebates, fast-tracked approval processes, increased density allowances, committing to connecting municipally owned buildings to TENs, setting up a municipal district energy utility, amenity cost charges).
- ☐ **Develop an action plan** to implement the thermal energy plan by transcribing it into policy, such as through zoning bylaws, building code compliance or funding eligibility. Without these linkages, plans may not translate into tangible outcomes.

BRAMPTON HERITAGE HEIGHTS SECONDARY PLAN[19]

In Brampton, ON, the Heritage Heights Secondary Plan was written to guide the development of a greenfield. Through the Secondary Plan, the municipality aims to prohibit retail natural gas and to require new buildings to be more efficient than the provincial building code. To meet future thermal demands, the municipality is looking at creating its own TEN utility.

19 Karen Farbridge. September 2022. "Net-zero secondary planning brings energy to local planning." *Municipal World*.

2.2.4 Neighbourhood plans

A neighbourhood plan (also known as a secondary plan or an area plan) is a statutory policy document regulated and approved under the applicable provincial planning act. It forms part of the municipality's official plan and typically focuses on detailed local development policies aimed at guiding growth and change in a defined area.

Single or lower-tier municipalities typically have the authority to approve neighbourhood plans, which can be used to enable TENs in new developments or intensification areas in two ways. In some provinces, neighbourhood plans can **require new buildings to meet more-stringent emissions standards** than the provincial building code, which can enable TENs that offer a viable alternative to combustion-fired space or water heating. Moreover, by leveraging their authority over public utilities, neighbourhood plans can **require new buildings to connect to a TEN** (typically only if the municipality is part of the ownership structure). Both obligations would be applied as a condition of subdivision plan or site plan approval.

2.2.5 Subdivision plans

Subdivision plans are the level of planning at which TEN infrastructure such as **nodes and pipes would be indicated** and allocated space. Depending on the authorities provided, as part of the approval process for subdivision plans, municipalities can **encourage or require developers to provide an integrated energy strategy**, which would detail the role of a TEN in meeting the new development's energy demands.

Example: **Berczy Glen project**

The Berczy Glen project in Markham, ON, is a cutting-edge TEN in a new low-rise residential neighbourhood. It uses geoexchange for space heating and cooling and domestic hot water, making the homes net zero. The subdivision plan mapped out piping locations for the ambient temperature loop and associated subgrade vaults and circulation pumps as well as the 170 boreholes beneath public streets.[20, 21]

2.2.6 Site plans

Municipalities can leverage their authority to approve site plans to catalyze TENs in several ways, depending on the ownership structure. Site plans are only required in certain cases, typically for larger buildings.

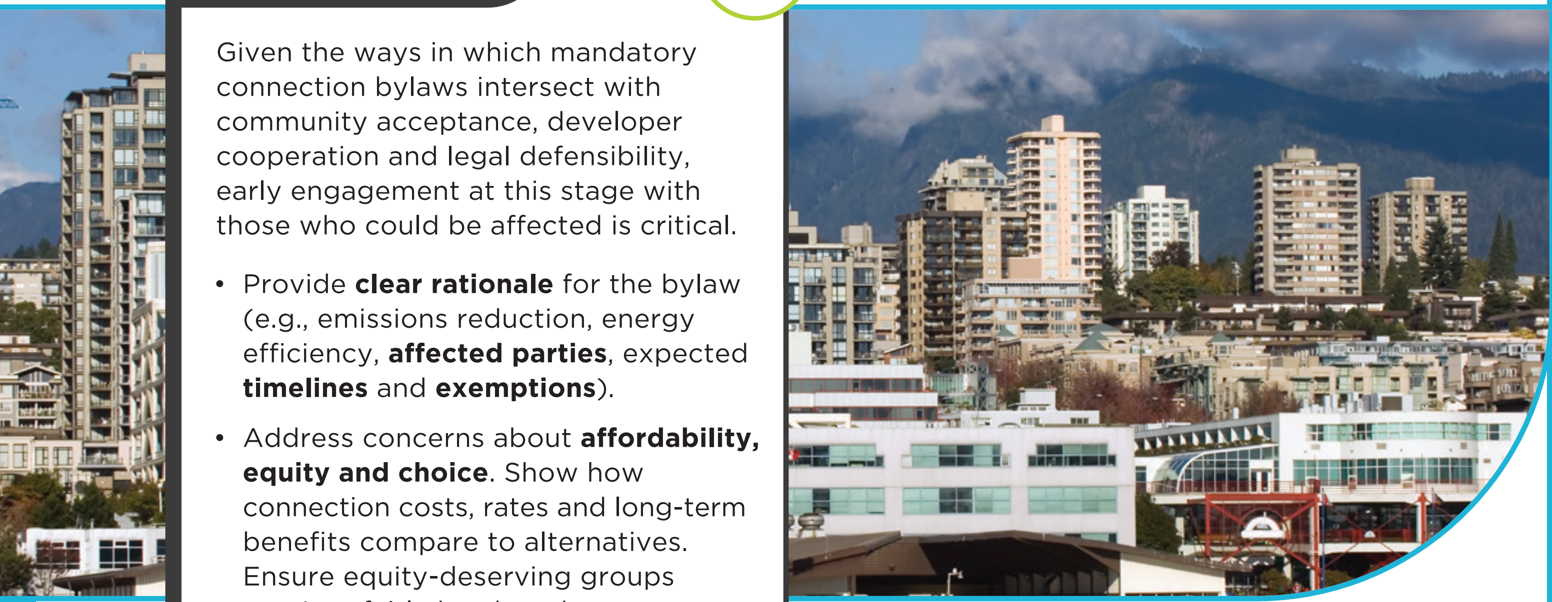
A **mandatory connection bylaw can be enforced through site plan approval** where provincial authorities allow (see Section 2.3). Regardless of whether the TEN utility is municipally owned, municipalities can require a developer to submit a site plan application that demonstrates TEN-readiness, if it is defined in the relevant neighbourhood plan stipulations.

2.2.7 Zoning bylaws

Zoning bylaws cannot require a TEN utility to supply a given building, so on their own they are not enough to catalyze the development of a TEN. However, zoning bylaws can be used to support TENs by containing a **requirement for buildings to include the needed infrastructure to connect** to a TEN.

20 Green Municipal Fund. "A first-of-its-kind geothermal community in Markham: The Berczy Glen Geoexchange Community Energy System." Accessed November 20, 2025.

21 Salas O'Brien. Berczy Glen Development. Accessed November 20, 2025.



STAKEHOLDER ENGAGEMENT CONSIDERATIONS

Given the ways in which mandatory connection bylaws intersect with community acceptance, developer cooperation and legal defensibility, early engagement at this stage with those who could be affected is critical.

