CCET
Centre for Community Energy Transformation

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UNLOCKING ONTARIO'S LOW CARBON FUTURE WITH *DISTRICT ENERGY*

Collaborative Strategies, Governance Models, and Innovations to Drive Ontario's Transition to Low-Carbon Thermal Networks

Co-Authored By

Tony Iacobelli, Centre for Community Energy Transformation
Max Lauretta, Royal Danish Consulate General in Toronto
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Opening Remarks

Building low carbon district energy systems at community scale in Ontario requires bringing together an ecosystem of players adding their expertise to set out the ownership, financing, design, construction and maintenance of the thermal network. CCET was established to be such a convenor, and to work with municipalities and partners to implement district energy solutions as part of municipal decarbonization goals.

Alongside energy transition objectives, the main drivers of district energy solutions in Ontario are business cases. The economic development rationale is realized through benefits such as centralized equipment, reliable and readily available technology, use of local and renewable resources, and being cost-competitive for the end user. These solutions are enabled through municipal policy and practices. District energy solutions are an example of “systems thinking” to address the energy transition challenges.

Attracting over 150 attendees, the November 5, 2024 workshop, Unlocking Ontario’s Low Carbon Future with District Energy, shows the interest in such a systems approach to solving decarbonization challenges. CCET thanks our event partners, Peel Region and the Royal Danish Consulate General, and all the contributors and attendees for the successful workshop.

Peter Love, Board Chair, CCET

To succeed in meeting the energy challenges of today and tomorrow we must continue to work together in new and innovative ways. Peel Region has recognized the significant community benefits of low carbon district energy systems which is why we played a key role advancing the Lakeview district energy project.

If planned well, thermal energy networks can play a crucial role, not just in offsetting electricity supply constraints, but help meet our climate goals and keep energy affordable over the long term. Peel will continue to promote, encourage and support low carbon developments that include collaborative district energy system planning for the benefit of generations to come.

Davinder Valeri, Commissioner and CFO, Peel Region

Denmark has long been a global leader in district energy, and we are proud to have partnered with Ontario’s energy, finance, and municipal leaders to facilitate knowledge-sharing and exchange of best practices.

As demonstrated in Denmark and other leading markets, district energy systems are a proven solution for decarbonizing urban environments while enhancing energy efficiency and resilience. The discussions at this workshop underscored the need for a coordinated approach that integrates strong policy frameworks, innovative financing mechanisms, and public-private partnerships. By working together across sectors and borders, we can accelerate the deployment of low-carbon district energy systems and support Ontario’s ambitious climate goals. We look forward to continued collaboration and the implementation of the insights gained from this workshop to help shape a more resilient and sustainable built environment.

Karina Bech, Consul General & Trade Commissioner, Royal Danish Consulate

Executive Summary

The "Unlocking Ontario's Low Carbon Future with District Energy" workshop brought together energy transition experts, finance professionals, and sustainability specialists to explore strategies for advancing low-carbon district heating and cooling systems in Ontario. The main challenge for the day's discussions for the 150 attendees and 23 presenters was to identify key elements of building thermal networks at community scale. This report synthesizes insights, best practices, and implementation strategies discussed during the workshop, organized by the Centre for Community Energy Transformation (CCET), The Royal Danish Consulate General in Toronto, and the Peel Region.

District energy systems play a crucial role in Ontario's climate action strategy, supporting the province's goal to reduce emissions by 30% below 2005 levels by 2030. Several successful implementations across Canada demonstrate the viability and impact of these systems, including Creative Energy's Vancouver operation serving 45 million square feet of building space, Enwave's $600 million expansion project in Toronto and Mississauga, and Markham District Energy's innovative wastewater energy transfer project.

District energy systems have proven to be successful using a variety of ownership and governance structures. This owes in part to being cost-competitive for the consumer. Various models have been implemented globally, each with unique advantages and challenges. A hybrid governance model that combines public oversight with private sector efficiency is exemplified by several projects across Canada, such as the partnership between Lulu Island Energy Company and Corix. Financial innovations, including substantial investments from the Canada Infrastructure Bank and hybrid approaches (including public-private partnerships), are proving essential for some projects. Other district energy systems can also be either wholly publicly owned or wholly privately owned, but in all scenarios, municipalities have an important role to play. Technical considerations emphasize the need for comprehensive heat planning, phased development approaches, and integration of low-carbon technologies.

Major challenges identified include high upfront costs, complex approval processes, and the need for specialized expertise. However, successful mitigation strategies have emerged, including mandatory connection policies, anchor load strategies, and innovative financing mechanisms combining public and private funding sources.

The report recommends specific actions for key stakeholders (see Section 4.2 Next Steps) with the themes below:

- **Policymakers** should develop robust policy frameworks and financial incentives for district energy providers and real estate developers
- **Articulating the business case** for district energy solutions for real estate developers, who can adopt district energy-ready standards and establish stronger municipal partnerships
- **Local governments** should take leadership roles through municipal utilities and comprehensive planning processes

Summarized below are the main actionable recommendations emerging from the full-day workshop of presentations and discussions aimed at accelerating the build-out of thermal grids at scale. The actionable recommendations are articulated as short-, medium- and long-term actions in Section 4.2:

- **Legal agreements** required to implement district energy solutions can be standardized to streamline negotiations. Legal arrangements can be between district energy providers and municipalities (e.g. access agreements), between district energy providers and real estate developers (e.g. connections, service agreements, sublicence for use of lands), and between municipalities and real estate developers (eg. access, building performance standards).
- **Financing structures** currently used to invest in district energy solutions (e.g. Canada Infrastructure Bank and private sector institutions) can benefit from municipal investment options, which can de-risk district energy implementation.
- **Ownership structures** of district energy systems (e.g. wholly publicly owned, wholly privately owned, or hybrid) are influenced by concerns or interest in matters such as consumer protection and de-risking the upfront capital cost of the district energy system.
- The importance of **municipal green standards** and district energy-ready design guidelines were noted in several sectoral discussions (case studies, financing, developer panel) in influencing and improving the business case for district energy solutions.
- Articulating the **business case** for district energy solutions versus the reference case or business-as-usual (BAU) considers not only the decarbonization potential, but factors such as reduced electrical load requirements, consumer protection, and financial resilience as well as climate resilience.
- **Heat mapping** or heat planning, connecting waste heat sources and energy developers to develop low carbon DES, is a tool utilized in European countries leading in the establishment of thermal networks.
- Almost universally, the need for ongoing **awareness and education** is recognized for district energy solutions to move from a nascent industry to a utility solution.

Success in implementing district energy systems requires coordinated action across stakeholders, supported by clear governance structures, technical expertise, and comprehensive knowledge-sharing initiatives. This collaborative approach, combined with technological innovation and strategic financing, positions district energy systems as a vital component in achieving Ontario's low-carbon future.

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1.0 Introduction

1.1 Overview

The one-day workshop, *Unlocking Ontario's Low Carbon Future with District Energy*, brought together 150 experts in the areas of energy transition, climate finance, and sustainability to explore the building blocks for advancing Ontario's low-carbon district heating and cooling systems. Coordinated by the Centre for Community Energy Transformation (CCET), The Royal Danish Consulate General in Toronto, and the Peel Region, the challenge to presenters and attendees was to identify the actions to build thermal utilities at community scale. The workshop featured case studies, business cases, financing solutions, governance discussions, and updates from municipalities and community organisations. Afternoon break-out groups, facilitated by FVB Energy, Building Decarbonization Alliance (BDA) and QUEST, focused on identifying strategies and tools to advance district energy systems.

