

Enermodal Engineering Building Energy Model

Project: 50-storey condominium project in Toronto, Ontario.

Software: eQuest

Weather files: Canadian Weather for Energy Calculations (CWEC)

HVAC Analysis

	WSHP	hybrid	Savings
kWh	2,491,069	1,617,706	873,363 (35%)
Therms 100,000 Btu	121,972	133,672	-11,700 (-10%)
TOTAL energy million Btu	20,699	18,888	1,811 (9%)
Building Energy cost	\$416,802	\$332,761	\$84,042 (20%)

Total Building Analysis

	WSHP	hybrid	Savings
kWh	5,245,304	4,371,941	873,363 (17%)
Therms 100,000 Btu	123,748	135,448	-11,700 (-9%)
TOTAL energy million Btu	30,277	28,466	1,811 (6%)
Building Energy cost	\$721,987	\$641,882	\$84,042 (11.6%)

Energy costs:

Electricity at \$0.1115 kWh

Natural Gas at \$1.50/therm (100,000 Btu)

Enermodal Engineering was commissioned as independent energy consultants to determine if the CGC Hybrid System delivers any energy or financial benefits. A condominium project was selected since it is the type of building that may yield the least favourable results for the CGC system, due to the limited quantity of operating hours with simultaneous heating & cooling modes. Buildings such as office complexes or schools where there may be more operating hours with simultaneous heating and cooling would yield better results for the CGC Hybrid System.

It is very important to note that the analysis was conducted with equal efficiencies and equal pumping rates for both systems. Typically, the CGC design offers better efficiencies and lower pumping rates, but for the purpose of this analysis, it was decided to provide no advantage to CGC in order to focus strictly on the **FREEHEAT™** and fuel switching advantages.

The conclusion reached by Enermodal Engineering is that the **FREEHEAT™** concept would deliver a **6% Total building energy reduction**, or a **9% reduction in energy** when compared to simply the HVAC portion.

FREEHEAT™ is possible when the heating compressors are turned off without the need for additional heat input from the boiler plant (or other heat source such as Geothermal). This typically occurs in the intermediate seasons, spring & fall.

Total building energy refers to the entire building including lights, and all other energy-consuming components.

The other main advantage of the CGC Hybrid system is **fuel switching**. This is the process of transferring the electrically generated heat away from the heat pump compressors to the boiler plant, where a lower cost fuel can be used. In this case, Natural Gas Fired boilers at 93% efficiency were used. Commonly, it is less expensive to heat a building with Natural Gas than it is with electricity.

In this building energy analysis, fuel switching contributed additional financial savings to bring the total building energy cost savings to 11%, or **20%** when compared to simply the HVAC portion.

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