- Provide **clear rationale** for the bylaw (e.g., emissions reduction, energy efficiency, **affected parties**, expected **timelines** and **exemptions**).
- Address concerns about **affordability, equity and choice**. Show how connection costs, rates and long-term benefits compare to alternatives. Ensure equity-deserving groups aren't unfairly burdened.
- Provide details on **legal authority**, **ownership** and **accountability** to strengthen buy-in.

Example:

The **District of North Vancouver** has the following conditions tied to rezoning:

- "Technical Criteria for District Energy Ready Buildings," which applies to buildings in specific areas, requires them to install hydronic systems for connection to a future TEN.
- Larger new developments in identified areas are required to have hydronic heating and domestic hot water systems designed to be compatible with a TEN and to provide tie-in points and a dedicated energy transfer station.[22]

2.3 CONSIDER MANDATORY CONNECTION BYLAWS

Municipalities may have the option of putting into place a bylaw that **requires buildings in a certain area to connect to a TEN**. In some provinces, such as BC and Ontario, this authority is limited to instances where the municipality is part of the TEN's ownership structure (see Section 4.1 for details on various ownership structures). This bylaw would be enforced **as a condition of site plan approval**.

When selecting areas for mandatory connection bylaws, municipalities should focus on zones with high TEN potential, as identified in the thermal energy plan or by using land use density designations, which are likely to include those undergoing (re)development.

22 District of North Vancouver. *Technical Criteria for District Energy Ready Buildings.* Accessed November 20, 2025.

Adjacent areas to a TEN can be required to be TEN-ready to streamline future expansion of any TENs. Connection bylaws can be temporary and limited to the scale-up phase of a TEN. They should also build in consumer protection such as transparent rate regulation.

Many mandatory connection bylaws factor in a comparison of energy rates under a business-as-usual scenario with the projected TEN rates. When calculating this, it is important to include all related costs such as energy bills, operations and maintenance costs, capital costs and replacement costs as well as redundancy and efficiency considerations.

2.4 LEVERAGE BUILDING AND PROCUREMENT STANDARDS

Municipalities may have the authority to use various tools to apply standards to new construction, existing buildings or their own municipal buildings. Each application is described in more detail below.

2.4.1 Green development standards

Green development standards (also known as high-performance development standards) refer to municipal requirements for building design that are **more stringent than the provincial building code** on elements of energy efficiency, emissions and resiliency.

Examples of mandatory connection bylaws in Canada

In Edmonton, the Blatchford Renewable Energy Utility Bylaw requires buildings to connect to the City-owned TEN and ensures that "All customer charges will be based upon cost of service and will be at most comparable to what consumers would pay elsewhere in the City of Edmonton in energy utility bills and annual maintenance costs."[23] In addition, buildings that meet a zero-carbon standard are exempt from the bylaw.

Similar bylaws have been implemented in the BC municipalities of Vancouver[24], Surrey [25] and North Vancouver [26] to support TEN development and expansion. In Ontario, Durham Region, along with its lower-tier municipal partner Carlington, is exploring the use of such a bylaw for a public TEN under development.

Other municipalities, such as Montreal and Mont-Saint-Hilaire in Quebec, have used an alternative approach by banning new gas connections.[27, 28] Such bans now require ministerial approval in Quebec.[29] However, this approach is not authorized in all provinces.

23 City of Edmonton. 2022. Blatchford Renewable Energy Utility Bylaw. Accessed October 27, 2025.

24 City of Vancouver. 2024. Energy Utility System By-law No. 9552. Accessed October 27, 2025.

25 City of Surrey. 2012. District Energy System By-law, 2012, No. 17667. Accessed October 27, 2025.

26 Lonsdale Energy. 2025. *Developer Guidelines and Requirements, version 1.2.* Accessed October 27, 2025.

27 Ville de Montréal. Ban on combustion heating devices in new buildings. Accessed October 27, 2025.

28 Ville de Mont-Saint-Hilaire. Règlements municipaux. Accessed November 5, 2025.

29 Gouvernement de Québec. Obtenir l'approbation ministérielle d'un règlement municipal portant sur la performance environnementale des bâtiments. Accessed February 12, 2026.

They are implemented as **conditions of either site plan or subdivision plan approval**. It is important to note that municipalities' ability to adopt and enforce green development standards **depends on the powers granted under provincial legislation and building codes** and that these powers are currently under review in some jurisdictions.

Typically, a green building standard defines multiple tiers, of which the first sets mandatory requirements and the higher tiers are voluntary. A predetermined schedule often defines when the higher tiers are expected to become mandatory. Municipalities often pair voluntary adherence to higher tiers with incentives (e.g., density bonusing, fee reductions) to improve uptake. Green building standards can also pertain only to emissions, as demonstrated in Montreal.

Green building standards enable TEN development by requiring buildings to achieve lower emissions, thus motivating them to **seek out low-carbon heating solutions such as TENs**. To further catalyze TENs, a green building standard could define a compliance pathway specific to a low-carbon TEN.

Ontario municipalities have been leading the way in terms of green development standards, with Toronto, Halton Hill, Ajax, Whitby, Brampton, Markham and Vaughan all having some form of these standards in place.[30] To learn more about green development standards, consult the guide *Towards Low Carbon Communities: Creating Municipal Green Development Standards. An Implementation Toolkit for Municipal Staff*.

STAKEHOLDER ENGAGEMENT CONSIDERATIONS

Especially for standards affecting private buildings, early engagement with those who could be affected is critical. Tips for engagement include:

- Provide clear rationale for the standard.
- Detail the requirements, timelines and performance targets.
- Seek input on compliance pathways, ensuring they are practical and align with existing codes.
- Communicate expected costs, incentives and long-term savings or co-benefits (e.g., energy efficiency, resilience).
- Address concerns about affordability, equity and choice. Show how long-term benefits compare to alternatives. Ensure equity-deserving groups aren't unfairly burdened.
- Explain the revision cycle and process including governance and accountability structure.

30 City of Toronto. Toronto Green Standard. Accessed January 5, 2026.

Examples:

- **Toronto's green development standard** has been in effect since 2010 and includes pre-set performance tiers, with the mandatory tier increasing to net zero by 2030. It is implemented through development permit processes. The standard covers five categories: air quality, energy efficiency/GHG reductions/resilience, water efficiency/ quality, ecological design and solid waste reductions.[31]
- **Montreal's green development standard** requires eligible new buildings to be zero-emission, though it exempts buildings connecting to a TEN, since TENs are captured under another mandate to be zero-carbon.[32]
- **Nanaimo, BC, has adopted a building bylaw** that limits allowable GHG emissions from new buildings.[33] This effectively prevents the use of oil, natural gas and propane as main heating sources due to their high GHG emission factors, thereby encouraging the use of TENs and other low-carbon heating sources.

