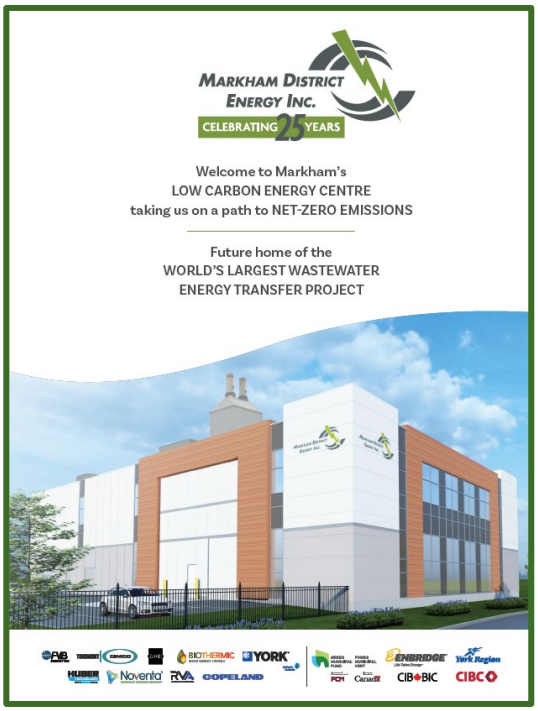
## Our Big Sector Coupling Story

### The World's Largest Wastewater Energy Transfer (WET) Project Breaks Ground in Markham Commercial Operation Q1 2026

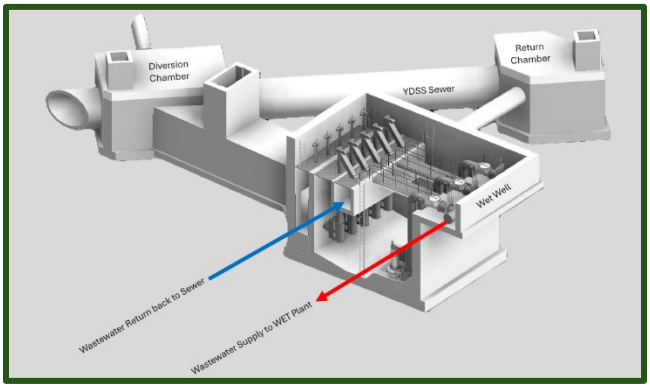



**31.45 MW** Energy Transfer System
(18.75 MW heating + 12.7 MW / 3600 tons cooling)

Heating and cooling energy for 7.5 million sq. ft. of district energy customers in our Markham Centre system.

When fully operational and subscribed, the WET project will reduce our annual GHG emissions by over **30,000 tonnes.**

On July 16, 2024 Canada's Deputy Prime Minister joined Markham District Energy, local leaders, and project partners to break ground on the **world's largest** wastewater energy transfer (WET) project in Markham, Ontario, Canada. Construction of the $58.3M (Cdn) plant is well underway and is on-schedule for commercial operation in Q1 2026.




MDE is constructing a large "wet-well" chamber that diverts 1,000 litres per second of wastewater at 19ºC. The project is utilizing HUBER RoWin heat exchangers (Germany) that extracts flow from the wastewater for heat pump operations. Low stage heat pumps (centrifugal chillers) lifts the flow temperature to 45ºC then high stage heat pumps (ammonia screw compressors) lifts the temperature to 95ºC for use in the district heating network.

Markham District Energy system currently services over 15.4 million sq. ft. (MSF) consisting of residential, commercial, and institutional customers across two systems. The WET project will supply energy to 7.5 MSF of customer additions driving to lower carbon, provide critical redundancy and system flexibility for our district energy operations. Without the WET project, MDE would be in construction of a 20 MW natural gas heating plant and a 3600-ton chilled water plant, adding to emissions, and providing zero Sector Coupling benefits.

**Groundbreaking by TVO Ontario:** https://youtu.be/ONTySQEuI4Q?si=UUOQvzG61g0mFiLY

## Markham District Energy Facts & Stats

| | |
|---|---|
| **Two District Systems served from four (4) plants** | Markham Centre (2000) and Cornell Centre (2012) |
| **Conventional Energy Production Assets** | 77.2 MW Hot Water Boilers<br>4.9 MW Steam Boilers<br>83.0 MW (23,610) tons Chilled Water Centrifugal Chillers |
| **Sector Coupling Assets** | 15.5 MW Combined Heat & Power (CHP) generators<br>40 MWH Hot Water Thermal Storage<br>300-ton Heat Recovery Absorption Cooling Unit<br>5 MW Diesel Peak Shaving Unit<br>31.7 MW of boilers are Dual Fuel<br>7.0 MW Heat Recovery Heat Pump Plant (heating + cooling capacity) (2024)<br>500 KW biomass fuel heating boiler (2024)<br>31.45 MW Wastewater Energy Transfer Plant (heating + cooling capacity) (2026)<br>3.0 MW Heat Recovery Heat Pump (2026) |
| **Distribution System** | 52 km Hot Water & Chilled Water distribution system |
| **Customers Base** (as of December 31, 2024) | 224 customers totalling 15.4 million sq. ft.<br>(residential, institutional, commercial, data centres) |
| **System Reliability** | 99.9992% over 24 years of continuous operations |
| **Hot Water Energy** | 169,666 MWH in 2024 |
| **Chilled Water Energy** | 102,458 MWH in 2024 |
| **Heating Peak Demand** | 60.0 MW in 2024 |
| **Cooling Peak Demand** | 43.0 MW (12,000 tons) in 2024 |
| **Sector Coupling Investments 2000 to 2023** | $20.7M or 10.0% of $199.6M (Cdn) total investments |
| **Reference Period Sector Coupling Investments** | $81.3M or 81.0% of total capital plan equal to $99.6M (Cdn) (2024 through 2026) |

