DISTRICT ENERGY DIGEST

No. 12, June 2026

DISTRICT ENERGY DIGESTS have been produced every four months by the Boltzmann Institute, but there's been a gap since the last one in June 2025.

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The *Two Pathways* project one year later

The main activity of the Boltzmann Institute during the two and a half years up to June 2025 was carrying out our *Two Pathways* project. It compared decarbonization of building heating by (i) electrification, with (mostly air-source) heat pumps, or (ii) by deployment of thermal networks, wherever heat demand density is sufficient for them to be viable, and ground-source heat pumps (GSHPs) in rural and other low-density areas.

The project's 189-page final report (cover shown on next page) and its dozens of annexes were published here on June 30, 2025. A nine-page executive summary of the final report is available here and a 17-minute video on the project is here.

The project's main conclusions were:

- Pursuing the electrification pathway to decarbonize heating of most/all Ontario buildings would be unaffordable and essentially unworkable
- Pursuing the thermal networks pathway should be feasible and affordable for decarbonized heating of up to about 70% of Ontario's buildings (with GSHPs in low-density areas).

We are encouraged by the continuing interest and response. The *Two Pathways* main report has been downloaded over 300 times; and there have been over 1,030 downloads of the individual annexes prepared for 55 of Ontario's local (electricity) distribution companies (LDCs).

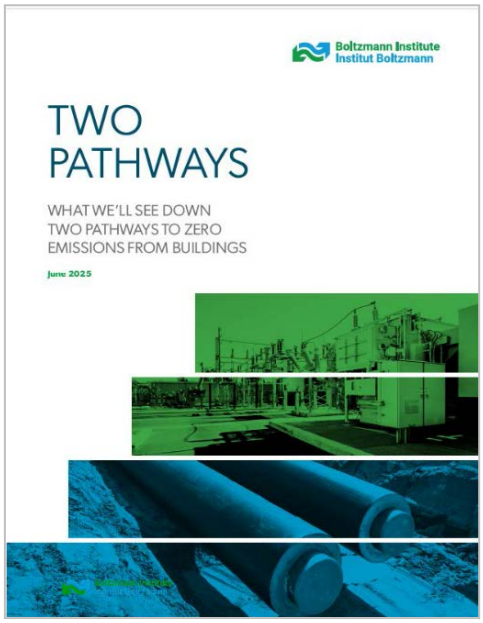
About the Boltzmann Institute

We're a federally incorporated, not-for-profit think tank founded in 2022, seeking to help eliminate harmful emissions from human energy use. Ludwig Boltzmann was a 19th-century Austrian founder of the science of thermodynamics.

We aim to contribute research and education towards securing carbon neutrality by 2050, initially focusing on thermal energy use in buildings (heating and cooling).

Our website at www.bi-ib.ca is a growing resource on thermal energy usage and related matters.

We operate with modest expenses and the volunteer labour of members. Donations to support our ongoing work would be very welcome; they can be made by e-Transfer to "deposits@bi-ib.ca". For offers/enquiries regarding personal involvement by relevant experts, or discussion of enabling the strategic transition of the Boltzmann Institute to a larger, employee-based organization, please contact Martin at mgreen@bi-ib.ca.



Cover of the main report on the Two Pathways project

Over the past year, the Boltzmann Institute (BI) has put much effort into building broad awareness of the project's findings and helping key stakeholders develop and implement warranted strategy and policy changes. Some highlights are below.

Thanks to participation of BI members on the Energy Task Force of the Ontario Society of Professional Engineers (OSPE), **the OSPE has recognized the importance and value of thermal energy**. It has launched an Advocacy for Thermal Energy in Ontario (here) and has directly engaged the Ontario Ministry of Energy and Mines through written submissions and meetings (see here).

OSPE's submission to the Environmental Registry of Ontario (ERO 025-0923) regarding Ontario's Natural Gas Expansion Program (here) "urges the Ministry to broaden the scope of this consultation to include district thermal energy systems (also called district heating and cooling or thermal energy networks). Many communities are committed to decarbonization and maximizing local energy resources; exclusive reliance on gas service risks locking in a carbon-based pathway and creating future stranded-asset risk. Thermal networks are a fuel-agnostic, future-proof platform that can complement or replace gas expansion where technically and economically viable, particularly in rural, northern, and Indigenous communities seeking affordable, reliable, resilient thermal services."