2.4.2 Building (emissions) performance standards

While green development standards address the performance of new construction, building performance (or emissions) standards address the **energy performance of *existing* buildings**. Building performance standards are typically structured as a **bylaw that sets an emissions reduction schedule** for each building based on its function, age and size. They are one of the few tools at a municipality's disposal that can help reduce emissions associated with existing building stock.

While building performance or emissions standards are becoming increasingly available, they are not yet widely established across all municipalities in Canada. The legal tools, the degree of implementation and the scope (which buildings, emission types, etc.) vary from one province to another.

These building performance standards motivate building owners to look for emissions reduction options, one of which could be to connect to a low-carbon TEN. Such a compliance pathway could be defined by the municipality as one of the approved options in its building performance standard.

2.4.3 Green procurement standards for municipal buildings

Municipalities can set green procurement standards (or sustainable procurement standards) for their own buildings that define how they will **construct new buildings** as well as how they will **maintain and upgrade their existing buildings**. Such standards could require that municipal buildings connect to a TEN if one is available. Green procurement standards for municipal buildings present an opportunity for municipalities to lead by example and **use their purchasing power to catalyze a TEN**. Standards can also apply to entities under municipal influence such as non-profit housing. Public buildings can be anchoring loads that may enable a TEN, which can then expand to neighbouring buildings.

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31 Clean Air Partnership. 2021. *Towards Low Carbon Communities: Creating Municipal Green Development Standards. An Implementation Toolkit for Municipal Staff.*

32 Ville de Montréal. *By-law concerning GHG emission disclosures and ratings of large buildings*. Accessed November 20, 2025.

33 City of Nanaimo. Natural gas in Nanaimo: here are the facts. Accessed November 5, 2025.

2.5 EXPLORE FINANCIAL TOOLS

Municipalities have many tools to help enable the financial viability of a TEN. These differ depending on whether it is owned by the municipality or a private entity. See Section 2 for costs related to local infrastructure and the tools available to municipalities to support private investments. There are more details on these options in GMF's Municipal Energy Roadmap.[34]

2.5.1 Financial support for municipal TENs

When municipalities are part of a TEN's ownership structure, they can leverage financial supports available only to municipalities, which are often **more competitive than those available to the private sector**.

Municipalities can also leverage in-house tools to fund TENs, including issuing **green bonds, municipal debentures or municipal loan guarantees** to raise capital for infra-structure. Municipally owned entities such as municipal utilities or energy service companies (ESCOs) may access private financing markets for project financing.

2.5.2 Hybrid investment models

Hybrid investment models enable municipalities to maintain ownership of a TEN utility while **leveraging the expertise and investment of the private sector**. Municipalities can either jointly invest in the TEN infrastructure (i.e., a public-private partnership) or maintain full ownership of some assets while the private sector owns others (i.e., split asset ownership). See Section 4.1.2 for more details on these hybrid ownership structures. In both cases, the municipality shares some of the financial risk with the private sector. In BC, for example, City of Richmond municipal corporation Lulu Island Energy Company has entered a public-private partnership with Corix Infrastructure Inc. under which Corix designs, builds, finances and operates the TEN system[35].

2.5.3 Innovative financing solutions

To finance connection costs incurred by private building owners, municipalities may provide financing support through **loans tied to the property** such as local improvement charges. Alternatively, local **utilities may offer on-bill financing** to building owners to cover their connection costs.

2.5.4 Incentives and grants

Municipalities in some jurisdictions can offer **grants or rebates** to building owners who connect to the thermal energy network (e.g., through community improvement plan mechanisms). These rebates may take the form of **connection subsidies** for early adopters to improve the business case and reduce upfront costs. For existing buildings, incentives can also be structured as **boiler buy-back programs**.

34 FCM. "Green Municipal Fund's Municipal Energy Roadmap." Accessed October 1, 2025.

35 International District Energy Association. 2018. "Richmond, BC, and Corix partner on City Centre district energy program." *District Energy*.

2.5.5 Development charge rebates

Development charges are the fees paid by new developments to cover their portion of relevant municipal service expansions. Municipalities may be able to provide **discounts on development charges** for certain building types if legislation allows. For example, Toronto provides a partial rebate of its development charges to buildings that meet the higher tiers of its green development standard. Similarly, North Vancouver has rebated development charges for rental units. Likewise, such rebates could be used to encourage developers to connect new buildings to a TEN.

2.6 REVIEW RIGHT-OF-WAY AND LAND USE/ SALE PROVISIONS

2.6.1 Right-of-way access agreements

Utilities operating TENs typically need access to the underground space below public land such as streets and sidewalks for piping infrastructure. Access to this right-of-way space, also referred to as a servitude or easement, is managed by the municipality. Typically, municipalities define the **process and cost for granting access to the right-of-way**. In dense urban areas there is often high demand for this underground space. As such, fees and wait times for municipal approval can be substantial, which can present barriers to TENs. Municipalities looking to catalyze TEN development can reduce these fees and/or wait times.[36]

2.6.2 Land sale and use provisions

Municipalities can support TEN development by providing **access to municipal land** for energy hubs or pumping nodes. Municipal parks, green spaces, roads, pathways or easements can host geoexchange or thermal storage infrastructure and still maintain their surface uses. Because TENs occur in high-density areas with expensive land costs, this access to public land is extremely valuable.

When municipalities plan to sell or lease their land, they can attach **"green strings" as provisions of sale or lease**. One such provision could pertain to a TEN, such as requiring buildings to connect, or stipulating that some of the land be used for TEN utility infrastructure.

In **Edmonton**, the City sold the land where the **Blatchford development** is being constructed. As a provision of the sale, the municipality required the development to connect to the municipal TEN utility. An exemption was given to buildings that could prove net-zero emissions without connection.

36 Note that, in Ontario, the Municipal Act dictates that electric and gas utilities cannot be charged a fee for access to the right-of-way space; however, that same exemption does not extend to TENs. Clean Air Council and Clean Air Partnership. May 2024. *Model Franchise Agreement Review.* Accessed October 27, 2025.

STAKEHOLDER ENGAGEMENT CONSIDERATIONS

Public engagement can ensure all perspectives are considered when deciding on appropriate uses for public land. This engagement should gather input not only from current land users but also from potential future users. The engagement process can take place as part of the development of a larger municipal land use strategy or on a project-by-project basis. As with all public engagement, an accessibility and inclusion lens should be applied to ensure that the project takes into consideration ways to protect equity-deserving residents.