1.2 Synthesis Report Purpose and Scope

This report aims to synthesize the key insights, strategies, and resources shared during the workshop to provide a practical guide for advancing low-carbon district energy systems in Ontario. The focus is providing actionable tools, real-world case studies, and proven financing and governance models to support the development and implementation of sustainable district energy solutions[1]. Combining lessons from industry leaders, best practices from successful projects, and collaborative strategies identified in the workshop's break-out discussions, this synthesis report aims to address barriers, identify opportunities, and drive the scaling of district energy systems as a critical component of Ontario's transition to a low-carbon future.

1.3 Ontario's Low-Carbon Energy Goals and the Role of District Energy

Ontario has set ambitious targets to reduce greenhouse gas emissions and transition to a low-carbon economy. The province aims to reduce emissions to 30% below 2005 by 2030, aligning with Canada's Paris Agreement commitments.[2] Released in October 2024, *Ontario's Affordable Energy Future: The Pressing Case for More Power* promotes an "all energy approach" to meet the IESO forecast of a 75 percent increase in clean energy demand by 2050, equivalent to 111 TWh of new energy. While the report makes note of complementary strategies to new energy generation, such as energy efficiency programs, distributed energy resources (DERs) and grid resiliency, there is no specific mention of district energy or the thermal network as part of meeting the energy demand. The final report of the Electrification and Energy Transition Panel, *Ontario's Clean Energy Opportunity* (December 2023), records stakeholder comments on the opportunity for expanded district energy systems "... to enhance energy efficiency, reduce total energy demand and mitigate carbon emissions in all communities, particularly in rapidly densifying downtown cores …". While there are no recommendations specific to thermal energy network (TENs) in the report of the Electrification and Energy Transition Panel, several recommendations regarding local energy planning, integration of energy planning with sectoral strategies, and innovation and economic development should provide an opportunity to make the case for TENs at scale.

[1] More comprehensive guides include "Low-Carbon District Energy" from the Danish District Energy Advisory (2024) and "Community Energy: Planning, Development and Delivery-Strategies for Thermal Networks" from the International District Energy Association (IDEA 2013).

[2] https://www.auditor.on.ca/en/content/annualreports/arreports/en19/v2_300en19.pdf

District energy systems play a crucial role in Ontario's climate action plans, such as Toronto's TransformTO initiative, which aims to reach net-zero emissions by 2040.[3] These systems can achieve higher energy efficiency and reduce overall energy consumption by utilising low-carbon heat sources like geothermal, biomass, and waste heat from industrial processes.[4] Municipal energy plans often include district energy as a critical climate action to meet energy demand while reducing carbon emissions. There is an opportunity to clearly articulate to the Province the role of the thermal grid in providing low carbon heating and cooling solutions as part of Ontario's energy transition strategy.

[3] https://www.toronto.ca/services-payments/water-environment/environmentally-friendly-city-initiatives/district-energy/
[4] https://www.cimcorefrigeration.com/resources/news/district-energy-systems-in-canada-paving-the-way-for-a-sustainable-future

2.0 Presentations: Insights and Best Practices

2.1 District Energy Development in Denmark

Denmark's district energy framework offers transformative lessons across the world and for Ontario's low-carbon ambitions. Prompted by the 1973 oil crisis, Denmark revolutionized its energy system with the introduction of the 1979 Heat Supply Act. This groundbreaking legislation required municipalities to develop heat plans, enabling widespread adoption of district heating systems powered by combined heat and power (CHP) plants and renewable energy sources like biomass and solar thermal energy. Over the decades, Denmark has pioneered innovations such as fourth-generation district heating (4GDH) systems, which operate at lower temperatures to enhance efficiency, integrate renewable energy, and reduce emissions. The success of this approach has been supported by a robust governance framework that includes municipal heat planning, regulatory oversight, and financial mechanisms like low-interest municipal bank loans. Together, these initiatives have positioned Denmark as a global leader in sustainable, near-carbon-neutral heating systems.

Key strategies from Denmark's district energy model offer actionable insights for Ontario's energy transition. First, mandatory heat planning, modeled after Denmark's Heat Supply Act, could compel Ontario municipalities to align local heat plans with provincial climate goals. This structured approach ensures a cohesive effort toward decarbonization. Additionally, Denmark's integration of renewable energy sources—such as biomass, geothermal, and solar thermal energy—into its district heating grids provides a scalable model for Ontario to diversify its energy mix and reduce reliance on fossil fuels.

Adopting fourth-generation district heating systems is another valuable practice Ontario could emulate[5]. These low-temperature systems not only improve energy efficiency but also reduce heat loss and facilitate seamless integration of renewable energy technologies. Denmark's success with public-private partnerships also serves as a useful model, demonstrating how collaborative governance can harness private sector innovation and investment while maintaining public oversight. Finally, Denmark's focus on digitalization, including smart metering and advanced heat distribution controls, showcases the potential of technology to optimize system performance and enhance customer engagement.

By adapting these best practices to its unique regulatory and market context, Ontario can accelerate its transition to a low-carbon energy future. Drawing on experience in Denmark and elsewhere in Europe, Ontario has the opportunity to establish district energy systems as a cornerstone of its sustainability agenda, driving urban decarbonization and energy efficiency at scale.

2.2 Case Studies of Notable District Energy Projects in Canada

Creative Energy

Creative Energy is a pioneer in sustainable urban heating and cooling solutions. Their Downtown Vancouver district energy system connects over 200 buildings and serves 45 million

[5] Note that the "Gen 4" DE generally requires energy efficiency for buildings to be higher than the current Ontario standard.

square feet of real estate, demonstrating the scalability of district energy solutions. The company is actively transitioning to low-carbon technologies, incorporating innovative solutions such as geo-exchange and sewer-exchange systems to modernise and decarbonise its operations.[6]

Creative Energy demonstrated to Thompson Rivers University (TRU) that a low carbon district energy system (LCDES) for its Kamloops campus provided an improved business case over a building-by-building decarbonization approach, and can provide renewable heating to TRU's immediate neighbours. The LCDES, to be energized in 2026, uses a centralized 2-stage air-source and water-source heat pump solution that is scalable to support campus growth and serve the surrounding neighbourhood. The LCDES will reduce TRU's GHG emissions by 95% and is a key part of meeting the university's goal to be a fossil fuel-free institution by 2030. TRU is financing the project by paying the capital costs through the rates over time, hence, fully off balance sheet for TRU.

Enwave

Enwave is a leading district energy company providing heating and cooling services to over 100 million square feet of building floor area across Canada. In 2021, Enwave secured a $600 million investment from the Canada Infrastructure Bank to expand and enhance its district energy systems in Toronto and Mississauga. Enwave is making significant strides in environmental protection by implementing low-carbon technologies and renewable energy sources, including large thermal storage tanks, with connected buildings across the Enwave system reducing electricity consumption by up to 80% and carbon emissions by up to 60%. Their approach integrates community energy planning and green building standards, leveraging federal funding programs and private investments to achieve these ambitious goals.[7]

The company was the successful proponent to a public RFP by the City of Toronto to secure a private partner to jointly develop low carbon TENs in the City. The resulting Joint Development Agreement (JDA) outlines how Enwave and the City of Toronto collaborate to evaluate land to develop as low carbon communities, with the Etobicoke Civic Centre as the first major project. Located in the Bloor-Kipling precinct, and covering 18 acres of City-owned land unlocked by the reconfiguration of the Six Points Interchange, the district heating and cooling system will use 625 boreholes built under 5 of the 7 blocks that comprise the precinct. Various commercial arrangements relating to matters such as land access and leasing and service agreements are in place among the City, Enwave and land developers/builders. The Etobicoke Civic Centre project demonstrates several considerations for district heating and cooling solutions:

- Phasing of district energy infrastructure
- Alignment of the municipality, land developers and district energy developers
- Eventual customer connections to the district energy system
- Definition of a "Business-as-Usual" case
- Allocated space for district energy facilities and infrastructure

