



# VICTORIA COMMON CONDOMINIUM

WHAT'S NEXT IN CONDOS? GEOTHERMAL ENERGY

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**Case Study** CITYMULTI



# Geothermal Energy: Victoria Common Condominium

## The Challenge

The Kitchener-Waterloo region in Ontario is an up-and-coming area for homeowners and investors looking to purchase property without the sky-high prices of Toronto. With many new-build houses and condos planned and on the market, new residential developments need to stand out to compete. One of these communities is Victoria Common, by Queensgate Developments (Kitchener) Inc. When complete, it will include five mid-rise condo buildings with over 990 residential suites.

To remain competitive, the condos are contemporary in design with a brick, steel and glass façade. All units include patios, balconies or terraces. Sam DeCaria, President of Anew Building Corp., explains that energy-and cost-savings for the developer and for end-users were also very important. The option of using a geothermal district energy system, which offers 30% energy-savings when compared to other systems, was very attractive. Queensgate wanted to build a single geothermal system that would work for all five buildings



to provide better energy efficiency and redundancy, ensuring that no one building could ever be without heating or cooling.

Queensgate needed a high-efficiency HVAC system that could connect to the geothermal system and reliably carry heating and cooling to each suite with the highest level of comfort and control. They chose Mitsubishi Electric's City Multi VRF (Variable Refrigerant Flow) Water-Source Heat Recovery systems. The VRF systems recover energy from zones on each floor of a building before drawing energy from the geothermal field – this means it can draw heat from a part of the building that needs cooling and

transfer it to an area that needs heating.

For example, west-facing areas can become hot in any season from sunlight streaming in. A traditional heating and cooling system would have to waste energy cooling the west side while at the same time warming up the east side. Instead, a VRF heat recovery system takes heat from the west and redistributes it to the east, balancing the temperature across each floor before going to the condensers and geothermal energy source.



## Geothermal Energy

Geothermal energy is sustainable, renewable, reliable, low maintenance and durable, with ground loops lasting up to one hundred years. A geothermal system channels solar energy naturally stored in the earth, delivering heat when needed and providing a heat sink when cooling is required. Essentially, the ground acts like a bank of energy: some energy is deposited and some is borrowed.

At Victoria Common, a series of boreholes were drilled into the ground under the parking garage of building A, where a system of geothermal pipes 17,920 feet in length was installed in an underground supply and return network. Fluid, tempered as it flows through the ground loop, is delivered to headers inside the building parking garage. A similar system of geothermal pipes was installed under the parking garage of building B as it will be under buildings C, D and E as they are built.

## Variable Refrigerant Flow Heat Recovery Systems

Mitsubishi Electric's City Multi VRF Water-Source Heat Recovery Systems, coupled to the geothermal system,



*"Variable refrigerant flow and geothermal energy are not the norm – there's a lot at stake if it doesn't work. There's a big learning curve, the system has to work for all parties, and it takes time to find a comfort level. The Mitsubishi Electric brand was huge in giving us the confidence to use this technology because they're a proven, reputable brand and company."*

Sam DeCaria, President of Anew Building Corp., a partner of Queensgate Developments (Kitchener) Inc.

continuously take or reject heat as required by the building. Central VRF condensing units use little electricity to exchange the water-source heat with environmentally friendly refrigerant. This adds a second layer of energy efficiency, in that refrigerant evaporates at a much lower temperature than water and the gas can be highly compressed, storing large volumes of energy in a small volume of gas. Variable drive motors send exactly the amount of refrigerant required to heat or cool the building

through two very small diameter pipes to Branch Control units centrally located on each floor of the building. Each Branch Controller is then connected by two small refrigerant pipes to up to 16 low-sound fan coil units concealed in the ceiling or walls in individual suites, each with their own fully controllable thermostats, simultaneously providing heating and cooling. The heat recovery capability of the system provides a third layer of energy efficiency, as it extracts heat from suites requiring air conditioning and

circulates it to suites requiring heating before it calls for more energy from the central compressors.

Energy efficiency is created by reusing energy by moving it around, before consuming electricity to create more. The geothermal/water-source heat recovery VRF system has three ways to simultaneously move and reuse energy: in the ground, in the central condenser loop and in each branch control loop. Typical COP values range 4 to 5 during heating mode, 5 to 7 during cooling mode and 6 to 11 during the spring and fall, when it is in simultaneous heating/cooling mode.

The integration of a geothermal system and VRF heat recovery technology will provide the residents of Victoria Common with renewable, efficient, cost-effective, carbon-free and sustainable energy for many years to come.

## The Solution

Mitsubishi Electric Heating and Cooling stepped in with a solution that would allow Victoria Common buildings to use a geothermal district

energy system without having to install a huge infrastructure before all the buildings are built. They suggested constructing each building on independent geothermal bore-fields, with multiple modular water-source VRF systems that provide redundancy, high energy efficiency and individual suite as well as whole-building digital controls.