2.7 DEVELOP A WORKING GROUP AND BUILD CAPACITY

To effectively explore the feasibility of a thermal energy network, a municipality should convene a cross-sector working group that brings together **technical expertise, local energy system knowledge, policy insight and user perspectives**. Such a working group may already exist from previous municipal engagements for developing climate-change or community-energy plans.

When developing the working group, clearly define its **mandate, objectives, structure and work plan** to ensure that discussions remain focused on actionable outcomes and inform future planning or procurement processes. Initially, the group may have an objective of education and capacity building, following which it may focus on more-specific decision points. The group can also be divided into sub-groups to streamline conversations.

Key stakeholders for the **working group** should include:

- Relevant municipal departments, including finance, legal, environment, planning, public works, economic development and wastewater.
- Local utilities: electricity, natural gas and any existing thermal energy providers.
- Representatives from large energy users: hospitals, post-secondary institutions and major commercial developers and buildings.
- Provincial or territorial energy agencies: utility board regulators.
- Private-sector experts: engineering or thermal technology firms.

STAKEHOLDER ENGAGEMENT CONSIDERATIONS

At this stage, parallel to developing a working group, the municipality may also need to build capacity, both internally and in the community. Training municipal staff can help the municipality make informed decisions. To build external capacity and integrate a multitude of perspectives when screening for TENs, the municipality should consider **providing educational opportunities and engaging the following stakeholders**:

- Community or resident associations,
- Indigenous communities,
- Local business associations or chambers of commerce,
- Equity-deserving groups (e.g., newcomers to Canada, non-binary persons, persons living with disabilities, racialized persons), and
- Contractor associations and training institutions.

2.8 KEY TAKEAWAYS

- Municipalities play a central role in enabling TENs due to the many policy and financial levers at their disposal.
- Federal and provincial regulations (e.g., energy codes, carbon pricing, emissions standards) help shape the business case for TENs.
- TENs can be embedded into various **municipal planning processes**:
  - Official plans, community energy plans, neighbourhood plans, subdivision and site plans and zoning bylaws all have a potential role to play in TEN development.
  - **Thermal energy plans** developed collaboratively by municipalities and utilities are emerging as a leading practice to optimize heating/cooling in defined areas.
- **Mandatory connection bylaws** may be implemented, though authority is often limited to municipally owned systems.
- Standards are another tool to support TENs, including:
  - **Green development standards,** which require new developments to be more energy efficient than provincial codes.
  - **Building performance standards,** which set emissions limits for existing buildings.
  - **Green procurement standards** pertaining to the emissions and efficiency of municipal buildings.
- Municipal land and infrastructure can be leveraged in support of TENs through:
  - Affordable access to the **underground right-of-way** for pipes.
  - **Land sales** with TEN-related requirements.
- Municipalities can **financially support** public or private TENs through:
  - Green bonds and debentures.
  - On-bill financing and local improvement charges.
  - Incentives such as rebates, boiler buy-back programs and development charge discounts.

3. ASSESS TECHNICAL FEASIBILITY & BUSINESS CASE

This chapter provides a high-level overview of steps and considerations municipalities should keep in mind when screening, developing and executing a specific TEN opportunity.

3.1 AUTHORITY AND REGULATORY REVIEW

A review of relevant authorities, regulations and legislation is an important step to identify which governments (municipal, provincial, federal) have authority over land use, energy infrastructure and utility regulation. This review is important to ensure legal feasibility and alignment with planning and permitting processes.

Key steps in a jurisdictional authority review include:

- Identifying relevant permitting bodies and utility regulators,
- Clarifying land ownership and rights-of-way, and
- Determining if Indigenous governance structures or treaty rights apply.

See Section 2.1 for more details on the authorities and legislation of each government.

3.2 TEN TECHNICAL ASSESSMENT

There are four key steps for the technical assessment of a TEN, from pre-feasibility study all the way to construction and operations. These are summarized in Table 3.

TABLE 3: STAGES OF THE TECHNICAL AND BUSINESS CASE ASSESSMENT

Pre-feasibility study

Purpose	Main components
Assess **technical and economic potential** to inform go/no-go decisions	• Initial **mapping** of heat sources • Identification of **anchor loads** (e.g., municipal buildings, hospitals, schools) • Modelling **future development** growth (greenfield and infill) and forecasting **thermal energy demand** • Class D **cost estimates** • Potential **business models** See Appendix A for an outline of a pre-feasibility study

Preliminary design & business case

Purpose	Main components
Secure **stakeholder buy-in and financing**	Defines: • Thermal **energy sources** • **Layout** and hub locations • **Pipe** configuration and sizing • **Financial** model (capital and operating costs and revenues) • **Ownership** model • **Risk** mitigation plan • **Funding** strategy

Detailed design

Purpose	Main components
Ensure **technical accuracy and regulatory compliance**	• **Engineering** specifications for all components • Finalized **route** planning and **interconnection** details • **Permitting** and **procurement** planning • Construction-ready **drawings** • **Tender documents** for contractors

Construction & operation

Purpose	Main components
Define activities for construction and operation, and **coordinate** with relevant utilities/ municipal services	Construction: • **Trenching** and pipe installation • **Energy hub** build-out and commissioning Operation: • Clearing **governance framework** • Defining project management plan • Hiring **staff** • Developing **billing systems** and **maintenance and monitoring protocols** • Onboarding **customers** • Performing **recommissioning** or performance **optimization** processes

3.3 TECHNICAL DESIGN CONSIDERATIONS

Several considerations, each described below, must be taken into account during a project's screening and development phases, including:

- Deciding which distribution model and temperature is most suitable for the project,
- Identifying anchor loads such as municipal buildings that could support a TEN's commercial viability, and
- Identifying municipal land that could be used for TEN infrastructure.

3.3.1 Thermal energy distribution models

Outlined below are two main distribution model designs—fourth-generation and fifth-generation—currently used for new TENs. Earlier generations of thermal energy networks (first–third) are no longer desirable because their high operating temperatures create high thermal energy losses, limit integration of renewable and waste heat and make them inefficient, costly and inflexible for modern decarbonized energy systems. The choice between fourth- and fifth-generation models is site and context dependent, as both can be very efficient. Many TENs are hybrids, combining features of both fourth- and fifth-generation systems. Table 4 outlines some of the key differences between the two and respective applications.

TABLE 4: KEY FEATURES AND APPLICATIONS OF FOURTH- AND FIFTH-GENERATION TENS

TEN feature	Fourth generation	Fifth generation
Temperature	Low (50–70°C)	Ambient (10–25°C)
Number of pipes	2 or 4—supply and return for heating and cooling, if included.	1 or 2
Flow direction	Unidirectional	Bidirectional, buildings may provide thermal energy back to loop.
Thermal energy production	Energy hub delivers thermal energy to buildings.	Heat pumps in each building generate the necessary temperature.
Technical consideration	Requires an energy hub and skilled operating staff.	Can require fewer operational staff when heat pumps are managed by building operators. May require larger pipes and offer less centralized thermal storage, reducing peak-shaving and grid-balancing capability compared with central-plant systems.

