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They chose an energy loop

Energy loops create interesting opportunities for energy efficiency and make it possible to achieve high-level LEED certification. Companies and institutions that have chosen this solution, such as McGill University and Université Laval, have taken advantage of the various financial incentives available to carry out their projects.

McGill University: From a heating network to an energy loop

For its energy management plan, McGill University set ambitious objectives for energy savings and GHG emission reductions. In addition to the energy-saving projects carried out in its buildings (renovation and recommissioning, etc.), an in-depth study of the networks was needed to reach its objectives.

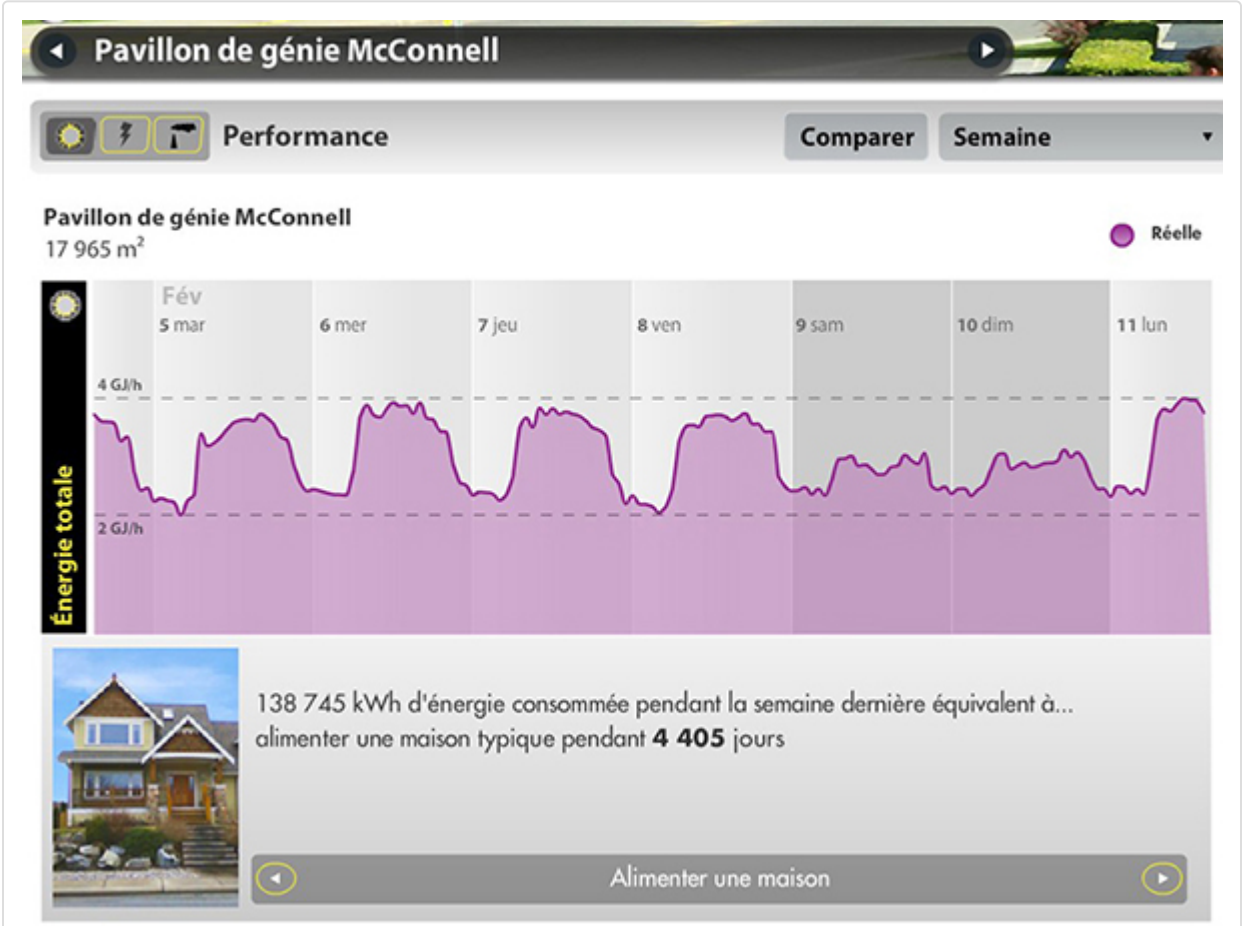
McGill manages a large property inventory comprising some 200 buildings. Its main campus in downtown Montréal alone has about 50 major buildings. A few figures underscore the scale of the energy challenges posed by such a collection of buildings:

- Approximately 1,000 heating, ventilation and air-conditioning (HVAC) systems
- Two steam networks that distribute more than 500 million pounds of steam per year (gas) – the downtown power plant can produce 320,000 lbs/hr of steam
- 12,000 tons of coolant
- Peak electrical demand of nearly 30 MW.