The OSPE's submission to the Impact Assessment Agency of Canada on the New Nuclear at Wesleyville (NNW) Project (here) includes: "OSPE encourages that the NNW Project be evaluated not only as a source of clean electricity, but also as a strategic thermal asset within Ontario's evolving energy system. Greater integration between electricity and thermal energy systems, often referred to as sector coupling, can materially improve overall system efficiency, affordability, resilience, and emissions performance." BI's submission on the NNW Project is here.

BI has productively engaged with several municipalities, notably Durham Region and Ottawa, to help them understand the thermal energy planning and local opportunities and options for deployment of thermal networks. BI director Michael Wiggin was featured in a *Smart Heat, Zero Emissions: Fireside Chat* (here) at Ontario Tech University's Brilliant Energy Institute.

BI is collaborating on an ongoing basis with the International Energy Agency, the OECD Nuclear Energy Agency, and the International District Energy Association. A significant outcome – that reflects the need for an integrated approach to energy systems – was the report *Thermal Networks: Empowering the Smart Transition to Net Zero. A Joint Report from the Perspective of 11 International Energy Agency Technology Collaboration Programmes* (available here).

Most of the rest of this issue of the *District Energy Digest* briefly describes key publications on thermal energy networks (also known as district energy systems) we've noted during the past year.

Items from Canada

THERMAL ENERGY NETWORKS IN CANADA: UNLOCKING IMPACT POTENTIAL AND ADVANCING ENABLING POLICY (link). This 42-page report was published in September 2025 by the Building Decarbonization Alliance (link), part of the Transition Accelerator (link), and Dunsky Energy + Climate Advisors (link), with funding from BC Hydro, the Cities of Edmonton and Toronto, The Atmospheric Fund, and Natural Resources Canada. The International District Energy Association says the report "looks at the broad benefits TENs [Thermal Energy Networks] can provide, the barriers to expanding their use, and the roles policymakers, regulators, utilities, municipalities, and developers can play in unlocking the potential of TENs." (link) The report's unsourced Figure 2, reproduced on the left, provides potentially interesting data on the fueling of Canada's 250 or so TENs (which, according to the report, provide about 3% of Canada's space heating). The figure suggests much scope for decarbonization of existing TENs. This may be a relatively easy task compared with decarbonizing other kinds of heating system.