TEN feature	Fourth generation	Fifth generation
Application	Ideal for mixed-use developments or variable climate zones. Can leverage waste heat sources.	May be more viable in lower-density areas. May be able to leverage a low-grade waste heat source.
Main benefits	Less space needed in buildings. Easier for retrofit applications. Easier to maintain and restore in emergency situations.	Less heat loss from pipes. Minimal underground infrastructure.

3.3.2 Municipal land and anchor loads

Municipalities can use their land and buildings to help catalyze a thermal energy network by providing sufficient energy demand and/or facilitating land access for critical equipment.

Municipal buildings such as recreation centres, offices and residences are often large, consistent energy users. Such buildings can provide stable demand, enabling a TEN's financial viability. By committing to long-term energy purchase agreements for their buildings, municipalities can form the foundation of a viable business case for a TEN's establishment. Some municipalities pass green procurement standards for their own buildings, which can further provide confidence for a TEN developer looking for load aggregation (see Section 2.4.3 for more details).

Municipalities can also support TEN development by providing access to municipal land for energy hubs or pumping nodes, as discussed in Section 2.6.1.

3.4 KEY TAKEAWAYS

- Municipalities should begin by **reviewing relevant authorities and regulations** to ensure alignment with legal authorities and planning processes.
- A **pre-feasibility study** assesses technical and economic potential, including mapping heat sources, identifying anchor loads, forecasting demand and estimating costs.
- **Preliminary design and business case** development includes defining energy sources, layout, pipe configuration, financial and ownership models and risk mitigation strategies.
- Municipal buildings can serve as **anchor loads** and public land can **host infrastructure** such as energy hubs and geothermal wells.
- **Detailed design** involves finalizing engineering specifications, route planning, permitting, procurement and preparing construction-ready documents.
- **Construction** includes trenching and pipe installation as well as commissioning energy hubs and energy transfer stations in customer buildings (if used).
- **Operation** involves governance set-up, staffing, billing systems, maintenance protocols and customer onboarding.

4. EVALUATE OWNERSHIP AND GOVERNANCE OPTIONS

Before deciding on an ownership structure, it is important to **review the range of policy tools** available as well as the economic regulation landscape (specifically referring to the regulation of rates and utilities' infrastructure investments) in the specific province or territory. When doing so, note that the range of policy tools available to de-risk a project may vary from site to site within the same municipality, depending on the development approvals process and land ownership. It is also important to leverage the input of a working group of relevant internal and external stakeholders to **build a common vision and understanding** of the respective strengths and limitations of each player (see Section 2.7 for details). With the authority and regulatory review complete and the working group engaged, the municipality can evaluate the various ownership models detailed in Section 4.1.

4.1 DETERMINE OWNERSHIP MODELS

The selection of a preferred ownership and delivery model for a TEN is based on a combination of factors including:

- The availability of policy tools for reducing connection risk;
- The municipality's desire for control over the TEN (climate goals, rate affordability, etc.);
- Financial resources;
- The presence or absence of economic regulation by the provincial energy board or utilities commission; and
- The expertise of local stakeholders.

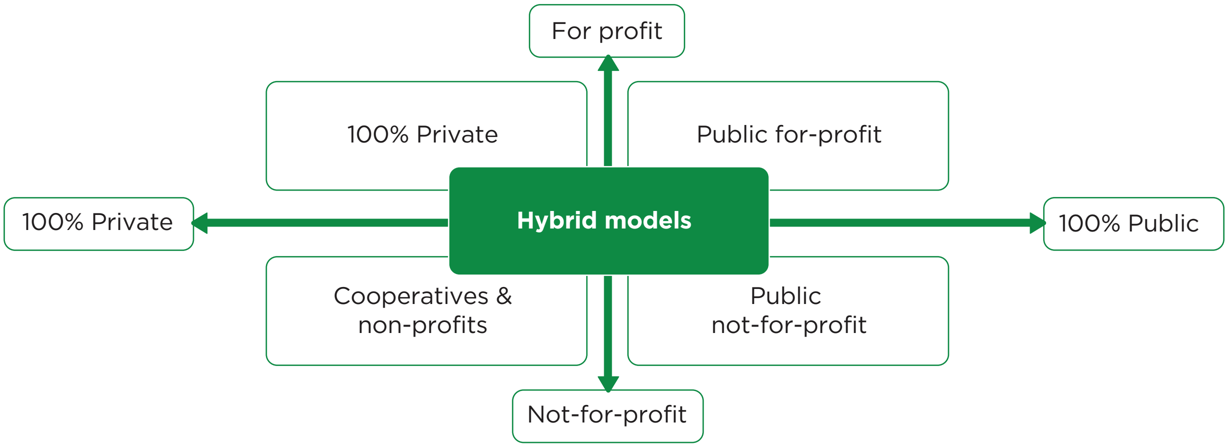
In jurisdictions where municipalities clearly have the **authority to mandate connection** to a TEN, and where municipally owned TENs are **excluded from economic regulation** by the provincial utilities commission or energy board (if applicable), there is a **very strong case for municipal ownership**.

In jurisdictions where municipal authority to mandate connection **is absent or unclear, other forms of ownership may be more appropriate**, especially if the municipality can leverage other types of policy and planning tools to enable TENs. In cases where a municipality can facilitate TEN development without municipal ownership, economic regulation can help address the challenges of setting up a new utility, for instance by ensuring continuity of service, customer protection against unfair rates and the ability to adjust rates over time to reflect incremental investment in the system. Avoiding economic regulation by a provincial utility board/ commission is likely not a sufficient basis on its own for selecting municipal ownership.

Municipal ownership typically provides the greatest degree of control over rates and affordability as well as GHG emissions. With municipal ownership, municipalities can determine how best to manage competing priorities such as affordability, cost recovery and environmental performance.

Each TEN falls along a continuum from fully public to fully private and there are examples of both for-profit and not-for-profit municipal TEN utilities (see Figure 3). Between fully public and fully private, there are **many hybrid models** with varying degrees and variations of shared ownership or governance, and all models offer success stories and lessons to learn from. **Success often depends more on the context, design and quality of execution than on the model itself.**

Figure 3: Spectrum of ownership structures for TENs



4.1.1 100% public ownership

Full public ownership is the **most common model globally** for TENs. It often takes the form of municipal ownership (often in the form of a government business enterprise or a local government corporation), though it can also include ownership by other public-sector entities such as regional governments, state/provincial agencies or social housing agencies.