The University chose the Southeast sector of its downtown Montréal campus to begin the optimization process for its energy management plan. That sector encompasses 11 buildings (totalling approximately 131,400 m²) connected to four chilled-water loops driven by various types of chillers, some of whose heat is recovered to preheat a dedicated heating loop for a building or sector.

The primary heating loop is fed by a thermal power plant. The steam is used to heat, ventilate and humidify the buildings. When the heating loops for the terminal and envelope heaters drop below 65 °C, they are considered at medium or low temperature and are better suited for heat recovery. The steam running through heat exchangers (steam/hot water and steam/hot glycol) is principally used for heating spaces and fresh air, for humidifying, producing domestic hot water as well as for sterilizing laboratories. Meters and specialized software are used to track the energy consumption of each of the 70 main buildings at all of the campuses, as illustrated in figure 1.

Figure 1: Total energy consumption of the McConnell Engineering Building



Only available in French

The Southeast sector has now been optimized by implementing:

- Chilled water loops available year-round
- Low-temperature warm water loops
- Heat recovery on exothermic systems.

Implementing these measures will allow the University's Southeast sector to transition from a series of heating networks to an efficient energy loop and should provide a 16% reduction in the sector's energy consumption while meeting ever-growing energy demands and ensuring greater user comfort.

Similar work will be carried out on the Southwest and Northeast sectors. Also, the performance of the thermal power plant will be improved through a project to recover heat from combustion products. All these projects will significantly contribute to McGill University's transition from a heating network to an energy loop.

Université Laval – A constantly evolving energy loop

In 1852, the original campus of Université Laval was located in Old Québec. Today, it is in Sainte-Foy and comprises more than 40 buildings totalling over 790,000 m². Given the type of establishment, the occupancy of its premises is as varied as at McGill University. The buildings are heated and cooled by two thermal power plants to ensure redundancy. And the centralized control system makes it possible to manage more than 60,000 control points and meet the occupants' needs and requirements.

Chilled water circulates from one building to the next, enabling heat pumps located throughout the campus to draw energy from or release it into the water loops. For example, as part of a major expansion and renovation project, the Ferdinand-Vaudry Pavilion, which is now an integrated health sciences training complex, grew from 16,941 m² to

42,360 m². Yet, despite the expansion, its energy consumption for heating and ventilation has remained stable. This achievement was the result of several measures, including:

- Redesign of the spaces
- Heat recovery using a heat pump and heat wheel
- Variable-rate ventilation and hydronic systems.

Even though the Pavilion's energy requirements increased and became more complex, the University was still able to achieve significant savings while ensuring user comfort.

The Ferdinand-Vaudry Pavilion project is an example of energy-loop optimization. The energy loop makes it easier to incorporate energy-saving measures. What's more, the two thermal power plants are equipped with various devices to enable them to produce steam efficiently: stack economizer, micro-modulation controls, high-efficiency burner, etc. The energy loop also offers opportunities for integrating renewable energy since several buildings can benefit from it. So it is easier for the energy-saving measures to be cost-effective.

In summary

McGill University's experience shows that it is possible to transition from a heat network to an efficient energy loop by implementing targeted energy-efficiency measures. In this case, optimizing heat recovery is crucial. As for Université Laval, its energy loop in Sainte-Foy was designed as such from the outset. Now it's a matter of maximizing the loop by systematically incorporating heat-recovery and control measures when work is being done in the various buildings. Energy loops provide tremendous opportunities to achieve energy-performance and GHG reduction objectives.

Finally, many cities have opted for these solutions, including Vancouver, Toronto, Ottawa, and even Montréal, which have had heating networks and energy loops supplying many of their buildings for several years now. These loops are constantly being developed to respond to new needs and urban concepts.

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1. Source: McGill Pulse Energy Dashboard website, consulted in February 2019.

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