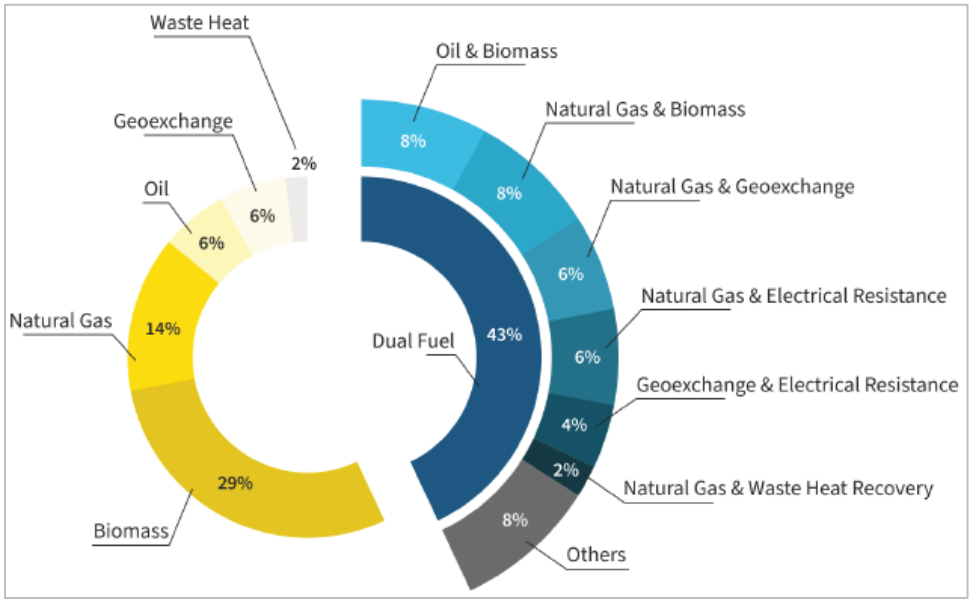


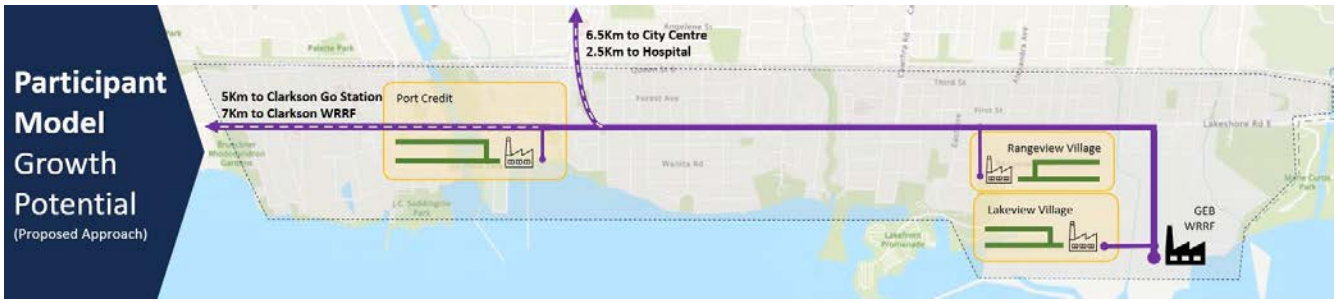
Figure 2 of the *Thermal Energy Networks in Canada* report, which has the legend "TENs Energy Sources Since 2010."

WIN-WIN: LESSONS FROM B.C. AND NEW YORK IN USING THERMAL ENERGY NETWORKS TO SUPPORT GOOD JOBS AND URBAN DECARBONIZATION (link). This 11-page report was produced in April 2025 by the Vancouver-based Zero Emissions Information Centre (ZEIC, link), one of seven regional centres funded by the Government of Canada in 2019 to the extent of $20-100 million per centre (link). The report concerns a three-day study tour of Vancouver TENs by a delegation of labour and community leaders from New York State under the auspices of the Building Decarbonization Coalition (BDC, link). BDC's report on the study tour is here. According to ZEIC's report, the top takeaways were these:

- The current "building-by-building" decarbonization approach can be costly and disadvantageous to utility workers dealing with high-carbon energy sources, such as natural gas for building heating.
- TENs represent a high-potential urban decarbonization solution because of the affordability and energy efficiency benefits that come from their larger scales. TENs provide a pathway for high-carbon utility workers to play a meaningful role in the energy transition.

- A strategic partnership towards deployment of TENs that works across the energy and construction sectors – that also brings in environmental and community groups – can unlock economic and social benefits that go far beyond decarbonization.

DISTRICT ENERGY AND THERMAL NETWORK (link). This October 2025, 14-page report by Peel Region staff is about the harvesting of thermal energy from wastewater, for which the Region is among the leaders. The report touches on such wastewater use across Canada but mostly discusses municipal "enabler" vs. "participant" approaches to use of this energy for TENs. It advocates the latter, "where Peel Region shares in the risk for a greater share of the created value. … Peel Region becomes an active part of the thermal energy process, actively searches for best opportunities to develop and expand its thermal energy from wastewater transmission system and includes suitable financial investment." The figure below suggests the growth potential.



The Peel Region report's Figure 5, legend "Future expansion under the participant model." GEB WRRF is the G.E. Booth Water Resource Recovery Facility (link). The green lines show distribution of thermal energy to customers. The purple lines are proposed and later (dashed) transmission lines.