Municipal ownership gives municipalities **the most control** over what a TEN aims to achieve and how it is delivered. Outcomes important to the public sector go beyond commercial goals of affordability, reliability and profitability and often include broader climate, environmental, equity, resilience and economic-development considerations. This structure allows municipalities to determine an acceptable balance across multiple objectives and to select the specific means of achieving the desired outcomes (e.g., particular service areas, technologies, financing models, rate structures, rates).

Municipal ownership provides greater opportunities for **low-cost financing, grants and other direct contributions** for public benefits, which can help reduce tensions between service affordability and other policy objectives. However, municipal ownership also requires municipalities to have access to adequate capital for investment.

There are many variations of municipal ownership, from internal departments to stand-alone subsidiaries with varying degrees of autonomy. In some cases, TENs can also be delivered via other wholly owned municipal utilities. **Municipal ownership can be very helpful in the early stages** of TEN development and can enable more direct control over risks that might hinder private-sector investment or increase private-sector financing costs.

The risk that buildings will opt not to connect to TENs, known as **connection risk, is often the primary impediment** to setting up a TEN or transitioning existing networks to low-carbon energy, particularly in the absence of other supporting policies. **Municipalities can reduce connection risk** through close coordination of TEN development with municipal policy/planning or mandatory connection policies (as outlined in Chapter 2). Municipal ownership may increase public acceptance of and legal support for mandatory connection policies.

In jurisdictions where TENs are regulated, **municipal systems are typically exempt** from regulation. This may be a further driver for municipal ownership as it avoids the additional layer of oversight by a public utilities commission that applies to other ownership models.[37]

DRIVERS OF MUNICIPAL OWNERSHIP OF TENS

- Ability to implement mandatory connection policies (varies by jurisdiction).
- Ability to access lower-cost debt and grants.
- Ability to set rates.
- Ability to control low-carbon outcomes.
- Coordination of TEN development with municipal policy/planning.
- Exemption from economic regulation (varies by jurisdiction).

37 While economic regulation can enhance transparency and accountability, the form of regulation can also increase administrative burdens, risks, uncertainties and constraints that may hinder the development or expansion of TENs that are aligned with municipal policy objectives.

Municipal ownership with long-term service contracts

There are many examples of municipal TENs that **secure services from the private sector without transferring ownership** or control. These services can include design, construction, operation and maintenance and may even include financing support. By outsourcing services, municipalities can maintain control while reducing demands on organizational capacity or capital, accessing industry-specific expertise and transferring some risk and profit opportunity to the private sector. Lulu Island Energy Company's 30-year design, build, finance, operate and maintain (DBFOM) contract with Corix Utilities is an example of this form of municipal ownership.

DRIVERS OF MUNICIPAL OWNERSHIP WITH LONG-TERM SERVICE CONTRACT

- Access to private capital for construction.
- Access to private-sector expertise for delivery.
- Risk transfer to the private sector in exchange for revenue opportunity.

4.1.2 Hybrid ownership models

Many of the **benefits of municipal ownership can be secured through hybrid models** with private-sector entities providing specific elements. The success of these arrangements depends on appropriate ownership or governance arrangements. Hybrid ownership models can reduce or eliminate capital and organizational demands on municipalities while also transferring risk and securing additional expertise. Municipalities can focus on defining the objectives of the TENs and leave operational details to the private partner.

Governance can be more complicated and nuanced in hybrid ownership models, and in jurisdictions that regulate district energy, they introduce regulatory complexity. Furthermore, private ownership, even when partial, tends to increase financing costs and constrain the balance between financial returns and public benefits that is possible under direct public ownership.

Public-private partnerships

Public-private partnerships often take the form of **joint ventures (shared public and private ownership)**, with contracts governing the relationships among assets and owners. For example, both Oslo[38] and Stockholm[39] have large TENs that are joint ventures between the municipalities and private investors or companies.

38 C40. Good Practice Guides: Oslo - Broad set of supportive tools. Accessed January 5, 2026.

39 Nordic Investment Bank. Stockholm Exergi: Where carbon turns to stone. Accessed January 5, 2026.

Split asset ownership

A split asset ownership arrangement involves **municipal ownership of a portion of the infrastructure** and private ownership of the balance of the TEN system.

For example, Metro Vancouver, which owns an existing waste-to-energy plant, is building new heat recovery and transmission infrastructure to sell heat under a long-term supply contract to a private TEN company in Vancouver. Metro Vancouver is also exploring the possibility of extending piping infrastructure and selling heat to a new municipally owned TEN in Burnaby.[40]

Strategic partnerships

Strategic partnerships do not involve ownership by municipalities but rather **strategic participation in exchange for public benefit**. For example, in exchange for securing public benefits (such as GHG reductions), a municipality could support a private TEN utility in ways such as:

- Providing access to land, resources and infrastructure (possibly on favourable terms);
- Contributing land or infrastructure paid for by the municipality (on favourable terms);
- Committing to connect municipal buildings or to include connection requirements as a condition when selling municipal land to developers;
- Committing to align policies to encourage connection to TENs (e.g., green building policies, accelerated permitting processes for developments connecting to TENs or property tax rebates for buildings connected to TENs);
- Coordinating installation of municipal and TEN infrastructure;
- Accelerating permitting process for TEN projects; or
- Providing property tax rebates for TENs (in cases where private TENs are required to pay property taxes) or for properties that connect to approved TENs.

Private TEN utilities may be incented to work with municipalities via strategic partnerships in order to protect their existing assets or to secure and de-risk new investment opportunities.

DRIVERS OF HYBRID OWNERSHIP MODELS

- Ability to retain control over specific assets.
- Ability to share energy between systems.
- Ability to leverage municipal authority to mandate connection while accessing resources owned by other parties, including the private sector.

4.1.3 100% private ownership

Privately owned TEN utilities are **more common in markets with little or no economic regulation of private TEN systems**, particularly in the United States, but also in parts of Canada and Europe. These private owners might be dedicated TEN utilities, gas and electric utilities or property developers (e.g., large master-planned developments with TENs).

40 Metro Vancouver. Waste-to-Energy Facility District Energy System. Accessed January 5, 2026.

Some private systems emerge out of systems that were previously publicly owned (e.g., the Enwave district heating and cooling system in downtown Toronto). Others have emerged in response to unique commercial opportunities to provide competitive energy services through economies of scale and efficiency.

Regardless of how they came about, most private systems **serve primarily commercial interests including competitive rates, reliability and investor profits**. Private systems can evolve in response to policies and incentives such as new building standards, carbon pricing or other environmental regulations. This is the case for some new private TENs in large master-planned communities facing higher environmental standards or expectations.