[6] https://creative.energy/district-energy
[7] https://www.enwave.com/

Etobicoke Civic Centre Commercial Arrangements		
City and Land Developers • Long term land lease • Commitment to achieve TGS Net Zero • Use of lands for boreholes	City and Enwave • Construction of plant shell • Long term lease for plant space • Licence for lands to place boreholes • Project Agreement • Municipal Access Agreement	Enwave and Land Developers • 30-year chilled and hot water service agreements • Sublicence for use of lands for boreholes (if needed)

Markham District Energy

Markham District Energy (MDE) continues to break new ground in sustainable energy solutions, recently announcing the world's largest wastewater energy transfer project. Their strategic investment and expansion of their affordable, low-carbon energy network is projected to achieve impressive emission reductions of 910,700 tonnes of CO2e. The system demonstrates how municipal leadership in district energy can create reliable, efficient, and cost-effective energy networks while supporting ambitious climate goals. These initiatives align with their commitment to achieving net-zero emissions by 2050, showcasing the vital role of district energy in urban sustainability.[8]

Currently serving 15 million square feet of connected customers (over 212 customer buildings), MDE was originally established with conventional boilers and chillers and is implementing a decarbonization strategy. In addition to the 18.5 MW sewer heat recovery project, the decarbonization initiatives include a wood pellet boiler and heat recovery chillers and demonstrates the neighbourhood-scale decarbonization potential for DE systems.

MDE Financial Partners in Decarbonization Strategy

- Federal Low Carbon Economy Fund
- Green Municipal Funds (Federation of Canadian Municipalities)
- Canada Infrastructure Bank (loan)
- CIBC (loan)
- Enbridge Gas Demand Side Management offerings

Lulu Island Energy Company

The Lulu Island Energy Company (LIEC) is a municipal corporation wholly owned by the City of Richmond, BC, that implements and operates district energy systems in Richmond. The ownership structure exemplifies a successful public-private partnership in the sector through a

[8] https://www.markhamdistrictenergy.com/

30-year agreement between LIEC and Corix, who was selected through a public competitive process to design, build, finance, operate and maintain the system. With support from the Canada Infrastructure Bank through a $175 million investment, the system implements innovative low-carbon technologies, including sewer heat recovery and air-source heat pumps. This partnership is set for significant expansion, planning to serve more than 170 new developments, comprising more than 50 million square feet of connected floor area by 2050. Key highlights from the initiative include:

- Retaining municipal ownership while transferring risk to an experienced private partner
- Rate regulation by City Council
- Municipal policies and bylaws to improve customer connection to the DE system
- Full project financing by Corix as the private partner
- Low cost financing from Canada Infrastructure Bank

The project's success is attributed to its innovative financing structure, such as “just in time” capital deployment and risk transfer principles, and it is expected to achieve a remarkable reduction in greenhouse gas emissions, targeting one million tonnes by 2050.[9]

Lakeview

Lakeview Village is a 177-acre development on Mississauga's eastern waterfront that prominently features a state-of-the-art district energy system. This innovative system will efficiently heat and cool the entire community, leveraging treated wastewater (effluent), making it one of the most sustainable developments in Canada. On October 21, 2024, the City of Mississauga, Lakeview Community Partners Limited, Enwave Lakeview Corporation, and the Region of Peel celebrated the groundbreaking of the system, which is the first of its kind in Ontario and the largest in Canada.

Utilizing a centralized piping network, the system reduces energy consumption and will reduce greenhouse gas emissions (relative to individual building-scale solutions) when it ultimately connects to treated wastewater from the nearby G.E. Booth Water Resource Recovery Facility as a low-carbon energy source. Construction of the district energy system began in late 2024, and it is expected to support the first residential occupants by 2029, with full project completion anticipated by 2045. This sustainable energy solution underscores the community’s commitment to innovation and environmental stewardship, driving economic growth while promoting clean energy technologies.

Heritage Heights

Heritage Heights, located in northwest Brampton, incorporates a forward-thinking approach to energy sustainability through the proposed implementation of district energy systems. This community is designed to be transit-supported and climate-focused, emphasizing sustainability as a central theme. The Heritage Heights Secondary Plan aims to develop a resilient urban area that includes renewable energy solutions to reduce greenhouse gas emissions and enhance energy efficiency across residential, commercial, and industrial developments. The Heritage Heights Secondary Plan includes policy directions for the City of Brampton to “work with appropriate partners to develop a District Energy Utility (DECO) that will provide cost effective district heating and cooling services to development in Mixed Use Areas and on lands designated Employment, wherever appropriate”.

[9] https://www.luluislandenergy.ca/

In July 2024, Brampton negotiated a settlement with appellants of the Secondary Plan, allowing the Ontario Land Tribunal to approve its progression. This milestone unlocks the potential to transform the area into a sustainable and energy-efficient community. The district energy system concept, under study, envisions centralized heating and cooling solutions to complement the city's climate action goals and support long-term energy efficiency for the region.

2.3 Business Cases and Implementation Strategies

Real estate developers approaching DES find themselves navigating a complex landscape of opportunities and challenges. Municipal green standards are increasingly being recognized as a useful policy tool to drive decarbonization solutions, including low carbon DES which offer promising potential to reduce energy costs and promote sustainability, while helping communities reach zero-emission targets. However, the successful implementation of DES requires careful consideration of multiple factors, from partnership structures to practical operational concerns.

The implementation of DES often begins with establishing strong partnerships and cooperation frameworks. Land developers typically position themselves as facilitators rather than primary operators, working to build effective relationships with municipalities, energy providers, and other stakeholders. Public-private partnerships have emerged as a particularly crucial model, enabling shared responsibilities in financing, design, construction and operation. This collaborative approach helps distribute risks and leverage diverse expertise while maintaining focus on core development activities.

Risk mitigation stands at the forefront of district energy developers' concerns when implementing DES. They must carefully balance long-term operational feasibility with demand uncertainty, while ensuring the system aligns with broader development goals. This often involves adopting sophisticated governance models that clearly delineate roles and responsibilities among various stakeholders. Additionally, district energy developers are increasingly turning to digital solutions, incorporating smart sensors and IoT technologies to optimize system efficiency and provide valuable data for decision-making.

The challenges developers face in implementing DES are substantial and multifaceted. Complex approval processes and negotiations for public land use can significantly extend project timelines. This is compounded by a general lack of awareness and understanding among stakeholders about the long-term benefits of district energy systems. The shortage of specialized contractors skilled in DES-specific construction technologies presents another significant hurdle, often leading to increased costs and potential delays in project completion.

Financial considerations remain a critical challenge in DES implementation. The substantial upfront costs compared to traditional systems require district energy developers to explore creative financing solutions, such as municipal bonds or long-term utility partnerships. Evaluating the business case requires that the district energy solution is adequately compared with the reference case or business-as-usual (BAU). A DES provides multiple benefits related to climate resilience (e.g. risk mitigation against extreme weather events), decarbonization and energy efficiency. This is in addition to providing comparable utility rates. In addition, the decarbonization BAU may require more energy generation than the district energy solution.

Despite these challenges, district energy developers are making steady progress in advancing DES through collaborative approaches, innovative technologies, and proactive governance structures. As awareness grows and technologies advance, these systems are increasingly being recognized as viable, eco-friendly and cost-competitive solutions for future urban developments.

2.4 Financing District Energy and Renewable Energy Projects

Decarbonization strategies provide an opportunity to be inclusive of economic reconciliation where Indigenous Peoples have equal access to economic opportunities and to benefit from profits being earned on their territories. With 630 Indigenous communities across Canada, and 133 communities in Ontario, organizations such as First Nations Power are demonstrating how Indigenous communities can be active leaders in Canada's clean energy transition. The Concord Green Energy project, with the intent to carry out at 50% First Nation ownership, is a 23.6 MW renewable energy installation where FN Power negotiated additional financing from the Canada Infrastructure Bank.