## Our Early History

**Energy Resiliency:** The concept of launching a district energy (or community energy) system serving Markam's growing downtown was our city's first response to the North American Great Ice Storm of 1998. The Storm caused major damage and power outages across a widespread area in Eastern Ontario, Canada's eastern provinces, and parts of northern US states. As many as 1,000 transmission towers collapsed leaving more than 4 million citizens without power for almost a month in January.

While the Storm did not land on our city, Markham sent utility crews east to assist with the recovery. City Council then reflected on what strategies could be pursued to reduce the risk of future weather impacts. A local thermal energy system (with power generation assets) became the leading strategy locally.

**Economic Development**: In early 1999, Markham was competing against many other jurisdictions in Canada and Europe to attract the relocation and construction of IBM's largest software laboratory that would employ over 2,500 highly skilled software professionals. As part of Markham's presentation to IBM, the City proposed the launch of Markam District Energy (MDE) where IBM could focus on their core business, and MDE would be IBM's energy supply partner. IBM said yes to Markham and later reported that the district energy proposition was a key differentiator in favour of Markham.

Less than three years after the Storm, IBM located its world software laboratory in Markham and Markham District Energy commenced energy supply operations on December 1, 2000.

**Efficiency & GHG Emissions**: MDE's heating and cooling production efficiencies have historically been higher than what standalone building systems would have reported resulting in lower community GHG emissions. Early implementation of CHP dramatically changed our heating production efficiency in our early years which moves to much stronger performance as our Sector Coupling investments advance. Refer to the Energy & Efficiency table during the Reference Period shown later in this document.

## Our Growth & Performance Story

**Markham Centre (MC) System:** After IBM connected as our first anchor energy customer, MC continued to grow with the addition of high-rise residential complexes, commercial buildings and institutional customers including schools, theatres and community centres. Adding to IBM, other data centres connected to the district cooling system that provided the community scale heat recovery heat pump opportunity that MDE has now implemented. After 24 years, MDE now services 100% of buildings constructed since 2000 totalling 15.4 million sq. ft. MC is projected to grow to 50 million sq. ft. over the next 20 to 30 years; and MDE will continue to expand to service all new buildings.

**Cornell Centre (CC) System:** In 2012, MDE launched its second system to service a major expansion of our regional hospital, surrounding medial buildings, a new community centre and a local fire station. Cornell Centre continues to grow with new hospital expansions planned plus residential towers and seniors living projects. CC is a priority urban growth node for the City with future density planned totalling 10 million sq. ft. Refer to the Third Quarter 2013 District Energy article attached in the Supporting Material section of this Submission.

**Best-in-Class Reliability:** After 24 years of operations, serving over 15.4 million sq. ft. or residential, commercial and institutional customers from four energy plants across two municipal systems, MDE's service reliability is reported at over 99.9992%. This equates to under 2.5 hours of system downtime in 24 years.

**Award Wining Health & Safety Record:** Best-in-class service reliability results from a best-in-class system design combined with forward planning preventative maintenance practices. To make all this work, MDE has a strong Operations Team with many years of continuity the leadership group. Key to this story is our health and safety record including our safety regulator awarding a legacy Safety Award in 2020 recognizing 20 years of continuous operations without reporting one lost-time-incident.

**Supporting the Community, Seniors & Youth:** Since our launch in 2000, MDE has prioritized giving back to the community including supporting our regional hospital's foundation, seniors' homes, and local charities that help people in distress. MDE has also provided educational bursaries (to young sustainability champions) to graduates from 14 high schools across the City and more recently, bursaries to undergraduate student at the York University campus.

## Impact Section: *What was achieved*

The following section provides key information for the Reference Period Impact Section in the Submission Platform. As requested, we have quantified delivered Heating & Cooling Energy Production and Efficiency statistics during the Reference Period.