DRIVERS OF PRIVATE OWNERSHIP

- A municipality lacks access to capital or the expertise to own a TEN.
- The business case is not attractive enough to entice the municipality to develop the utility structure.
- The municipality can indirectly ensure the delivery of a TEN to serve a specific area through the use of planning and development approval processes and other policy tools (such as green building standards with carbon intensity limits).

4.2 IDENTIFY THE PREFERRED TEN OWNERSHIP AND DELIVERY MODEL

Once a municipality has established an understanding of the local context with respect to enabling policies and economic regulation and has defined its objectives related to GHG reductions, affordability and financial involvement, the next step is to evaluate how well different ownership models serve its goals and to identify the preferred ownership model(s) for further investigation.

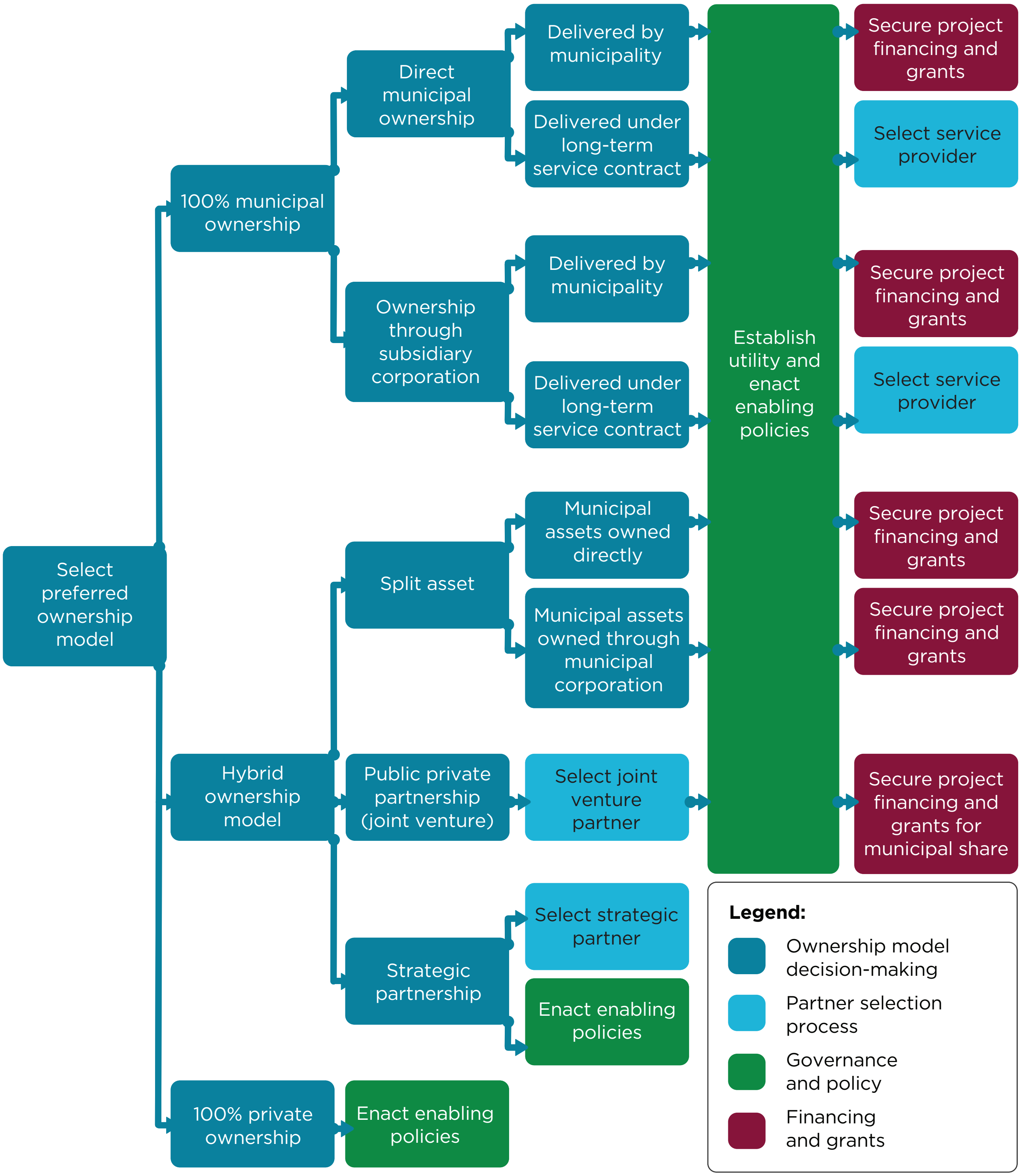
Table outlines an ownership model evaluation matrix. It may be amended to reflect a municipality's local context and specific objectives. The shortlisting or selection of a preferred ownership model may be only the first in a series of decisions based on additional due diligence as shown in Figure 4.

TABLE 5: OWNERSHIP MODEL EVALUATION

Ownership model	Municipal financial exposure	Ability to mandate connection	Municipal control over rates	Municipal control over GHG outcomes	Exemption from economic regulation[41]
Municipal	(Negative) Highest risk, mitigated through mandatory connection bylaw	(Positive) Highest potential to use mandatory connection bylaw	(Positive) Highest	(Positive) Highest	(Positive) Yes
Municipal with long-term service contract	(Positive) Potentially no risk	(Positive) High potential for mandatory connection bylaw	(Positive) Potentially same as full municipal ownership	(Positive) Potentially same as full municipal ownership	(Positive) Maybe—potentially same as full municipal ownership
Hybrid (PPP, split asset, strategic partnership)	(Positive) Depends on arrangement	(unclear) Depends on arrangement	(unclear) Depends on details of agreement	(Negative) Likely requires GHG regulation via performance standards	(Negative) Unlikely—potentially same as private ownership
Private ownership	(Positive) Typically none	(Negative) Limited, most likely for projects on municipally owned land	(Negative) Limited	(Negative) Likely requires GHG regulation via performance standards	(Negative) No

41 Only relevant in BC, where private TEN utilities face economic regulation.

Figure 4: Decision tool to select preferred ownership model



4.3 KEY TAKEAWAYS

100% public ownership model:

- Highest municipal control
- Financing through municipal capital, grants, low-cost debt
- Moderate complexity (depends on internal capacity)
- Municipality bears most financial and operational risk
- Steps to implement:
  - Determine form of ownership (i.e., direct municipal ownership or municipal corporation)
  - Enact enabling policies
  - Secure financing/funding agreements
  - Select a utility service provider (if applicable)

Hybrid ownership model:

- Partial municipal control
- Financing through shared public-private investment
- High complexity (requires coordination and governance)
- Shared risk (depends on agreement terms)
- Steps to implement:
  - Define partnership structure and roles
  - Negotiate agreements and responsibilities
  - Align municipal policies to support TENs
  - Secure financing and land/infrastructure access

100% private ownership model:

- Lowest municipal control
- Financing through private capital
- Moderate complexity (depends on internal capacity)
- Low risk for municipality; high risk for private entity
- Steps for the municipality to implement:
  - Enact enabling policies
  - Select a utility partner
  - Facilitate land access and permitting
  - Align development approvals with TEN goals

5. CONCLUSION

Thermal energy networks (TENs) represent a transformative opportunity for Canadian municipalities to advance climate action, energy resilience and sustainable economic growth. By leveraging their unique planning authority, policy tools and convening power, municipalities can catalyze the development and expansion of TENs—whether through direct leadership or strategic partnerships.