The report concludes that Peel Region has access to a substantial reserve of thermal energy with the potential to provide heating and cooling services for up to 300,000 dwellings. This resource is underutilized due to the absence of a thermal network. A thermal network developed to harness the energy at scale could generate a significant and sustained revenue stream for Peel. It would contribute meaningfully to climate targets and advance Peel Region's strategic objectives.

ARE THERMAL ENERGY NETWORKS THE FUTURE OF URBAN DECARBONIZATION? is the title of an article by Kéa Anderson in the April 3, 2026, issue of the *McGill Energy Journal* (link). She concluded, "As cities in Canada and around the world experience a growing need to address urban emissions and improve climate adaptation, a concerted focus on sustainable heating and cooling will be a necessity. TENs are conveniently situated to play a central role in shaping a sustainable urban future."

GEOTHERMAL NETWORKS LET CITIES WARM AND COOL AS ONE (link) This three-page December 2025 article in the prestigious scientific journal *Nature* by Peter Fairley, a science and environmental journalist based in Victoria, B.C., was cited in the above-noted *McGill Energy Journa*l article. (References to the item can be a little confusing because offprints of it have a different title: **"**Ageing Cities get a Geothermal Upgrade.") The article touches on several topics concerning TENs served by closed-loop borehole-based geoexchange, noting such systems in Toronto in passing – likely including those at the University of Toronto campuses (link), Liberty Village (link), and others (link). The topics include North American cost overruns on these systems, perhaps due partly from paying insufficient attention

to European practice, and "the ability of gas workers to change gears and install the thermal network pipes after just a couple of hours of training" – also addressed in the ZEIC report noted above.

A VISION FOR DISTRICT ENERGY IN CANADA (link) This web page of the International District Energy Association introduces IDEA's 2026 advocacy program towards achieving a national district energy strategy to "avoid more than 20 GW of electrical generation and transmission capacity at winter peak, and reduce required grid infrastructure spending by over $100 billion." (This seems separate from OSPE's advocacy program noted above on Page 2.) IDEA's web page contains links to three items:

- *Canadian Federal Policy Brief*, which cites the *Two Pathways* report (see above) and this *Digest*
- *Homegrown Heat eBook*, a Canada-focused primer on district energy
- *Vision for District Energy*, a PowerPoint presentation concluding with three federal commitments sought by the advocacy program: (i) streamlined grants, (ii) a $2B low-cost financing facility, and (iii) a national district energy strategy –. all to "grow district energy from 2.5% to >25% of heating demand, unlock billions in investment, reduce peak grid pressure, support Indigenous energy sovereignty, and achieve >25 MT of annual GHG reductions by 2050."

Later in 2026, IDEA "will convene a Canadian district energy advocacy working group, bringing together operators, utilities, campus leaders, municipal officials, and policy partners to align on shared priorities and a coordinated strategy for the years ahead."

SHARING THE LOAD: A LOOK AT HOW THE PROJECTED EXPANSION OF AI INFRASTRUCTURE COULD STRENGTHEN ONTARIO'S ENERGY SYSTEMS (link) This 35-page March 2026 report, prepared by Mantle Climate (link) for the MaRS Discovery District (link; MaRS stands for Medical and Related Sciences, an innovation hub now broadened to include many other sectors.) The report suggests that data centres requiring up to about 1.5 GW during the next decade can be accommodated within planned grid expansion. Beyond that, and certainly if 3.0 GW is required – the maximum the report considers – on-site generation and/or district energy and thermal storage will be required. Current requests for connection of data centres to the Ontario grid already exceed 6.5 GW and may be approaching twice that amount (link, link). (For an up-to-date readable academic review of the use of data centre waste heat for TENs, see the 15-page article by Xiaolei Yuan and six others at link. Also see the 56-page report *Environmental Cost of Artificial Intelligence* by Miriam Aczel and five others at the United Nations University Institute for Water, Environment and Health, Richmond Hill, Ontario [link].)