Several significant financing options exist for district energy projects in Canada, with the Canada Infrastructure Bank (CIB) playing a central role through substantial investments, including $600 million for Enwave's expansions across Canada, $135 million for Markham District Energy, and $175 million for Lulu Island Energy Company in Richmond, BC. With a minimum $100 million investment, CIB maintains specific investment criteria, requiring projects to demonstrate public impact through GHG reductions, Indigenous participation, and to "crowd in" private capital involvement at an appropriate time in the project lifecycle.

CIBC Capital Markets is a leading bank in supporting low carbon district energy projects in Canada, including investments in Enwave and Markham District Energy. CIBC Capital Markets has also invested in several projects in the United States and Europe. Their global experience in structuring, coordinating and executing deals in the district energy sector builds on their sustainable finance credentials. This includes being a founding contributor of the Institute for Sustainable Finance and recently launching a new Sustainable Finance Methodology to assess eligible sustainable finance transactions.

The economic benefits of district energy systems extend beyond direct financial returns, creating economies of scale that reduce both costs and emissions while attracting private investment and supporting local economic development. The City of Toronto exemplifies effective municipal engagement, leveraging civic assets for climate action through initiatives like their wastewater energy program and partnering with private entities such as Enwave to expand district energy systems.

However, the sector faces significant challenges, including high upfront costs, financial risks that can deter developers and municipalities, and difficulties establishing clear business cases for DES adoption. Various strategies have been implemented to address these challenges. These include financial incentives for developers through grants and tax breaks, subsidies for low-carbon technologies, and innovative P3 structures that leverage private sector investment with municipal backstops to reduce financial risks. Additionally, hybrid ownership models help distribute costs and responsibilities more effectively.

Project viability is further strengthened through lifecycle costing approaches incorporating carbon accounting to demonstrate long-term savings and environmental benefits. Federal grant programs, such as the Low Carbon Economy Fund and Green Municipal Fund, provide crucial support for municipal projects. These programs can be strategically combined with provincial funding to support more complex DES projects. Many projects adopt a phased implementation approach to manage financial risks effectively, starting with smaller-scale systems and expanding incrementally as confidence and capacity grow. This multi-layered approach to financing, combining public and private funding sources with strategic implementation planning, helps overcome financial barriers while ensuring long-term project sustainability.

2.5 Governance, Ownership, and Policy Matters

European cities are witnessing significant policy shifts in heating and cooling infrastructure planning. Local heating and cooling plans are becoming mandatory across the continent, with Germany requiring community heat plans by 2026 for cities over 100,000 residents and by 2028 for cities over 20,000. The European Union has set similar mandates for cities exceeding 45,000 residents. These policies are accompanied by ambitious national targets for thermal networks, with Germany aiming to increase its current 3.5% coverage to 15% by 2035, while the EU plans to expand from 14% to 30% by 2030.

Local heating and cooling plans are characterised by several key features that ensure comprehensive energy infrastructure development. These include spatially targeted policies for building retrofits, coordinated planning of local energy infrastructure, and a strong emphasis on citizen engagement and participation. The plans also clarify specific areas for thermal networks, gas grid pruning, and electric system upgrades.

Implementation examples demonstrate the practical application of these planning approaches. Hannover, Germany, has developed a zoning system that identifies areas for existing thermal networks, potential expansion, and decentralised heating solutions. Similarly, Zurich, Switzerland, has adopted an integrated planning approach that coordinates thermal and electric systems development.

Emerging thermal utility legislation is taking shape in the United States with a different focus. New policies are being developed to support thermal networks, including provisions to allow traditional utilities to sell thermal energy and amendments to existing service obligations. These policies incorporate equity priorities and address labour transition considerations in their planning frameworks.

The district energy systems' policy and governance landscape has evolved significantly and has been shaped by local initiatives and broader governmental frameworks. The City of Brampton's journey exemplifies this evolution. Analysis through the City’s Community Energy and Emission Reduction Plan (CEERP) estimates that 30% of energy paid for by the community does not reach the end user. Strategies to emphasize local energy generation and distribution are articulated in the Heritage Heights Community Energy Plan, for example, which directs district energy implementation in medium and high-density areas through a District Energy Company (DECO).

District energy systems' governance and ownership structures demonstrate considerable diversity, ranging from fully government-owned systems like Vancouver False Creek and

Burnaby Mountain to private operations such as Enwave Toronto and River District Energy. As exemplified by Lulu Island Energy Company, hybrid models have gained prominence as they combine public oversight with private sector efficiency. Toronto's governance approach illustrates this evolution, utilising Joint Development Agreements between the city and private partners, requiring City Council and corporate board approvals, and establishing limited partnerships for specific projects.

The deployment of large-scale district energy systems requires effective governance and ownership structures. Various models have been implemented globally, each with unique advantages and challenges. The table below summarizes key governance approaches, providing examples and insights into their applicability. This overview serves as a practical guide for policymakers and stakeholders to assess and select the most suitable framework for their specific contexts.

Table 1 - Governance Model Benefits & Challenges

Governance Model	Example	Benefits	Challenges
Public Ownership (including Municipal Utilities)	Vancouver (False Creek, BC), Burnaby Mountain Markham District Energy	Full municipal control, prioritizes public interest and local benefits, and ensures long-term planning.	Requires significant municipal resources and expertise, and/or utilizing private sector expertise and subject matter experts to support the public model. Limited scalability due to reliance on municipal funding without external investment.
Private Ownership	Enwave (Toronto, ON), River District Energy (Vancouver, BC)	Access to private capital, high operational efficiency.	Robust public oversight to ensure alignment with community interests and to mitigate risks of profit-driven decision-making.
Hybrid Models Public-Private Partnerships (P3)	Lulu Island Energy Company (Richmond, BC) City of Toronto and Enwave (Joint Development Agreement)	Combines public oversight with private sector efficiency; shares risks and resources.	Sophisticated agreements that balance differing priorities. Risk-sharing, governance structures and contract terms must be carefully

			formulated.

Policy frameworks at provincial and federal levels have strengthened support for district energy adoption, with Ontario's Affordable Energy Act and Federal funding through FCM supporting low-carbon community energy systems. However, significant challenges persist, including the lack of mandatory requirements, misalignment between long-term energy planning and short-term political cycles, and developer hesitation without clear regulations. To address these challenges, municipalities implement mandatory connection policies, develop green standards and district energy-ready guidelines, and advocate for provincial and federal laws to support district energy systems.

As indicated in Table 1, municipal planning and governance face challenges primarily centred around resource limitations and expertise gaps. Successful implementation strategies include establishing municipal utilities or hybrid governance models, pooling resources across municipalities, and fostering cross-ministerial collaboration. Municipalities are increasingly taking active roles in planning and enabling district energy systems through land leases, rights-of-way licenses, and expedited approvals. The trend toward hybrid governance models, starting with public-private partnerships and evolving based on project maturity, has emerged as a practical approach to balance municipal oversight with private sector efficiency.

Indigenous Leadership

FNpower empowers communities to lead in renewable energy development while actively promoting equity ownership and partnership structures for utility-scale renewable projects. With a strong focus on economic reconciliation opportunities within Canada's clean energy transition, the organisation has witnessed significant progress in Indigenous participation across the sector. This is evidenced by notable initiatives such as Manitoba Hydro's solar RFP, which requires 51% Indigenous ownership, and IESO's RFP scoring system that integrates Indigenous participation requirements. FNpower's framework further demonstrates a clear pathway for meaningful Indigenous involvement in renewable energy projects, setting a standard for future developments in the industry.

Barriers and Risks

District energy development faces significant barriers and risks that require careful consideration, including financial, regulatory, political, and operational challenges. The primary operational challenges include connection risk, uncertainty in securing sufficient demand for the system, and demand risk, which involves managing variability in energy demand over time. Developers must also navigate technology risks associated with integrating new systems, siting risks in finding suitable locations for energy centres, and fuel supply risks related to maintaining reliable and low-carbon fuel sources. These challenges often make developers and municipalities hesitant to invest without greater certainty.