This guidebook has outlined a practical, step-by-step framework for municipal staff, from embedding TENs in planning documents and developing robust thermal energy plans to implementing enabling policies and standards and evaluating ownership and governance models. Success hinges on intentional cross-departmental coordination, regular stakeholder engagement and a commitment to capacity-building within both municipal teams and the broader community.

Municipalities are encouraged to:

- **Integrate TENs into planning documents and processes** to ensure long-term alignment with municipal objectives.
- Consider **developing a thermal energy plan** to identify optimal locations for thermal energy networks.
- **Use policy levers** such as zoning bylaws, mandatory connection policies and building and procurement standards to create a supportive environment for TENs.
- **Leverage municipal buildings and land** as anchor loads and infrastructure sites, maximizing public benefit and financial viability.
- **Explore innovative financing options**, including grants, green bonds and public-private partnerships, to de-risk investments and accelerate implementation.
- **Convene cross-sector working groups** and **engage diverse stakeholders** to build consensus, foster innovation and ensure equitable outcomes.

After taking these critical steps, the municipality will be ready to advance a TEN project and:

- Conduct a **pre-feasibility study** to assess loads, energy sources and infrastructure needs.
- **Assess the technical feasibility** and **business case**.
- **Evaluate ownership** and **governance options**.

Ultimately, the path to successful TEN deployment is not one-size-fits-all. Municipalities must tailor their approach to their local context, objectives and resources—aligning climate resilience, affordability and economic development with the right mix of technical design, policy support and governance structure. By leading with vision, collaboration and a clear roadmap, municipalities can unlock the full potential of thermal energy networks and deliver lasting benefits for their communities.

APPENDIX A: OUTLINE OF A TEN PRE-FEASIBILITY STUDY

1. **Project kickoff and information requests**
2. **Energy demand forecast and GHG emissions targets**

- Identify potential TEN customers:
  - New buildings (floor area projections, timing of development), and/or
  - Existing buildings (building size, energy use).
- Confirm GHG performance objectives for TEN scenarios and reference case.

3. **Qualitative screening of low-carbon energy sources and TEN configurations**

- Develop a long list of low-carbon energy sources for the TEN based on the local context.
- Complete qualitative screening of energy sources and TEN configurations to shortlist up to three scenarios for quantitative analysis.

4. **TEN concept development**

- Develop high-level technical concepts for the shortlisted TEN scenarios to inform the preparation of a class D or class 4 capital cost estimate.
- Prepare a basis of costing memo for the TEN concepts and provide it to a cost consultant for capital cost estimation.
- Quantify space considerations for the TEN options.

5. **Reference case development**

- Develop a technical concept for a building-scale alternative to TEN connection that will achieve the same level of carbon outcomes (the reference case).
- Prepare a basis of costing memo for the reference case and provide it to a cost consultant for capital cost estimation.
- Quantify space considerations for the reference case.

6. **Lifecycle cost and emissions analysis for TEN and reference case**

- Complete a lifecycle cost analysis of the TEN scenarios and the reference case to evaluate their relative costs and GHG performance. For new TENs, this can include considerations of embodied carbon impact.

7. **Final report**

- Summarize the data inputs, assumptions and methodology of the pre-feasibility study.
- Summarize the load forecast, GHG targets, energy source and TEN concept screening steps.
- Summarize the lifecycle cost and emissions analysis.
- Recommend a preferred low-carbon pathway (TEN or reference case).
  - Recommend a preferred TEN concept for further study (if applicable).
- Recommend next steps.

APPENDIX B: GLOSSARY OF TERMS

Basis of costing memo: A document that outlines the assumptions, methodology, data sources and rationale behind a project's cost estimates.

CEP: Community energy plan or community emissions plan

CIB: Canada Infrastructure Bank

Class D (or class 4) estimates: Preliminary cost estimates with -20% to +30% accuracy, used to inform directional decision-making.

Community energy plan or community emissions plan: A strategic roadmap developed by a municipality or community to guide local action on reducing greenhouse gas (GHG) emissions and improving energy efficiency. A community energy plan focuses more narrowly on how energy is produced, distributed and used within a community, while a community emissions plan centres on reducing GHG emissions from all community sectors (buildings, transportation, waste, land use, etc.), not just energy.

FCM: Federation of Canadian Municipalities

Fifth-generation TENs: Thermal energy networks piping water at ambient temperatures (10–25°C) without a central heating/cooling plant. Instead, each building operates its own heat pump to meet its thermal energy needs.

Fourth-generation TENs: Thermal energy networks with centralized heating and cooling plants and one directional flow. In heating mode, they operate at temperatures around 50–70°C.

GHG: greenhouse gas

GMF: Green Municipal Fund

Green building standards (also known as green development standards or high-performance development standards): Municipal requirements for new developments that pertain to energy efficiency, resiliency or other environmental performance elements and are more stringent than the provincial building code.

Neighbourhood plan (also known as a secondary plan or area plan): A land-use planning document that builds upon the policies of a municipality's official plan and provides more-detailed direction for the development or redevelopment of a specific area within a municipality.

NRCan: Natural Resources Canada

Official plan (also known as an official community plan or a municipal development plan): A long-term policy document adopted by a municipality that lays out the community's vision for growth over the next few decades.

Site plan: A detailed technical drawing that shows how a new development will interact with public infrastructure and comply with local bylaws.

Subdivision plan: A detailed technical drawing that depicts lot divisions and public infrastructure needs in a specific area.

tCO_2e/yr: Tonnes of carbon dioxide equivalent emissions per year

Thermal energy networks (TENs) (also known as district energy systems or district heating and cooling): Networks of pipes and associated thermal energy sources distributing thermal energy to a group of connected buildings or energy users.

TEN-ready: Having the infrastructure in a building needed to connect to a TEN, including allocating space for future energy transfer stations, installing two-way thermal piping and using low-temperature hydronic heating systems.