DeCaria explains that it was an easy choice selecting Mitsubishi Electric, as they are a recognized, proven performer in the marketplace and they have plenty of experience with this technology, as far back as the 1990s. Plus, their systems come with a 10-year warranty and offer another 25% energy-savings on top of the 30% offered by a geothermal system.

There were other benefits to this solution, too. Unlike traditional systems, Mitsubishi Electric's Water-Source VRF Heat Recovery Systems didn't require water pipes or pumps throughout the building, which can lead to leaks and headaches for the developer, property management and residents.

There are no compressors in occupied suites, so the system operates at very low sound levels, almost a whisper, even during the summer cooling season. The individually metered systems offer residents the convenience and flexibility of operating heating or cooling year-round, which is perfect for older residents who might want heat in the summer or people who run hot and need a cooler temperature to sleep well.

Mark Zwicker, Principal at Architecture Unfolded and Victoria Common architect, also appreciated the design flexibility of the in-suite air distribution units, as they were smaller and offered more placement options, meaning they are hidden in the ceiling freeing up additional floor and living space and not obstructing windows.

*It was great having an association with and support from Mitsubishi. They provided a lot of time advising and reviewing documentation; it was like having a second check from a manufacturer. When they are putting their product in they are very involved.*

Leon Demaiter, President of  
DEI Consulting Engineers

## The Results

Everyone involved with the project was very pleased with the results. Mitsubishi Electric met budget constraints and worked with a third-party energy provider to provide individual suite monitoring and measuring for billing purposes. Trained contractors, factory oversight and their 10-year warranty ensured quality installation and the reliability the client required.

Since geothermal energy is a newer technology, everyone involved was very appreciative of the experience and extra support provided by Mitsubishi Electric to ensure the project was a success.

## Summary

### Developer:

Queensgate Developments (Kitchener) Inc.

### Distributor:

Mits Airconditioning Inc.

### Engineering Consulting Firm:

DEI and Associates Inc.

### Architectural Firm:

Architects Unfolded

### Contracting Firm:

- Hy-Mark Mechanical Inc./Art Blake Refrigeration
- Dean Lane Mechanical

### Location:

Kitchener, ON

### Industry:

Residential

### Size:

Building A 77 suites, occupied 2015; Building B, 116 suites, occupied 2017; Buildings C,D,E in development

### Challenges:

Builder Queensgate Developments needed a competitive but highly energy-efficient heating and cooling system that could make the most of geothermal energy for its new residential condominium community.

### Selection Criteria:

- Energy savings
- Design flexibility
- Proven partner
- Brand reputation
- Energy efficiency
- Cost competitive
- End-user comfort and convenience

### Design/Engineering Solution:

**Building A** - Mitsubishi Electric Outdoor unit models:

- 16 X PQRYP Water-Source Heat Recovery Units, 575V (condensers)
- 8 X CMB-P1012NU-GA1 Branch Controllers (heat recovery)

Mitsubishi Electric Indoor models:

- 77 - PEFYP NMAU-E3 Horizontal, Ceiling-Concealed Indoor Units

**Building B** - Mitsubishi Electric Outdoor unit models:

- 24 X PQRYP Water-Source Heat Recovery Units, 575V (condensers)
- 12 X CMB-P1012NU-GA1 Branch Controllers (heat recovery)

Mitsubishi Electric Indoor models:

- 113 - PEFYP NMAU-E3 Horizontal, Ceiling-Concealed Indoor Units

### Results:

- Very smooth performance
- Easy low maintenance
- Cost-savings for developer and end-users
- More living and floor space in each suite
- Energy-savings: 30% from geothermal + 25% from VRF heat recovery system

## Mitsubishi Electric Canada

Mitsubishi Electric Sales Canada Inc. was established in 1979 as a subsidiary of the Mitsubishi Electric Corporation of Japan. Since then Mitsubishi Electric Sales Canada Inc. has been at the forefront of heating and air conditioning technology, sales, installation and service.

With over 90 years of experience in providing reliable, high-quality products to both corporate clients and general consumers all over the world, Mitsubishi Electric Corporation is a recognized world leader in

the manufacturing, marketing and sales of electrical and electronic equipment used in information processing and communications, consumer electronics, industrial technology, energy, transportation and construction. No matter what you do, or where you live, work or play, chances are a Mitsubishi Electric product touches your life.

### **Vision:**

To be the most trusted industry leader in providing innovative heating, cooling and ventilation technology, engineered specifically for Canadian climates.

### **Mission:**

To deliver quality, comfort and value to all Canadians through leading-edge engineering, locally inspired design and a dedication to superior service.



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