A comprehensive set of mitigation strategies can be implemented to address these challenges. For connection risk, establishing mandatory connection bylaws and securing anchor loads from city buildings has proven effective, along with phasing in buildings over time, to reduce initial risks. Municipal buildings or municipal land hosting energy centres is another proven risk mitigation measure. Precise regulatory oversight mechanisms and standardised agreements

help build consumer confidence and reduce delays. Economic incentives for developers and building owners and rezoning policies prioritising DES-ready developments provide additional support. To ensure long-term success, it's crucial to decouple energy planning from short-term election cycles and build strong business cases demonstrating economic and environmental benefits. Furthermore, encouraging provincial and federal leadership to provide regulatory and financial support while fostering collaboration among municipalities, developers, and utilities creates a framework for sharing risks and resources effectively.

Technical & Development Considerations

District Energy Systems represent a transformative approach to urban energy management, offering centralised energy production that significantly improves efficiency and reduces emissions. These systems integrate renewable energy sources and capture waste heat from industrial processes while maintaining the scalability and flexibility needed to adapt to evolving energy needs and technologies. The success of district energy implementation is evident in numerous Canadian examples, such as Enwave achieving over 67,000 tonnes of annual GHG reductions, Markham reducing 33,700 tonnes annually, and Lulu Island cutting over 34,000 tonnes of GHG emissions each year. Notable local implementations include Sheridan College's Davis Campus, which features a modern, efficient district energy system and has led to collaborative efforts with the City of Brampton in developing the Community Energy and Emissions Reduction Plan (CEERP) and plans for a municipal district energy utility.

However, implementing DES presents several technical challenges that need careful consideration. Primary among these are the complexities involved in integrating DES with existing infrastructure and the critical risks associated with improper system sizing, which can lead to operational inefficiencies and increased costs. These technical challenges have been addressed in Europe and other parts of the world and suggests that solutions can be modified for the North American context.

To address these challenges, comprehensive planning and strategic development approaches are essential. Heat planning is a fundamental first step, utilising heat mapping techniques to identify optimal service areas and potential heat sources while prioritising energy efficiency and decarbonisation goals. A phased development approach proves most effective, beginning with anchor loads such as municipal buildings and gradually expanding the system. This strategy helps ensure that future demand remains within peak capacity limits, preventing system inefficiencies and maintaining optimal performance.

Technology integration plays a crucial role in system success, emphasising incorporating low-carbon technologies such as geo-exchange and sewer heat recovery systems to reduce emissions and enhance overall system efficiency. The selection of equipment and materials must also consider embodied carbon impacts, taking a holistic approach to environmental sustainability. These systems support broader electrification efforts, providing localised, integrated solutions for neighbourhood decarbonisation while reducing the need for reactive grid expansions.

Innovation in thermal networks has led to diverse green heat offerings, including differentiated thermal solutions based on emission factors from electric boilers, heat pumps, and gas systems, with weighted average emission factors for blended solutions. Cities like Toronto are exploring

open-loop geothermal[10] as a low-carbon heat source, conducting test boreholes to establish temperature gradients and potential use cases. Large-scale renewable integration encompasses various technologies, including geo-exchange, sewer heat recovery, thermal energy storage, and solar thermal systems, with energy distribution facilitated through underground pipes in roads and parkades.

Robust technical standards and guidelines for DES design and operation are necessary to ensure consistent quality and performance. These standards should include regulations for transmission infrastructure that promote equitable access and fair cost-sharing among users, creating a foundation for sustainable and efficient district energy systems that contribute to sustainable urban environments while supporting local economies.

3.0 Break-Out Group Synthesis

The break-out groups identified several key strategies and tools to advance district energy systems in Ontario. At the administrative level, streamlining land access and permitting processes for district energy infrastructure, while collaborating with municipalities to ensure alignment with urban planning goals, emerged as crucial priorities. To support sustainable development, the groups emphasized the need to develop and enforce standards for new developments to be district energy-ready, including specific requirements for low-carbon mechanical systems and flexible energy solutions. Integrating mandatory connection requirements was identified as a potential strategy to de-risk investments for real estate developers. Additionally, leveraging green development standards (GDS) was seen as essential to ensure district energy solutions are an integral, rather than a supplemental, part of municipal planning.

Integrated planning and public-private partnerships (P3s) were highlighted as essential mechanisms to leverage expertise and resources while engaging stakeholders such as municipalities, developers, and utilities. On the technical front, priorities included low-carbon technologies, such as heat pumps, sewer heat recovery, and renewable energy integration, as well as the implementation of smart grids and digitalization to optimize energy efficiency and customer use. To ensure long-term success, the importance of education and knowledge sharing was emphasized, recommending the exchange of best practices and lessons learned from successful projects in Denmark, Sweden and Canada, alongside comprehensive training and capacity-building programs for municipalities and developers.

3.1 Identifying Building Blocks for Success

The foundation for successful district energy implementation requires several critical building blocks. Access agreements with clear protocols for rights-of-way and property access, particularly in redevelopment scenarios, were deemed essential. Heat mapping and source identification were identified as strategic tools to ensure district energy systems are aligned with available resources and demand. Mandatory connection guidelines need to balance regulated and deregulated approaches to support system viability and investor confidence, with examples

[10] Where open-loop geothermal is defined in this context as geothermal wells drilled to depths of 2-3km, and primarily used for direct heat applications rather than electricity generation.

like the BC Step Code identified as successful frameworks. Furthermore, municipalities should incorporate district energy-ready guidelines into their Municipal Energy Plans (MEPs) and ensure these plans are enforced at the provincial level. This will reframe district energy solutions in MEPs to focus on implementation.

3.2 Key Challenges and Proposed Solutions

Stakeholder engagement and collaboration present significant challenges in implementing district energy systems. Barriers identified include political risk, timeline management, and financial feasibility. Proposed solutions involve hybrid ownership models combining public and private sector strengths, clear municipal leadership to provide certainty for developers, and comprehensive education programs targeting all stakeholders, including council members and end users.

There was also a debate on the necessity of regulation versus an unregulated market. Recognized challenges included the lack of access fees for natural gas utilities compared to district energy systems and the potential for regulation to lead to higher standardized costs for customers, albeit with the benefit of enabling utilities to recover costs. The role of the province in leveling the playing field and promoting economic development opportunities was also emphasized.

3.3 Tools and Strategies for Stakeholders

A robust toolkit for stakeholders is essential for successful district energy implementation. This includes policy templates and examples accessible through knowledge hubs to provide open-source tools for implementation. Technical guidelines addressing both new construction and retrofits, with a focus on system sizing and efficiency optimization, are critical. Financial planning tools incorporating lifecycle costing, carbon pricing, and various incentive structures can support the financial viability of projects. Standardized processes to streamline municipal agreements can reduce risks for developers and accelerate project timelines. Additionally, education and awareness campaigns, such as "District Energy 101" and "Renewables 101," can educate municipal players, developers, and consumers about the benefits and urgency of district energy systems.

3.4 Specific Discussion Points and Highlights

Regulation vs. Unregulated Market

In Ontario's DE ecosystem, the balance between regulated and unregulated markets presents unique challenges and opportunities. Regulated markets can address consumer protection and can provide standardized frameworks and policies that encourage uniform adoption of DE systems.

Currently, the main drivers for DE in Ontario are the business case, demonstrated efficiency, and meeting decarbonization goals. The lack of comprehensive governance in the DE sector means that DE is not actively supported across all municipalities. This regulatory gap can hinder the widespread adoption of DE systems, as municipalities may face challenges related to limited

authority and capacity. There is an opportunity for the province to integrate municipal energy plans into regulatory frameworks to address these challenges.

