MIRVISH VILLAGE
TORONTO, ON

CREATIVENERGY

Innovation in energy design and sustainability

THE COMMUNITY

The redevelopment of the iconic Mirvish Village & Honest Ed's site at Bathurst & Bloor Street will create nearly 1 million sq. ft. of purpose-built rental housing and retail space. This 4.5-acre development is currently under construction and will boast 5 mixed-use towers within a fully integrated community of dedicated rental housing, retail-commercial space and functional green space, with a focus on environmental stewardship affordability.

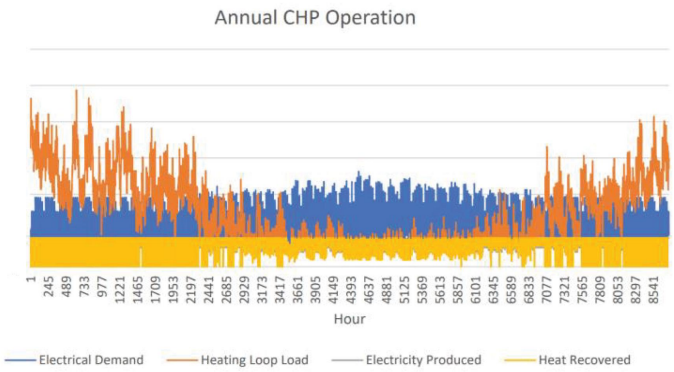
To help the neighbourhood meet the LEED Platinum criteria and the City of Toronto's Tier 2 requirements of the Toronto Green Standard, Creative Energy is developing a District Energy System (DES) for the community that offers a resilient means of thermal energy, power, and emergency power.

Currently under construction, the Creative Energy DES is expected to come online in early 2021 and occupancy is expected by 2022.

THE ENERGY SYSTEM

The key priorities for the Mirvish Village DES were affordability, resiliency, and sustainability. This led us to design a centralized heating and cooling system coupled with a "behind-the-meter" micro-grid with combined-heat-and-power ("CHP"), solar PV generation, and natural gas emergency generators.

The CHP is sized for base-load electrical demand and operates nearly continuously. Through a highly efficient process, the CHP produces electricity for on-site use and waste heat is captured and re-used within the community for space heating, domestic hot water heating, and ice-melting. Because a CHP approach provides usable electrical energy and thermal energy, the overall efficiencies are around 90%. This is significantly higher than utility scale gas plants which are used on the margins in Ontario's electricity grid and operate at 30 – 50% efficiently. As Ontario continues to grow, the electrical grid is expected to face both generation and distribution challenges, and it's carbon intensity is expected to increase. Distributed generation assets such as our Mirvish Village energy system will play a crucial role for the province's grid resiliency, affordability, and sustainability.



Frequent brown-outs are a well-known phenomenon in Ontario and lead to the demand for a more stable electrical grid. On-site electricity generation can reduce the grid strain during peak demand and provide unparalleled resiliency affording the residents of Mirvish Village with the peace of mind that the lights can stay on.

The DES system is designed with two natural gas generators that serve the dual purpose of providing emergency power for the entire community, as well as to manage peak demands to mitigate the costly Global Adjustments[1]. By working with data experts and predictive software, we can estimate the timing of the Global Adjustment peaks and enter "island mode" to minimize consumption from the grid, avoid or minimize Global Adjustment charges, and pass on savings to our customers.

The heating system consists of waste-heat from the CHP as the primary source and is complimented by four high-efficiency condensing boilers. Cooling is provided through high-efficiency centrifugal water-cooled-chillers with roof mounted cooling towers.

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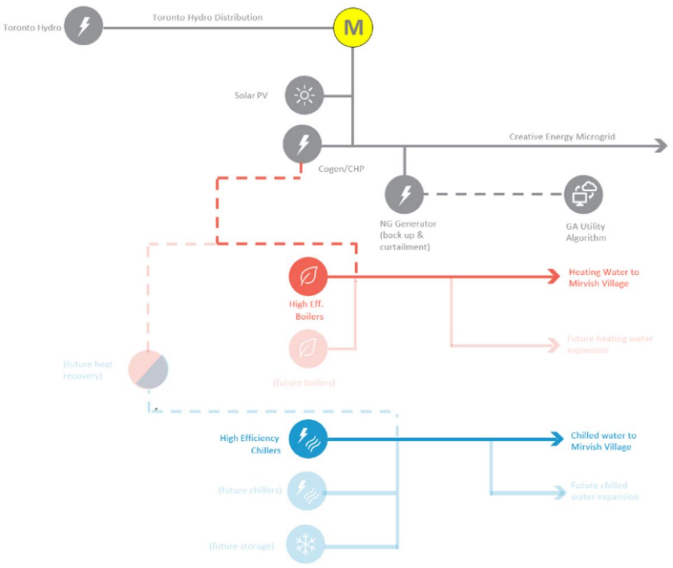


ENERGY REQUIREMENTS

The energy requirements for this project were designed to meet the Tier 2 benchmark from the Toronto Green Building Standard and LEED Platinum targets. To do this, the development is required to achieve a 25% reduction in energy compared to an ASHRAE 90.1 reference building.

The modelled results without the Creative Energy DES (i.e. business-as-usual thermal generation) resulted in a 16.5% reduction which fell short of the Tier 2 requirements. When our DES was incorporated into the analysis, this grew to a reduction exceeding 35%, far surpassing the Tier 2 requirements.

Achieving the environmental performance using a building-scale solution would have been far more costly than our neighbourhood energy approach.