| Heating Energy (MWh) | 2024 | 2025 (est.) | 2026 (est.) |
|---|---|---|---|
| | Reference Period | | |
| Heating Energy Production | 169,666 | 175,562 | 181,694 |
| | | | |
| Natural Gas Boiler Operations | 98,313 | 94,377 | 34,310 |
| Heat Recovery from CHP Operations | 61,029 | 61,029 | 61,029 |
| Heating Energy from Heat Recovery Heat Pumps | 10,696 | 19,656 | 19,656 |
| Heating Energy from Biomass Boiler Operations | 1133 | 500 | 500 |
| Energy from Wastewater Energy Transfer System | 0 | 0 | 66,000 |

| Heating Energy Efficiency (MWh) | 2024 | 2025 (est.) | 2026 (est.) |
|---|---|---|---|
| | Reference Period | | |
| Heating Sales | 163,235 | 168,761 | 174,575 |
| Conventional Buildings Nat Gas Input (Status Quo) | 217,647 | 225,015 | 232,766 |
| | | | |
| District Energy Input Boiler Fuel (natural gas) | 115,662 | 111,032 | 40,600 |
| CHP (cogeneration) Natural Gas to Heat Fraction | 0 | 0 | 0 |
| Electricity to Heat Recovery Heat Pumps | 1,753 | 3,222 | 3,222 |
| Biomass Energy Input | 0 | 0 | 0 |
| Electricity to Wastewater Energy Transfer System | 0 | 0 | 25,000 |
| **Total District Heating Energy Input** | **117,415** | **114,254** | **68,822** |
| | | | |
| **Energy Savings over Status Quo Building Heating Plants** | **46.1%** | **49.2%** | **70.4%** |

| Cooling Energy (MWh) | 2024 | 2025 (est.) | 2026 (est.) |
|---|---|---|---|
| | Reference Period | | |
| Cooling Energy Production | 102,458 | 105,809 | 109,295 |
| | | | |
| Centrifugal Chillers Input Energy | 95,216 | 92,502 | 87,988 |
| Energy from Heat Recovery Heat Pumps | 7,241 | 13,307 | 13,307 |
| Energy from Wastewater Energy Transfer System | 0 | 0 | 8,000 |

| Cooling Energy Efficiency (MWh) | 2024 | 2025 (est.) | 2026 (est.) |
|---|---|---|---|
| | Reference Period | | |
| Cooling Energy Sales | 93,625 | 98,278 | 101,485 |
| Conventional Buildings Electricity Input (Status Quo) | 28,773 | 30,227 | 31,229 |
| | | | |
| Energy from Centrifugal Chillers | 20,983 | 20,297 | 19,294 |
| Cooling from Heat Recovery Heat Pumps | 1,810 | 3,327 | 3,327 |
| Cooling to Wastewater Energy Transfer System | 0 | 0 | 2,000 |

| | | | |
|---|---|---|---|
| **Total DE Cooling Electricity** | **22,793** | **23,624** | **24,620** |
| | | | |
| **Energy Savings over Status Quo Building Cooling Plants** | **6.4%** | **6.7%** | **6.5%** |

**Greenhouse Gas (GHG) Emission Reductions During the Reference Period**

| **GHG Emissions (tonnes)** | **2024** | **2025 (est.)** | **2026 (est.)** |
|---|---|---|---|
| | **Reference Period** | | |
| GHG Reduction from Heat Recovery Heat Pumps | 2,278 | 4,187 | 4,187 |
| Incremental GHG from electricity for HRHP operations | (70) | (129) | (129) |
| **Net GHG Reductions from HRHP Operations** | **2,208** | **4,058** | **4,058** |
| Net GHG Reductions from Biomass Operations | 241 | 106 | 106 |
| GHG Reductions Wastewater Energy Transfer (WET) | 0 | 0 | 14,058 |
| Incremental GHG from electricity to WET operations | 0 | 0 | (998) |
| **Net GHG Reductions from WET** | **0** | **0** | **13,061** |
| CHP (cogeneration) Heat Recovery GHG reductions | 12,652 | 12,652 | 12,652 |
| | | | |
| **Total Overall GHG Reductions / Sector Coupling** | **15,101** | **16,816** | **29,877** |

As shown above, the Wastewater Energy Transfer (WET) system starts to contribute material GHG reductions in 2026 when it achieves commercial operation in Q1. First year GHG reductions of 13,061 tonnes increases to over 30,000 tonnes as the district heating network expands to fully utilize the WET capacity for greater annual hours.

**Other Environmental Benefits**

Our Heat Recovery Heat Pump (HRHP) projects combined with the Wastewater Energy Transfer (WET) heat pump system are projected to save over 165,000 m3 of water annually when both assets are fully operational.

**Investment Paybacks**

In 2023 KPMG reported the Internal Rate of Return (IRR) equal to 10.06% on MDE's capital investment from 2000 through 2018 totalling $50.4M (Cdn) at that time. As a "for-profit" utility in a non-rate regulated jurisdiction, MDE continuously strives to find the balance of investment returns while maintaining competitive customer rates. It should be noted that our profits are then cycled back to the community given that the City of Markham is our sole shareholder. We can also report that signature Sector Coupling project highlighted in this submission is projected to return an after-tax IRR of 10.3% given current grant funding and input assumptions.

## Additional Links

**Markham District Energy Website:** www.markhamdistrictenergy.com

**CIBC Podcast**
December 22, 2022
In Conversation with Bruce Ander: Why District Energy is Important to the Energy Transition in Canada
https://cibccm.com/en/insights/podcasts/in-conversation-with-bruce-ander-why-district-energy-is-important-to-the-energy-transition-in-canada/