Enwave exemplifies an entrepreneurial approach within this landscape. Enwave's operations demonstrate how private enterprises can drive innovation and efficiency in the DE sector, even in the absence of comprehensive regulatory support.

The break-out discussions did not establish a clear stance on whether district energy should be regulated. However, the absence of strict regulation in Ontario presents an opportunity to strengthen collaboration between public and private sectors to frame district energy firmly as a utility solution that complements the electrical grid. In particular, partnering with municipalities can help address consumer cost concerns by articulating the business case associated with district energy systems while navigating municipal growth planning decisions.

Mandatory Connections

Mandatory connections have been identified as a key strategy to de-risk investments and enhance the long-term viability of DE systems. To ensure cost competitiveness, it is crucial that the business case for district energy connections remains favorable compared to alternative solutions, effectively serving as a market-driven control mechanism. Alongside discussion on mandatory connections, alternative approaches, including the adoption of green standards and developer incentives, have been suggested to further promote DE integration.

Role of Green Standards

Green development standards, such as the Toronto Green Standard (TGS), play a pivotal role in facilitating the adoption of DE systems. The TGS is a set of sustainable design requirements for new developments, aiming to improve air quality, reduce energy consumption, and decrease greenhouse gas emissions. By setting progressive performance tiers, the TGS encourages developers to incorporate energy-efficient designs and technologies. Notably, the TGS mandates that buildings be designed to connect to district energy systems where such systems exist or are planned, thereby directly promoting DE integration.

The effectiveness of green standards like the TGS in promoting DE adoption is evident in Toronto's climate action initiatives. The city's TransformTO Net Zero Strategy includes an accelerated schedule for updating the TGS, aiming for all new buildings to achieve net-zero emissions by 2030. This strategy underscores the city's commitment to expanding renewable energy generation and low-carbon district energy systems.

Heat Mapping

Heat mapping is a critical tool in the planning and optimization of DE systems. It involves analyzing spatial data to identify areas with high thermal demand, potential sources of waste heat, and opportunities for system expansion. By providing a visual representation of thermal energy flows within a region, heat mapping enables planners to make informed decisions about where to implement or extend DE networks.

Awareness and Education

Broad awareness campaigns targeting smaller municipalities and key stakeholders were recommended. Collaboration networks, such as BDA, QUEST, and CAP Best Practice Network,

were identified as valuable platforms for sharing knowledge. The need to articulate business cases effectively to elected officials and the public, emphasizing long-term benefits over short-term election cycles, was also highlighted.

Through effective awareness and education, DE systems and TENs can complement existing decarbonization initiatives, demonstrating that this is not a "this or that" approach. By highlighting how DE and TENs integrate seamlessly with renewable energy systems and electrification strategies, municipalities can foster a holistic perspective that aligns diverse efforts toward achieving sustainability goals. Public trust and understanding of the collaborative potential of these systems can significantly accelerate their adoption and long-term viability.

Municipal Approaches to De-Risk Investments

Municipalities can adopt tools such as using municipal buildings as anchor tenants, creating open-source knowledge hubs for district energy solutions, and establishing hybrid ownership models to accelerate implementation. An example of Portland's "utilidor" concept demonstrated the benefits of integrating multiple utilities to reduce future retrofitting costs.

While these approaches provide immediate benefits, municipalities must adopt a longer-term vision to ensure the sustained success and expansion of district energy systems (DES). Municipalities should incorporate DES into city-wide energy and infrastructure planning from the outset. This ensures that future developments are designed with energy efficiency and connectivity in mind, minimizing the need for costly retrofits and maximizing system scalability. This includes planning for DE infrastructure in the same way as other utilities (e.g. water, electricity, gas, communications), such as within right-of-ways (ROWs) and providing DE infrastructure the same access rights.

A long-term strategy requires aligning local policies and building codes with provincial and federal goals for carbon reduction and energy efficiency. Municipalities can advocate for changes that support mandatory connection policies or incentivize developers to prioritize DES adoption.

Establishing stable, long-term partnerships between municipalities and private stakeholders can provide the necessary capital and operational expertise to expand DES. Hybrid ownership models can distribute risk while ensuring public interest remains a priority.

By integrating immediate actions with a long-term vision, municipalities can play a pivotal role in de-risking investments and ensuring the viability of district energy systems as a cornerstone of sustainable urban development.

3.5 Additional Insights and Recommendations

Heat planning was identified as a critical area, with advocacy for provincial-level requirements for heat mapping and planning. Examples from Germany and Amsterdam demonstrated successful integration of waste heat into district energy systems. Shared resources were emphasized as a missing link in Canadian district energy strategies, with lessons from Europe suggesting more streamlined planning and operations. Hybrid public-private ownership models

were proposed to address the pace and financial constraints of municipalities, with private investment supporting municipal budgets stretched by growth pressures.

Developer readiness requires a mix of incentives (carrots) and mandatory requirements (sticks) to engage developers effectively. Business cases must reflect long-term benefits to address resistance to new approaches. Securing local funding to build thermal grids while avoiding thermal monopolies can support a market-based approach.

3.6 Final Remarks

The synthesis underscores the need for coordinated action across multiple stakeholders, with municipalities playing a central role. Success hinges on robust governance structures, comprehensive education and capacity-building initiatives, the integration of technical expertise with long-term planning, and provincial and federal frameworks supporting municipal efforts while ensuring equitable market conditions for district energy systems.

4.0 Towards a Low Carbon Future in Ontario

District energy systems have emerged as a powerful tool for reducing greenhouse gas emissions, with implementations like those in Mississauga demonstrating potential reductions of up to 90% compared to conventional systems. The success of these systems relies heavily on effective governance models, as exemplified by Lakeview Village's privately owned system and Downtown Mississauga's evolving approach. While direct municipal ownership isn't always necessary, cities play a crucial enabling role through land leases, right-of-way licenses, and potential incentives. This can be further enhanced through the development of municipal utilities tasked explicitly with overseeing district energy systems and implementing mandatory connection requirements in high-density and mixed-use areas through strategic zoning and by-laws.

Implementing district energy systems benefits from a phased approach, allowing for gradual scaling and effective risk management. This strategy is strengthened by leveraging Canada Infrastructure Bank (CIB) funding and private capital through innovative mechanisms like public-private partnerships (P3s). Technical innovation is crucial, with investments in low-carbon technologies, renewable energy integration, and waste heat recovery systems. Integrating intelligent grids and digital solutions further optimises energy efficiency, while forward-thinking policy development, such as DE-ready standards for new developments, ensures long-term system compatibility.

Comprehensive stakeholder engagement in planning and implementation, including municipalities, developers, utilities, and Indigenous communities, is critical to advancing district energy systems. As DE remains a relatively new concept for many stakeholders, sustained outreach efforts and capacity building are essential, including specific training programs for municipalities and developers. Knowledge sharing through organisations like CCET and FNpower helps accelerate the adoption and improvement of these systems. Municipalities can further accelerate their progress by learning from successful projects in other jurisdictions, such as Enwave in Toronto and Markham District Energy while addressing common challenges through mandatory connection policies, anchor load strategies, and comprehensive stakeholder engagement. This collaborative approach, combined with technological innovation and strategic financing, positions district energy systems as vital in achieving community sustainability goals.

4.1 Action Plans and Recommendations from Stakeholders

Insights from Reshape Strategies and the Danish governance model highlight several critical aspects of effective district energy implementation. Establishing municipal utilities or corporations at the governance level is essential for overseeing district energy projects while maintaining transparency and accountability through rate regulation and citizen engagement. These efforts are supported by policy mechanisms, including legislation like Denmark's Heat Supply Act, which mandates heat planning and promotes district energy adoption, alongside energy taxes and financial incentives to encourage the transition to low-carbon energy sources. Municipalities play a crucial role in this framework by actively participating in zoning decisions, project approvals, and funding facilitation while developing supportive policies and by-laws for district energy service areas and connection requirements.