Items from elsewhere

FLEXIBILITY IS NOT OPTIONAL – IT IS THE NEW FOUNDATION OF DISTRICT HEATING (link) This was the title of the editorials in the first two 2026 issues of HOT|COOL magazine, produced monthly by the Danish Board of District Heating – a no-cost, on-line source worth subscribing to if you have the slightest interest in heating and cooling buildings. The editorials made these points, each with a powerful justification:

- Overcapacity is not inefficiency – it is strength
- Storage is not a heat source – yet the most important one.
- Storage turns volatile inputs into stable outputs
- Flexibility is the key – just do it.

SMART THERMAL NETWORKS IN THE EUROPEAN UNION: 2025 STATUS REPORT ON TECHNOLOGY DEVELOPMENT, TRENDS, VALUE CHAINS AND MARKETS (link) This 60-page, December 2025 report is a major document on TENs produced by the European Commission's Clean Energy Technology Observatory. It contains a wealth of well-documented data and analysis including, for example, the chart below. The following begins the report's conclusions (which continue by setting out the potential for the EU as a global supplier of large-scale heat pumps and other DHC-related items).

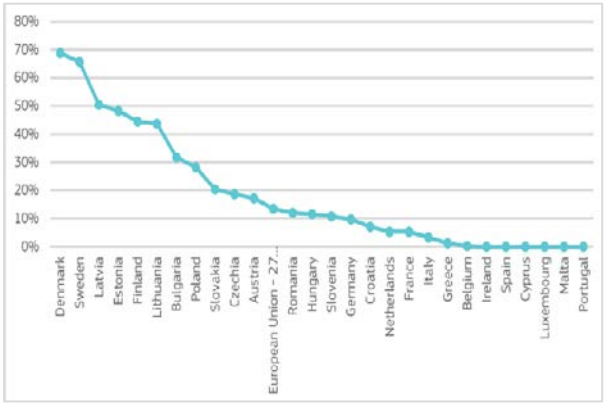


Figure 3 of the EU report, legend "Share of district heat in total energy use for space heating in households in 2023."

"District heating and cooling (DHC) systems play a crucial role in decarbonising the EU heating sector and achieving global net-zero emissions by 2050, as highlighted in the IEA's *Net Zero by 2050 Roadmap* [2023 update here]. The role of DHC is evolving, becoming an integral part of the wider energy system through the integration of large-scale heat pumps and thermal energy storage technologies into their existing heat sources, enabling effective and flexible integration to the power sector. Projections indicate a significant increase in the use of renewable sources and waste heat, with centralised heat pump capacity in the EU expected to rise from 3.8 GW to over 17.6 GW by 2030."

BARRIERS TO DISTRICT HEATING DEPLOYMENT: INSIGHTS FROM LITERATURE AND EXPERTS (link) This 29-page academic article, published in *Energy Policy* in July 2025, identified barriers to deployment of TENs through an AI-aided literature review and a survey of 94 district heating experts. Overall, political, economic, and legal barriers were found to be the most challenging. Perhaps paradoxically, the authors found that environmental, social, and technical barriers require more attention in countries with lower district heating adoption rates than in those with higher rates.

THERMAL ENERGY NETWORKS IN THE UNITED STATES: EMERGING OPPORTUNITIES, CHALLENGES AND NEEDS (link) is a 76-page review published in May 2025 by two consulting firms, Transformative Strategies (link) and Common Spark (link). It has four substantive chapters beyond an introduction concerned mostly with explaining TENs: 2. TENs policy landscape, 3. TENs ownership models, 4. Equity and environmental justice perspectives on TENS, and 5. Energy democracy perspectives on TENs. A concluding chapter sets out 17 points towards advancing TENs while prioritizing equity, environmental justice, and energy democracy.

Study tour of nuclear and district energy facilities in China?

We noted in last June's *Digest* that China may now have the world's largest extent of district heating, reported as consisting of over 200,000 kilometres of thermal networks supplying almost nine billion square metres of building floor area (link). We said we'd be pleased to arrange a study tour of Chinese facilities for 2026, including use of heat from nuclear generation. At the time, there wasn't enough interest to proceed for 2026. If there's enough interest now, we'll move towards arranging a study tour for March or November 2027. If interested, please send a note to rgilbert@bi-ib.ca.