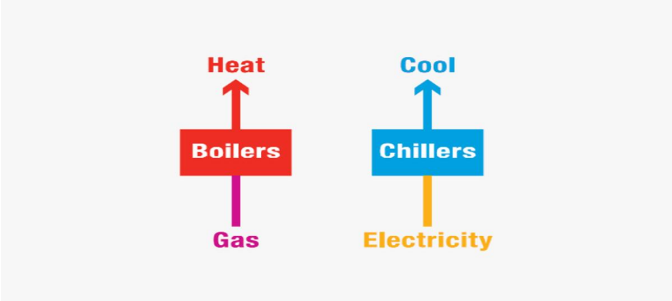
TECHNOLOGY SELECTION

Guided by the principles of affordability, resiliency, and sustainability, a number of systems and technologies were considered for the Mirvish Village DES. From geo-exchange and heat recovery, to co-generation and batteries, each concept underwent iterations of reviews, analysis, and optimizations to arrive at the most suitable technology for the community.

Several concepts were compared against a Reference Case, which was defined as gas-fired boilers and electric chillers at each building.

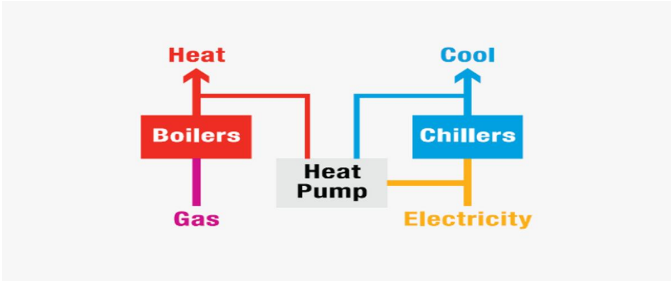
BASE CONCEPT

Centralized high efficiency gas-fired boilers and electrical chillers only. This provided cost savings and modest carbon savings over the Reference Case, but minimal resiliency benefits.



HEAT PUMPS

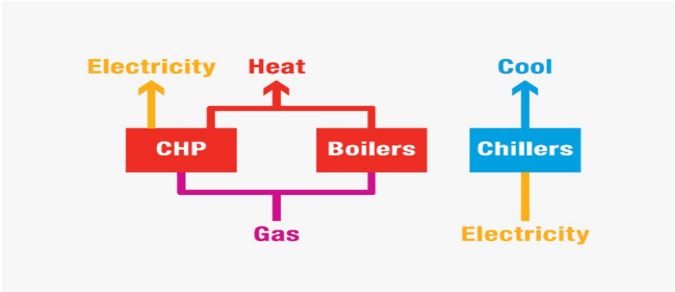
Base Concept with a heat pump for baseload heating and cooling (geo-exchange, sewer heat, and air source all considered). These concepts provided carbon reductions but were higher cost than the Reference Case and provided minimal resiliency benefits.



[1] *Global Adjustments, or "GA", are cost mechanisms implemented by the IESO that charge Class-A customers based on their peak coincidental demand with the peak grid demand 5 times a year. By curtailing from the grid during the peak demand periods, a considerable charge can be avoided, providing cost savings that can be passed down to customers.*

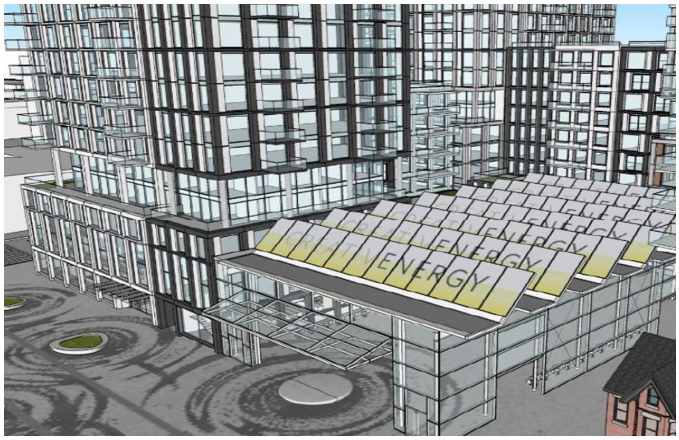
CHP & MICRO-GRID

Base Concepts with a gas-fired CHP unit. The CHP provides base load electrical energy and waste-heat to the development. The concept provided modest carbon reductions at a lower cost that than the benefits.



OPTIMIZATIONS

Solar PV was considered as a companion technology to the CHP concept and was ultimately incorporated into the DES to enhance its carbon performance. However, because of the amount of electrical energy the development of and the amount that rooftop Solar PV could provide (100s of kW), it was considered as an optimization strategy only to compliment the primary concepts.



PREFERRED CONCEPT

The CHP & Micro-grid option, optimized with a modest solar generation component, resulted in the ideal DES that balanced carbon reduction, resiliency, and affordability.

SYSTEM EXPANSION

Located in the heart of the Annex, an area of Toronto poised for growth, the Mirvish Village DES is being developed with the ability to expand to serve other buildings in the area with low-cost, reliable, sustainable energy. The distribution system will include capped connections for future expansion in all directions. The central plant was designed to accommodate additional installed capacity as the system grows.

The Mirvish Village DES was designed with a vision of resiliency for the whole Annex neighbourhood. As the area grows and new and existing developments seek sustainable, cost-effective energy solutions, Creative Energy's DES will be well-positioned to provide future developments with the ability to exceed energy capabilities not possible at the building scale.

District energy systems are platforms that are able to adopt different energy supply technologies over time. Developments like Mirvish Village act as anchor loads, attracting nodal developments to form connections to the anchor loads, expanding and linking to adjacent systems – the typical evolution of DES is shown in the figure below. Eventually the network of nodal systems can tie into other energy supply technologies that are not cost effective at the building scale. We envision Mirvish Village DES as a catalyst that will help expand our DES platform, develop new nodes, and help create a resilient, low-carbon future.

Source: International District Energy Association, King & Parks, 2012