4.2 Next Steps for Policymakers, Developers, and Local Governments

To advance district energy systems effectively, stakeholders must adopt a phased approach, focusing on immediate priorities while building capacity for sustained progress. Below is a structured framework outlining short-term, mid-term, and long-term actions tailored to each stakeholder group.

Government, Policymakers & Regulatory Bodies

Short-Term	• Develop and implement clear regulatory frameworks intended to de-risk district energy adoption, especially in high-density areas. • Introduce financial incentives, such as grants, tax credits, and subsidies for low-carbon technologies, to reduce upfront costs. • Establish knowledge-sharing platforms to disseminate successful case studies and best practices.
Mid-Term	• Collaborate with municipalities to create heat mapping and planning guidelines for district energy development. • Align provincial and federal policies to streamline permitting processes and ensure consistency in district energy regulations. • Launch public awareness campaigns to educate communities on the benefits of district energy systems.
Long-Term	• Enact legislation requiring mandatory local heating and cooling plans for municipalities, similar to European models. • Integrate district energy considerations into national energy strategies, ensuring alignment with climate targets. • Monitor and adapt policies based on system performance and emerging technologies.

Real Estate Developers

Short-Term	• Incorporate district energy-ready designs into new construction projects to future-proof developments. • Establish partnerships with municipalities and energy providers to secure anchor loads and ensure project viability. • Conduct feasibility studies to identify opportunities for integrating district energy systems.

	• Identify financial incentives for developers to incorporate DES if policies are not in place. (i.e., reduced developer fees; mechanical room zoning (rooftops), etc.)
Mid-Term	• Develop phased implementation plans to reduce financial risk and allow for incremental system expansion. • Invest in training programs for contractors to address skill gaps in district energy-specific construction technologies. • Adopt digital tools and smart technologies to optimize system design and performance.
Long-Term	• Pursue large-scale integration of renewable energy sources, such as geothermal, solar thermal, and waste heat recovery, into district energy networks. • Advocate for standardized policies and agreements to reduce market entry barriers for developers. • Establish industry coalitions to drive innovation and share expertise in district energy implementation.

Local Governments

Short-Term	• Conduct heat mapping studies to identify priority areas for district energy development. • Expedite permitting processes and land access agreements to accelerate project timelines. • Use municipal buildings as anchor tenants to de-risk district energy investments. • Municipalities can advocate for changes that support mandatory connection policies or incentivize developers to prioritize DES adoption.
Mid-Term	• Create municipal utilities or hybrid governance models to oversee district energy projects and manage stakeholder collaboration. • Develop green building standards and district energy-ready guidelines for new developments. • Facilitate public-private partnerships (P3s) to leverage private capital and technical expertise.

Long-Term	• Implement mandatory connection policies in designated service areas to ensure system viability. • Establish long-term funding mechanisms, such as municipal bonds or infrastructure levies, to support district energy projects. • Foster cross-ministerial and regional collaboration to align energy planning with broader climate and economic goals.

ABBREVIATIONS AND ACRONYMS

4GDH	Fourth-Generation District Heating
CCET	Centre for Community Energy Transformation
CEERP	Community Energy and Emissions Reduction Plan
CIB	Canada Infrastructure Bank
CHP	Combined Heat & Power
DE	District Energy
DECO	District Energy Company
DES	District Energy System
FCM	Federation of Canadian Municipalities
GDS	Green Development Standards
JDA	Joint Development Agreement
LCDES	Low Carbon District Energy System
MEP	Municipal Energy Plans
P3	Public-Private Partnerships
TEN	Thermal Energy Network
TGS	Toronto Green Standard

Appendix A - Workshop Program

MORNING

9 to 9:10 a.m.

Opening Remarks

Davinder Valeri, Commissioner of Corporate Services and CFO, Peel Region

MPP Rudy Cuzzetto, Parliamentary Assistant to the Honourable Minister of Energy and Electrification, Stephen Lecce

Tony Iacobelli, Centre for Community Energy Transformation

9:10 to 9:20 a.m.

Danish Perspective

Max Lauretta, Consulate General of Denmark Toronto

9:20 to 10:20 a.m.

Canadian District Energy Case Studies

Thompson Rivers University Diego Mandelbaum, Creative Energy

Lulu Island Energy Corporation Jeff Salazar, Corix

Etobicoke Civic Centre, Toronto Amy Jacobs, Enwave

Markham District Energy Michael Conte, FVB Energy

10:20 to 10:40 a.m.

Break

10:40 am to 11:20 am

Climate Finance Panel

Firman Latimer, **FNpower**

Mike Schoen, **Canada Infrastructure Bank**

Josh Hogarth, **CIBC Capital Markets**

11:20 am to 12:00 pm

Developer Perspective Panel

Moderator: John Rathbone, **Rathco ENG**

Panelists:

Phillip Santana, **Mattamy Homes**

Matthew Marsili, **Lakeview Community Partners Ltd.**

12 to 1 p.m.

Lunch

AFTERNOON

1 to 1:40 p.m.

City of Brampton Journey

Pam Cooper, City of Brampton

Herb Sinnock, Sheridan College

1:40 to 2:40 p.m.

Municipal Updates

Matthew Day, **Waterloo Region Community Energy**

Farshad Salehzadeh, **Peel Region**

Teresa Chan, **City of Mississauga**

Jack Bolland, **City of Toronto**

2:40 to 3 p.m.

Break

3 to 3:45 p.m.

Theme-specific Presentations

Governance, Ownership and Policy

Sonja Wilson and Trent Berry, **Reshape Strategies**

Technology

Uffe Schleiss, Grundfos Carl Vreugde, Logstor

3:45 to 4:45 p.m.

FVB Energy, QUEST & BDA

Facilitated breakout sessions to help identify action areas for municipalities to advance low carbon district energy systems. Breakouts will be divided into thematic areas that include: Strategy/Vision, Municipal Planning, Development Planning DE Feasibility/Pre-Design or De-Risking. The reports and summaries from the break-outs will be consolidated into an "action plan" as a resource for municipalities.

4:45 to 5 p.m.

Key Findings from Break-outs and Closing Remarks

Re-convene in the main hall for rapporteurs to provide a 5 minute summary of each break-out discussion.

5:00 pm

Reception and Networking

Pickle Barrel
Bramalea City Centre
25 Peel Centre Dr., Brampton, ON

Appendix B - Highlight Slides

Consulate General of Denmark

CONSULATE GENERAL OF DENMARK
Toronto

DDEA | THE EVOLUTION OF DANISH DE: FROM CRISIS TO CARBON NEUTRALITY

1970s: Oil Crisis and Energy Planning

1973 Oil Crisis: The oil embargo and subsequent crisis exposed Denmark's reliance on oil for energy, sparking an urgent need for energy security.

The 1979 Heat Supply Act: This landmark legislation mandated municipalities to develop heat plans, encouraging the shift to district heating systems powered by domestic and renewable resources. It laid the foundation for Denmark's future leadership in sustainable heating.

1980s-1990s: Shift to Combined Heat and Power (CHP)

Adoption of CHP: Denmark significantly expanded its use of combined heat and power plants, which capture waste heat from electricity generation and use it for district heating. This was more efficient than heat-only boilers and reduced the need for separate heat and electricity generation.

District Heating Networks Expansion: The Heat Supply Act facilitated the rapid expansion of district heating networks, making it the preferred heating system in urban areas.

2000s: Integration of Renewable Energy

Biomass, Wind, and Solar: The 2000s saw a major push toward incorporating renewable energy into district heating. Biomass plants became increasingly popular, and solar thermal fields were introduced to support district heating grids.

