

Geothermal HVAC Systems, Best Approach to Peak load & Consumption Reduction!

Ministry of Energy, IESO Team:

One question that comes to mind when you are presented with the challenge to “Electrify” our space & water heating along with our personal transportation is;

How to we accommodate and facilitate the increase in kwh, consumption and peak load, in KW requirements associated with this push to electrification.

With current capital cost projections for new nuclear power plants currently coming in at (including escalation and financing costs) in the range of \$5,500/kW to \$8,100/kW or between \$6 billion and \$9 billion for each 1,100 MW plant, it is crucial to look at current technologies that can reduce the peak load and overall consumption associated with the push for Electrification.

It is our contention that the, demonstrated, grid benefit with peak load and consumption reduction associated with Geothermal HVAC systems should be recognized and incentivized to promote wide scale adoption across Ontario.

Whether you use avoided capital cost or cost per kwh as the metric to measure by, Geothermal should be a significant tool in the IESO's conservation or capital cost reductions efforts

Please see the two scenarios below comparing ccASHP to Geothermal HVAC System options from a peak load in KW's and overall consumption, in kwh's perspective

Heat Loss @ 40,000 btu/hr & Heat Gain @ 20,000 btu/ hr & a Design temperature @ -2 F

- 1 (1) 4 ton, 19 SEER, Cold Climate Air Source Heat Pump (ccASHP) system with a 10 KW auxiliary heater
 - ASHP, domestic hot water heater
- Heat Loss @ 40,000 btu/hr & Heat Gain @ 20,000 btu/ hr
- * Total Kwh for ccASHP in heating, including auxiliary heater @ 8,387 kwh
- * Total kwh for ccASHP in cooling @ 706 kwh
- * Total kwh for ASHP, for domestic hot water @ 1437 kwh
- Peak KW demand in heating or cooling = 9.6 KW in heating

Total Yearly kwh system usage = 10,530 kwh

Solar PV array size required to offset this yearly demand = 10 KW +/- @ \$2,800/ KW = \$28,000 *

- (1) 4 ton Geothermal (GSHP) system with a pre-heat domestic hot water system to augment the domestic
 - ASHP, domestic hot water heater with pre-heat off the GSHP system
- Heat Loss @ 40,000 btu/hr & Heat Gain @ 20,000 btu/ hr
- Total Kwh for GSHP in heating @ 5,168 kwh
- Total kwh for GSHP in cooling @ 687 kwh
- Total kwh for ASHP with pre-heat off the GSHP, for domestic hot water @ 525 kwh
- Peak KW demand in heating or cooling = 3.16 KW in heating

Total Yearly kwh system usage = 6,380 kwh

Solar PV array size required to offset this yearly demand = 6 KW +/- @ \$2,800/ KW = \$16,800 *

- * Does not include other building electricity consumption; only the HVAC & DHW System
- * Does not factor carbon emissions from hydro production