Energy Taxes and Support Mechanisms: Policies such as taxes on fossil fuels and financial incentives for renewables further drove the transition from coal to cleaner energy sources.

2010s: Technological Advancements and Low-Temperature Systems

Fourth-Generation District Heating (4GDH): Denmark pioneered the development of low-temperature district heating systems. These operate at lower temperatures (50-55°C), increasing efficiency and reducing heat loss in the grid. This also made it easier to integrate renewable energy sources like geothermal and solar.

Smart Grids and Digitalization: Technological advancements led to the implementation of smart meters and digital heat control systems, optimizing the efficiency of heat distribution and customer energy use.

2020s and beyond: Carbon Neutrality and Future Outlook

Carbon-Neutral Heating by 2030: Denmark aims to achieve a carbon-neutral heating sector by 2030. This includes further integrating renewable energy and expanding district heating to areas still dependent on fossil fuels.

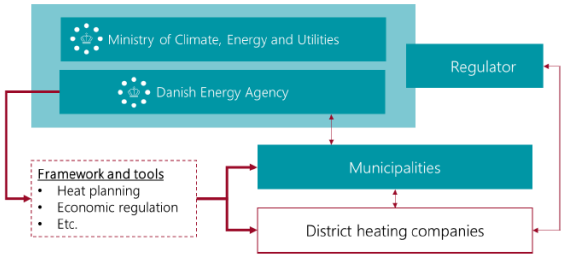
International Leadership: Denmark has become a global leader in district heating, sharing expertise and exporting technologies to other countries aiming to reduce emissions through centralized heating.

DDEA | INTRODUCTION 6

CONSULATE GENERAL OF DENMARK
Toronto

DDEA | GOVERNANCE FRAMEWORK: ROLES AND RESPONSIBILITIES IN DANISH DE

INSTITUTION	RESPONSIBILITY
Danish Energy Agency	Implement political ambitions in the legislation, standardized guidelines for heating, handle changes to the legislation, citizen requests, coordination with sector and other authorities, etc.
Municipalities	Heat planning authority, that approves new district heating projects, conduct zoning to avoid suboptimized investments, citizen dialogue, etc.
District Heating Companies	Implement district heating and operate the company based on non for profit principles, etc.
Danish Utility Regulator (DUR)	The implementation of the Heat Act in regards to price regulation. The DUR acts as the consumer protection in the monopoly market.
Energy Board of Appeal	Complaints about energy legated legislation can be processed in this organ.
Municipal Bank	Provides low interest loans to district heating projects conducted by municipal owned district heating companies.



DDEA | INTRODUCTION 7

Environment & Climate
Districts & Development

Development of Low Carbon Thermal Energy Networks (LCTEN)
City of Toronto Approach

Thermal energy supply not regulated by Ontario Energy Board

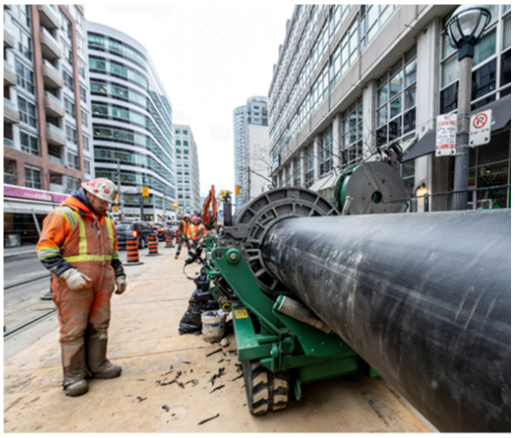
- The City cannot mandate connection on private property
- Our approach is to:
  1. Regulate what we can
  2. Lead by example with our assets
  3. Encourage, incentivize, and enable the private sector

Ownership:

- Privately owned/operated, with some municipal involvement
  - A majority of Canadian DES started with public support.

Benefits:

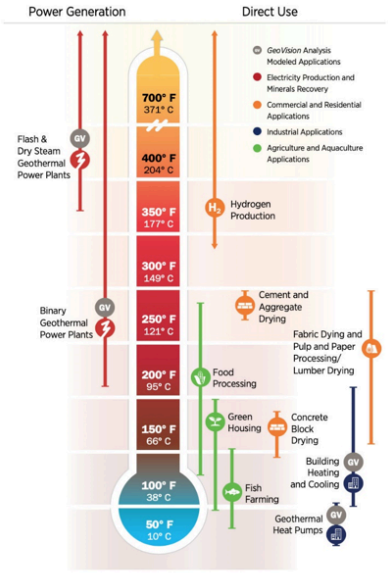
- Economies of scale; emissions reductions for lower cost
- Enable the use of less carbon-intensive fuel sources and integrate them at an energy centre
- Attract private investment and support local economic development.
- Continue rapid development: Housing Now, downtown, centres, brownfields, waterfront…



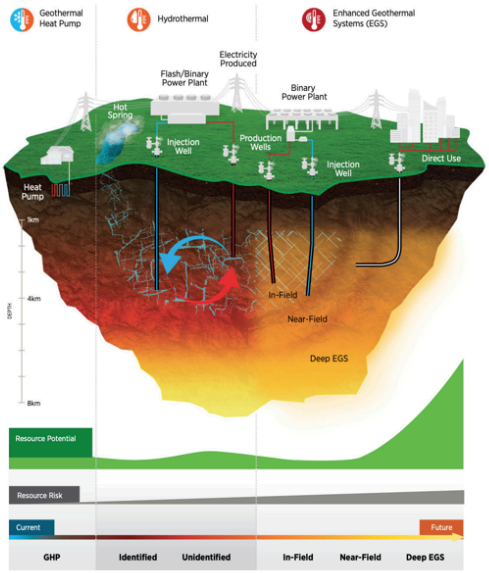
Enwave distribution piping being installed on Blue Jays Way

Environment & Climate
Districts & Development

Development of Low Carbon Thermal Energy Networks (LCTEN)
Deep Geothermal



- The subsurface thermal conditions in Toronto remain uncertain as there are no existing data on temperature logs at depth deeper than approx. 850 ft and no data on temperature gradients.
- The test bole aims to establish those temperature logs and gradients which will determine the relevant use case.



Reshape Strategies

POLICIES AND STRATEGIES FOR MITIGATING CONNECTION RISK

RESHAPE STRATEGIES

Compulsory ← → Non-Compulsory

Owner / DES	Mandatory Connection Bylaw in Service Area	DE Requirement in Site Rezoning	City Building Anchor Loads	City-Wide Green Building Bylaw with GHGI	Economic Incentive	Informal / Encouraged in Planning Process	Master Developer Mandates Connection	Developer-Owned Utility
City of Edmonton	✓		✓					
City of Vancouver	✓	✓		✓				
City of Toronto			✓	✓				
City of Markham					✓	✓		
Lakeview						✓	✓	
Zibi							✓	✓

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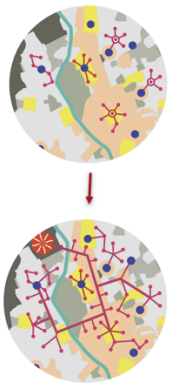
EVOLUTIONARY PERSPECTIVE ON DISTRICT ENERGY DEVELOPMENT

RESHAPE STRATEGIES

Service Areas

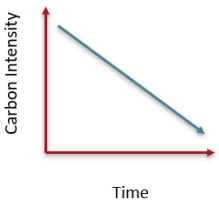


Connection Policies

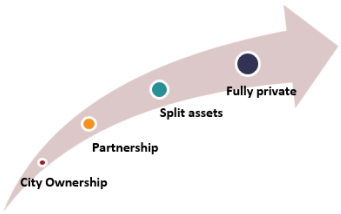
Mandatory

Voluntary

Technology



Ownership



Source: IDEA Community Energy: planning, development and delivery

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